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General Comment

See attached file(s)

Attachments

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Subject: **WMG Inc. Comments to the NRC on DRAFT revisions to the 1995 Branch Technical Position on Concentration Averaging and Encapsulation**

WMG Inc. is a Nuclear Services organization specializing in Low Level Radioactive Waste Characterization services. WMG has successfully applied the regulatory requirements of 10 CFR Part 61 and 10 CFR 20 as well as the associated regulatory guidance since inception. This guidance is contained in the May 11, 1983 "Final Waste Classification and Waste Form technical position papers", the January 24, 1991 "Waste Form Technical Position " Revision 1 and the January 17 ,1995 Final Branch Technical Position on Concentration Averaging and Encapsulation with Revision in Part to the Waste Classification Technical Position.

The activity concentration limits for shallow land disposal of low level radioactive waste established in 10 CFR Part 61 were based on consideration of exposure pathways to a postulated inadvertent intruder under various scenarios at a point beyond which institutional controls were in place to prevent the intrusion. By establishing concentration limits on a nuclide specific basis, the regulations effectively limit the amount of activity, per nuclide, which can be present in a given geometric and geographic location within the disposal environment.

It is important to note that the differences in the three levels of NRC waste classification specified in 10 CFR 61 (Class A, B and C) are not a function of more toxic or hazardous nuclides being allowed in the higher classes but merely the total activity of the Table 1 or 2 nuclides which can be present in a given package as a function of the individual nuclide concentration limits.

With that in mind, the NRC approach to providing revision to and clarification of the guidance specified in the January 17, 1995 BTP is a worthwhile effort and we welcome the opportunity to comment on suggested changes.

Definitions and Glossary of Terms Section
Classification Controlling Radionuclides-
This definition should be expanded to recognize that not only must a radionuclide be >1% of its applicable table value to be considered classification controlling but must also be present in a relative fractional abundance such that the concentration of the individual radionuclide (or a combination of controlling radionuclides) are the specific basis for transition from one waste class to another. This is the only means by which a generator can determine if the factor of 1.5 or 10 will be applicable in a concentration averaging scenario.

Heterogeneous waste mixture -
This definition should be modified to better define "*reasonably similar*" radionuclide concentrations. Assuming the wastes originate from differing sources and contain *dissimilar* radionuclide concentrations but *similar* relative fractional abundance, then the mixture of materials could reasonably approach uniformity in the context of the intruder scenario. It would be more appropriate to define heterogeneity as a function of differing radionuclide concentrations of *classification controlling* radionuclides present in each portion of the overall waste mixture. Application of the factor of 10 to the average would be an appropriate control to impose on mixtures of materials with differing relative radionuclide concentrations.

Heterogeneous mixture of similar waste types -
This definition describes the scenario under which blending of wastes types, individually considered to be homogeneous would occur. The physical blending of these materials would be expected to result in a final waste in which radionuclide concentrations would approach uniformity in the context of the intruder scenarios used to establish the 10 CFR 61.55 Table 1 and Table 2 values. (i.e. homogeneous waste). It is worthwhile to note that regardless of the degree to which physical mixing occurs prior to disposal; these types of materials will result in a reasonably homogenous distribution of activity in terms of the exposure pathway in an intruder scenario. (i.e. mixing would occur as a function of the intrusion)

Homogeneous waste -
This definition can be applied to a single, as generated waste type as defined in the current BTP OR the resulting waste from a combination of physically similar waste types, of similar radionuclide relative fractional abundance but dissimilar radionuclide concentrations.

Homogeneous waste type -
As indicated, this definition should continue to apply to as generated waste types such spent ion exchange resins, flowable filter media (i.e. charcoal), solidified liquids, evaporator concentrates, contaminated soils and containerized Dry Active Waste. As in earlier BTP documents the only wastes excluded from this definition would be activated hardware and potentially cartridge filters, depending on the source of generation, processing applied and packaging.

Nuclides other than primary gamma-emitting nuclides -
No comment – definition is appropriate as written.
Primary gamma-emitting nuclides –
No comment – definition is appropriate as written.
Waste type –
No comment – definition is appropriate as written.

1. Introduction, Purpose and Scope

The second sentence of the second paragraph, which states "*This §61.55(a)(8) requirement applies to packages of reasonably homogenous waste.*" is not a stated limitation within the regulation. A reasoned argument can be made that the authors intended that to be the case. However, it is more likely that this broad regulatory language was a consideration in identifying the need for the 1995 Branch Technical Position on concentration averaging. The 1995 BTP was designed to provide generators with improved guidance on assessment of the individual contributions to the total waste package and appropriate determination of both the individual and overall concentrations of radionuclides present within the waste package.

2. Relationship between the 1983 BTP,1995 BTP and this BTP

Paragraph 3 of this section highlights the need to provide further clarity and distinction between the concept of "encapsulation" and "solidification". Additions to the previous definition section consistent with the following would be appropriate.

Encapsulation -
The process of surrounding a discrete radioactive source, or collection of discrete sources in an approved binding matrix, within a container, where the activity remains within the geometric dimensions of the source(s), thereby providing additional separation from the environment and an additional and readily recognizable waste form with regard to potential inadvertent intrusion.

Solidification -
The process of incorporating radioactive material an approved binding matrix, in a manner to achieve homogeneity within a container, where the activity is distributed throughout the final monolith thereby providing additional separation from the environment and an additional and readily recognizable waste form with regard to potential inadvertent intrusion.

3. Organization of the BTP

The statement in paragraph 2 of section 3 and the attendant flow charts introduce a limitation on application of the concentration averaging process that was not intended by the original version of the 1995 BTP. Requiring the removal of higher concentration contributors to the overall package is completely contrary to the intent and concept of the 1995 BTP. Rather, demonstration that a specific collection of wastes within the container that meet the averaging limitations such that the higher concentration contributors can be considered to meet the class concentration limits is the intent.

The concept of mathematical averaging of low level radioactive materials is a practice that is appropriately controlled by the current regulations and technical positions. Mixing or blending of LLRW waste streams has been undertaken at licensed facilities as a matter of design and or physical limitations of the systems in which the waste is generated and collected. This was recognized in the two clarifying Branch Technical positions issued by the NRC subsequent to the initial 1983 position.

The 1995 BTP provided a limitation of a maximum factor of ten (or 1.5 if gamma driven classification) differences between the maximum concentration and the average for a given batch of waste as well as the same factor differences between the minimum concentration and the average. This effectively limits the extent to which a generator could utilize the concentration averaging process to reduce average concentrations in determining ultimate waste class. Based on historical disposal data, it is evident that the factor of 1.5 for gamma driven classification of waste packages is arbitrarily limiting and does not result in any appreciable additional protection. Application of the factor of ten in all cases results in an appropriate limitation to mathematical averaging of heterogeneous wastes within a package where physical blending cannot reasonably occur.

Although not specifically stated in the final position, it is clear by review of the comments and responses associated with the 1995 BTP that the purpose and intent was to provide a means to address potentially stranded wastes that fell outside the individual waste class concentration limits. In practice this provides a means to adequately control disposal of potentially greater than Class C wastes by averaging with material of similar but slightly lesser concentrations. Although this has been historically applied for the higher concentration (Class C) wastes it is conceptually the same regardless of ultimate waste class. So long as the final package/waste form meets the concentration limits and waste form criteria for a given class, then the waste can be appropriately disposed of as that class regardless of how or where the averaging occurs.

Furthermore, the January 17, 1995 Branch Technical Position clarified the concept of mixing for the full spectrum of generated and collected wastes of differing nuclide distributions and/or concentrations. This technical position specifically *excluded* from the definition of mixing, that collection of waste which occurs in various plant systems and tanks for purposes of operational efficiency and dose reduction. In practice, this applied primarily to *homogeneous* waste types (i.e. spent ion exchange resins, concentrates DAW etc.) as defined in the various Technical Positions. This provision to exclude limitations on wastes that can be physically blended should remain available for

all licensees regardless of whether or not the blending occurs at the point of initial generation or a subsequent process facility, so long as the 10 CFR 61.55 waste concentrations for a given class are met at the time of disposal.

4. Initial Waste Classification

As introduced in section 2 of the draft revision, this section begins to attempt to streamline the process by incorporating the specific criteria from the original into a version that distinguishes waste classification requirements more simply by initial heterogeneity and homogeneity of the various wastes and waste types rather than the distinction, (1) activated metals, (2) contaminated materials and (3) cartridge filters. Unfortunately, the draft section 4 imposes terminology and limitations on all wastes that were specifically intended to address the significant variation in activity and concentrations associated with activated hardware. Section 3.3 (3.3.1-3.3.6) including the Flow chart Figure 1 of the original BTP lists the specific guidance to be applied to activated hardware. Imposition of these criteria on other wastes is impractical and serves no benefit in terms of improved protection of the public or the environment. Rather, relocation of section 3.3 in its entirety (including Figure 1) into section 7 to the revised BTP will provide the specific guidance necessary to address activated hardware while allowing streamlining of the process for all other wastes.

The term "discrete Item" should be reserved for individual contributions to a waste package where the higher radionuclide concentration within the item has the potential to vary from the average concentrations within other items or contributions to the package by more than a factor of 10. This would generally apply to activated hardware and sources.

The term "contribution" or "contributor" to the overall waste package would be an appropriate means to distinguish between separate volumes of resins, batches of concentrates/liquids, cartridge filters or batches of contaminated materials from differing generation sources for purposes of evaluation of heterogeneity/homogeneity of the total waste package during classification.

For similar materials (i.e. resin and resin, soil and soil) originating from different sources, classification can be based on the volume or mass weighted concentrations from each source averaged over the final volume or mass.

For dissimilar materials (i.e. resin and soil, resin and filters) classification can be determined by the highest individual waste type contributor. (refer to section 6.1)

Sources that do NOT meet the concentration limits of a given waste class should be handled separately from other waste with clear provisions identified for acceptability of averaging over an encapsulating mass.

References to "discrete items" and classification in accordance with section 7 should be removed from section 4.

5. Classifying Homogenous Waste Types and Mixtures of Homogenous Waste Types

This section is generally appropriate as written with two exceptions.

- Remove the last part of the last sentence of paragraph 3 *"provided that the concentrations of the individual waste type contributors to the mixture are within a factor of 10 of the average concentration of the resulting mixture."*

Since the waste is a collection of similar homogeneous waste types, the statement in the last sentence of paragraph 1 of section 5 would be applicable. *"Because homogenous waste types have soil like properties, the radionuclides in these waste streams would be uniformly distributed when exhumed under the discovery or construction scenario described in the EIS supporting Part 61."* Therefore the factor of 10 to the average limitation is not necessary so long as the overall average concentration meets the appropriate Waste Class limit.

- Remove the last Paragraph as not applicable to this section

If the waste is a collection of physically similar homogenous wastes that will result in uniformly distributed activity when exhumed under the discovery or construction scenario then the radionuclide concentration heterogeneity of individual contributors to the total package is not a factor so long as the average concentration meets the appropriate Waste Class limit.

6. Classifying a Heterogeneous Mixture of Similar Waste Types

The title of this section should be revised to "Classifying a Heterogeneous Mixture of **Dis**similar Waste Types

Section 6.1 Conservative Classification Based on Highest Individual *Contributor*

Paragraph 1- No comment – appropriate as written

Paragraph 2- Delete – references to the 1 mCi per item are applicable only in the activated metal section.

Paragraph 3 Revise to address classification of individual contributions to the total package. Classify based on highest waste class concentration of any individual contribution of each dissimilar waste type within the package.

If dissimilar but homogenous waste streams (i.e. resin and soil combined) and highest waste class is equal to average waste class then classify based on activity over total volume or mass.

Section 6.2 and 6.3

Since gamma activity at 100 years post closure are reduced (Co-60 activity is essentially nonexistent and Cs-137 activity is reduced by a factor of ten), the factor of 1.5 is only applicable to Nb-94 in activated hardware or cartridge filters generated during activated hardware cutting activities. Tables A and B were developed to control classification of irradiated hardware and should be captured in section 7 (relocation of section 3.3 of the original BTP into section 7 of the revision will accomplish this.)

7. Classifying Individual Discrete Items

This section should be retitled "Classification of Irradiated Components and Associated Cartridge Filters" and be comprised of the entire content of section 3.3 of the original 1995 BTP, including Figure 1.

It is critically important that the definition of "component" described in the original 1995 BTP be retained for purposes of concentration averaging and that re-characterization of sub-pieces that result from sectioning of the larger component for packaging efficiency not be required. Such an interpretation would result in orphaned waste and is completely contrary to the original intent and purpose of the 1995 BTP. The "piece" rule (< .01 ft^3) contained in section 3.3.2 of the original BTP was designed specifically to address those situations where discrete pieces may require separate consideration for classification purposes.

8. Determining the Concentration and Volume of Waste

The table in section 8 is appropriate as presented with one minor addition, "solidified ion exchange resins" should be modified to read "solidified solid materials" and should retain the requirement that **If homogeneity is maintained in the solidified mass.

9. Position on Encapsulation of Sealed Sources and Other Solid Low Level Waste

This section should be modified as follows:
Item (2) -Revise the last sentence to read "Encapsulation of multiple sources in a larger volume is acceptable so long as the maximum .2m^3 of encapsulate per discrete source is retained and all other requirements of this section are met.

A useful addition to the BTP would be to allow encapsulation of larger activity sources contained within their original transfer shields (or equivalents) such that activity can be averaged over the encapsulating mass up to the applicable waste class limits for the specific source radionuclide. The combination of shield and encapsulation media can provide sufficient barrier to the inadvertent intruder under the discovery or construction scenarios and addition of the transfer shield should be sufficient to prevent access in a well drilling scenario.

10. Quality Assurance Program

This section is appropriate as presented.

11. Waste in High Integrity Containers

This section is appropriate as presented.

12. Alternative Provisions

This section is appropriate as presented.

13. References

This section should include the U.S. NRC, 1991 Waste Form Technical Position; Revision 1 dated January 24, 1991.

Appendix
This section is appropriate as presented.

Respectfully,

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JL/dd/