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August 24, 1992

USNRC
OFFICE OF ADMINISTRATION
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Chief, Rules & Directives Review Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: WMG Inc. Comments, Proposed Concentration Averaging and Encapsulation Technical Position, Revision in Part, dated June 26, 1992

Gentlemen,

We are pleased to submit the enclosed comments on the subject Technical Position. Our firm supports use of the RADMAN low level radioactive waste management computer code used by most nuclear power stations. Thus, we will have to revise our computer codes to produce the documentation needed to demonstrate compliance with the Technical Position.

Our firm is also involved in the characterization and 10 CFR Part 61 classification of activated metal components. We provide technical support for most of the projects conducted and also generate most for the paperwork to support shipment and disposal of these wastes. The proposed Technical Position on mixing activated metals will have a major impact on current industry practices in this area.

If additional information is needed relative to the enclosed comments, please let us know.

Sincerely yours,

P Tuite

Peter T. Tuite
President

PTT/cr
enclosure

August 24, 1992

WMG, INC. COMMENTS ON USNRC PROPOSED CONCENTRATION AVERAGING AND ENCAPSULATION TECHNICAL POSITION, DATED JUNE 26, 1992

GENERAL

1. ALARA Considerations

Earlier drafts of the Technical Position (TP) specifically addressed the subject of satisfying requirements consistent with ALARA. The draft for comment neglects this very important consideration. Specific ALARA issues are raised in the detailed comments below. However, we recommend that all those instances of additional waste sampling and radiation measurement that will be required to satisfy the proposed draft requirements be evaluated in the context of actual waste stream conditions, current characterization and classification practices, and the additional radiation exposure that will result.

2. Overall Approach to Alternative Provisions

As proposed, the TP presents prescriptive requirements for mixing non-homogeneous waste types (streams), that would require that 80-90 percent of the activated metal waste currently generated be addressed under the "alternative provisions" section. It would seem that available information acquired over many years coupled with current and historic practices should be acknowledged by the TP. If this were the case, prescriptive requirements would cover and be compatible with 80-90 percent of the cases encountered and 10-20 percent of cases encountered would be addressed under the "alternative provisions" section.

We recommend that the TP be revised consistent with the below comments to ensure that the "alternative provisions" section only covers exceptions to general mixing rules for non-homogeneous waste.

3. Use of Terms

a. "waste stream" vs. "waste type" - These terms seem to be used interchangeably. For example, on page 2, the phrase "mixtures of various waste types" is used and just below it the term "such waste streams would include" is used. In both cases the text refers to the same thing. We suggest that these terms be defined as follows:

- Waste Stream - A LLW source with a particular radionuclide content and distribution independent of its physical characteristics.
- Waste Type - A waste stream with a particular set of physical characteristics. Ion exchange resins, powdered resins, instrument strings, control rod blades, contaminated metal, cartridge filters, trash, and evaporator concentrates would all be different waste types.

Mixing different waste streams of the same waste type is different than mixing different waste types of the same waste stream. Defining terms which acknowledge such distinctions would help.

b. "homogeneous" vs. "non-homogeneous" - As drafted, "activated metals and contaminated components" and "cartridge filters" are non-homogeneous by definition. Does this mean that all other waste types are homogeneous ? We recommend that the TP clearly state that other waste types are homogeneous by definition as

opposed to using incomplete waste type listings to identify some homogeneous waste types.

c. "displaced volume" - This term is used throughout the TP to primarily distinguish between the "waste volume" and the "container volume". Yet, its classic definition is based on placement of an object in water coupled with measurement of the volume of water the object displaces. We do not think the intent is to use the classic displaced volume definition since this would significantly alter current practices. Illustrations of the waste volumes typically used for Part 61 classification are as follows:

   - Spent Resins - The bulk volume of the resin bed is used for the waste volume. This is about TWICE the "displaced volume" due to the interstitial spaces between the resin beads.

   - Activated Metals - The metal volume is used for the waste volume. This is not exactly the "displaced volume" since some components have enclosed voids, like those in the stainless sheath which encloses tubing containing boron carbide pellets in BWR control rod blades.

   - Cartridge Filters - The envelope volume defined by the filter diameter and length is used as the waste volume.

   - DAW - The envelope volume defined by the interior dimensions of the packaged DAW is used as the waste volume.

   We recommend that EITHER prescriptive definitions be used to define the volumes that should be used for classification of different waste types OR that the term "waste volume" be substituted for "displaced volume".

4. Distinction Between Gammas and Alpha/Betas

We submit that the distinction between gamma emitters and alpha/beta emitters for the purposes of mixing activated metals and cartridge filters has no technical basis when evaluated in the context of the 10 CFR Part 61 intruder scenarios. The technical basis for this conclusion is presented in paragraphs 4 and 5 of the Section C comments below. Moreover, this approach would seem to conflict with the original basis used to define the current classification system and thus constitute a new 10 CFR Part 61 rule-making. Accordingly, we recommend that this distinction be deleted from the TP.

SECTION C REGULATORY POSITION

1. Volumes and Masses for Determination of Concentration

The discussion on determination of trash and contaminated soil volumes is misleading. As a practical matter when these waste types are packaged, the density is rarely known but the container fill volume and gross weight are almost always known. We suggest that the language be revised to reflect making the determination with the available information.

The discussion on ion exchange resins uses the terms "volume or weight" and then combines the discussion of both parameters. For clarification we suggest; "In such cases, resin classification should be based on the bulk volume of the resins and the dewatered weight of the resins. Use of the container internal volume will overstate the waste volume and use of the resin weight before dewatering will overstate the waste weight."

2. Mixing of Similar Homogeneous Waste Streams

(Mixing of Homogeneous Waste Types)

We suggest that the heading be revised as shown in parenthesis since this case applies to mixing different waste streams of the same waste type, e.g., resins with resins or soils with soils. Each batch with a different radionuclide content and distribution should be classified separately.

3. Solidified or Absorbed Liquids

(Stabilized or Solidified/Absorbed Liquids)

We suggest that the heading be revised as shown in parenthesis. As drafted, "solidified" liquids, which do not necessarily meet stabilization criteria, can be classified taking credit for the solidification media. We do not think this is the intent and suggest that a distinction be made between "solidified/absorbed" on one hand and "stabilized" on the other.

4. Mixing of Activated or Contaminated Components

Although a portion of the activity on activated metal components arises from surface contaminants, the contribution from these contaminants is generally negligible for the purposes of classification. More importantly, the radionuclides which drive Part 61 classification of activated metals (Ni-59 and Nb-94 in Table 1 and Ni-63 in Table 2) and their concentrations bear no resemblance to those which drive classification of contaminated metals (transuranics and Cs-137) and their concentrations as surface contaminants. Thus, the technical basis for considering activated and contaminated components under the same heading when the subject is mixing, cannot be supported. We therefore suggest that these two very different waste types be addressed separately.

Comments on the proposed TP for mixing these two waste types are discussed separately below.

a. Mixing Activated Metals

We submit that there is no technical basis for using the Nb-94 Class C concentration in ANY piece of ANY component (waste type) as the limiting factor for activated metal classification. The rationale for this limit appears to be 10 CFR Part 61 intruder scenarios which originally provided the basis for the limiting Nb-94 concentration. These scenarios considered the dose received from a Nb-94 source with Class C concentrations with a volume that was several orders of magnitude larger than any activated metal component (including D&D material) that can be handled and shipped for disposal.

To put the Nb-94 limit in perspective, the largest non D&D activated metal component is a BWR control rod blade with a volume of about 19,000 cc. At the Nb-94 limit, this 15 foot long component contains 3.8 mCi of Nb-94. After volume reduction processing, pieces from this component can range from 250 cc to 4000 cc in size. For these volumes, the limiting Nb-94 concentration represents from 0.05 to 0.8 mCi, respectively. The largest pieces of D&D activated metal that can be shipped are on the order of 10,000 lbs (about 580,000 cc) of stainless steel with most pieces less than 1000 lbs (58,000 cc). At the Nb-94 concentration limit, these sources contain 116 to 11.6 mCi of Nb-94, respectively. It is difficult to define a intruder scenario considering the attention currently given to activated metals where these component and component piece activities can lead to intruder maximum doses even when many pieces are dispersed as a source.

We therefore recommend that the distinction between gammas and alpha/betas be eliminated. Mixtures of activated metals should be permitted provided that:

1. The sum of Table 1 and Table 2 fractions be individually determined for each component using the displaced metal volume of the individual component (albeit in pieces), and

2. The sum of the Table 1 and Table 2 fractions are within a factor of 10 between components of the same waste type (eg, LPRM string or dry tube), and

3. The sum of the Table 1 and Table 2 fractions are within a factor of 10 between batches of different activated metal waste types (eg, LPRM strings and control rod blades).

This approach corresponds to that currently in effect at a disposal site and is more conservative than the TPs proposed Rule of 10 for homogeneous wastes.

Additionally, since components are usually not activated uniformly, it is common to have whole components which are below the Class C Nb-94 concentration limit but have individual pieces of the component which exceed the Nb-94 limit. Under the "piece" rule in the TP, once pieces are produced, any piece which exceeds the Nb-94 limit cannot be packaged for disposal as LLRW. Using the TP approach, volume reduction processing which reduces the radiation exposure incident to handling and shipping in todays environment, is no longer acceptable. Industry thus has two undesirable alternatives; (1) eliminate volume reduction processing and increase radiation exposure or, (2) continue with volume reduction processing, and sort pieces according to Nb-94 limits, and increase radiation exposure. We recommend that all references to characterizing and classifying "pieces" of activated metal be deleted from the TP.

b. <u>Contaminated Metals</u>

The classification of contaminated metals is driven by the Table 2 less than 5 year half life radionuclides plus Co-60 (A to B only), Cs-137 Sr-90, and Ni-63, and the Table 1 transuranics. The radioactivity on contaminated metals arises solely from fixed and removable surface radioactive contaminants and is not intrinsic. This activity is also very mobile relative to activated metals.

Contaminated metals are typically considered DAW. This DAW is comprised of one or more waste streams, typically packaged with other non-metal DAW, and characterized as DAW. Alternatively, where decommissioning is performed, it combined exclusively with other contaminated metals and characterized as metal DAW. In both cases, individual pieces of contaminated metal, which may represent different waste streams, placed in the same disposal container are rarely characterized separately. Typically, a representative swipe is taken and used to characterize the entire container content. By addressing this subject under activated metals, the proposed TP requires that "pieces" be characterized...a requirement that is not practicable. We recommend that all references to characterizing and classifying "pieces" of contaminated metal be deleted from the TP.

The TP also requires that mixtures of contaminated metals distinguish between gamma emitters and alpha/beta emitters. However, while the 10 CFR Part 61 intruder scenarios distinguish between activated metals and routine wastes, no such distinction is made for contaminated metals. Additionally, the only gamma emitter present during the 500 year intruder scenario is Cs-137 which has decayed

16.6 half lives since the time of disposal from a Class C limit of 4600 uCi/cc to about 0.05 uCi/cc. This Cs-137 value is not sufficient to impact the intruder dose via the direct radiation pathway. Accordingly, we see no technical basis for applying the gamma-alpha/beta distinction to contaminated metals and recommend that this distinction be deleted from the TP.

5. Mixing of Cartridge Filters

The classification of cartridge filters is driven by the Table 2 less than 5 year half life radionuclides plus Co-60 (A to B only), Cs-137, Sr-90 and Ni-63 and the Table 1 transuranics. Since Cs-137 is soluble, it almost never shows up on filters in quantities sufficient to effect waste form class. Cartridge filters fall into two groups; (1) low activity filters which are almost always Class A waste, and (2) higher activity filters which require remote handling and can exceed Class A limits. The methods currently used for filter characterization and classification differ for these two groups. Comments on each group are presented below.

a. Low Activity Filters

A large number of filters generated in the nuclear power industry can be contact handled. These filters have low activities and are always NRC waste form Class A. They are rarely characterized and classified individually as the proposed TP requires. Since Co-60 is the driver from Class A to Class B and the limit is 700 uCi/cc, it is unlikely that a filter containing more than 700 uCi/cc could or would be contact handled. The smallest filter disposed is a BWR CRD strainer with a waste volume of about 150 cc's which results in about 100 mCi of Co-60. Dose rates from such a filter at the Class A Co-60 concentration limit are about 1.2 Rem/hr at 1 foot and 5 Rem/hr at 6 inches. Most cartridge filters are much larger than this with volumes in the 5,000 to 15,000 cc range. These larger filters would have substantially higher dose rates arising from Co-60 activities in the 3.5 to 10.5 Ci range. None of these filters would have radiation levels which are compatible with contact handling.

We recommend that cartridge filters which have radiation levels a factor of 2 below those which will result in exceeding NRC waste form Class A limits based on Table 1 and Table 2 concentrations be specifically EXEMPTED from the proposed mixing TP. This approach will eliminate the proposed requirement to individually characterize low activity filters, eliminate the additional radiation exposure from characterizing each low activity filter, and enable current practices to continue.

b. High Activity Filters

By definition, cartridge filters capture particulate radionuclide species which include Co-60, Mn-54, Fe-55, C-14, Ni-63, and transuranics. Once a cartridge filter exceeds Class A limits, the only long-lived gamma emitter present is Cs-137. Since this is a soluble species, it is rarely, if ever, present in abundances above 10 percent.

Consider the fate of a typical filter with a volume of 15,000 cc. It is combined with 29 other filters and packaged in a 100 cubic foot capacity high integrity container. If the container is at the Class C limits at the time of disposal, it can never contain more than 1000 uCi/cc of Cs-137 (about 20 percent of the Table 2 limit) or 450 Ci of Cs-137. This same high integrity container has an activity of about 4.5 mCi, 500 years later, at the time of the intruder scenario. The resultant dose rate from this container is less than 1 mRem/hr at 1 meter. Moreover, it is initially disposed as Class C waste. Thus, the Cs-137 content in filters is not sufficient to impact the

intruder dose via the direct radiation pathway. Accordingly, we see no technical basis for applying the gamma-alpha/beta distinction to cartridge filters and recommend that this distinction be deleted from the TP.

We understand the need to address the non-homogeneous nature of cartridge filters and recommend the following mixing criteria:

1. The sum of Table 1 and Table 2 fractions be individually determined for each filter of the same waste stream, and

2. The sum of the Table 1 and Table 2 fractions are within a factor of 10 between filters of the same waste stream, and

3. The sum of the Table 1 and Table 2 fractions are within a factor of 10 between batches of different filter waste streams.

This approach is more conservative than the TPs proposed Rule of 10 for homogeneous wastes and acknowledges the non homogeneity of filters.

6. Waste In High Integrity Containers

This section refers to "displaced volume" and should be clarified (see Use of Terms, General Comments, paragraph 3, subsection c. above).

7. Encapsulation of Solid Material

This section defines a solidified mass as one which meets stability requirements. We recommend use of the term "stabilized" instead of "solidified" (see paragraph 3 above).

8. Mixing of Dissimilar Waste Streams

(Mixing of Dissimilar Waste Types)

We suggest that the heading be revised as shown in parenthesis since this case applies to mixing different waste types, e.g., resins with filters or trash with resins. Each waste type has different physical characteristics as well as unique radionuclide content and distribution.

This section also seems to exempt small microcurie sources from the TP mixing criteria. The types of sources casually mentioned under "such as" can vary widely in terms of specific radionuclides and concentrations relative to 10 CFR Part 61 classification limits. We recommend that more prescriptive guidance be provided in terms of activity (for example, up 999 microcuries) and concentrations relative to classification limits (for example, less than Class C limits).

9. Alternative Provisions

See General Comment 2 above.