2015 Concentration Averaging Branch Technical Position

Implementation Questions and Answers

October 30, 2015

1. **Is there a significant difference between the guidance in Revision 1 of the Concentration Averaging Branch Technical Position (CA BTP) on when to apply the Factor of 2, which replaced the 1995 CA BTP Factor of 1.5, and the 1995 CA BTP guidance on when to apply the Factor of 1.5?**

   The 1995 CA BTP guidance for activated metals, components incorporating radioactivity in their design, contaminated materials, and cartridge filters stated that the Factor of 1.5 should be applied to primary gamma emitting radionuclides when the primary gamma-emitting radionuclides "dictate the classification of the waste." Similarly, for these waste types, Revision 1 of the CA BTP states that the Factor of 2 should be applied to primary gamma-emitting radionuclides "If the primary gamma-emitting radionuclides are classification-controlling". Revision 1 also states the Factor of 2 should be applied to sealed sources that are not encapsulated. In addition, the 1995 BTP stated that the Factor of 1.5 should be applied to cartridge filters in all cases, whereas Revision 1 only applies the Factor of 2 to cartridge filters when they are treated as discrete items instead of blendable waste.

   Revision 1 of the CA BTP provides a step-by-step process to determine whether the primary gamma-emitting radionuclides are classification-controlling, based on the process for determining waste classification in 10 CFR 61.55. The U.S. Nuclear Regulatory Commission (NRC) staff finds no significant difference between the phrases "dictate the classification of the waste" and "classification-controlling." However, some stakeholders have noted that the step-by-step process outlined in Revision 1 of the CA BTP may be slightly different from common practice in determining when primary gamma-emitting radionuclides dictate the classification of the waste.

2. **There is a provision in both the 1995 BTP and the revised BTP that if a container is at least 90 percent full, the nominal internal volume of the container can be used for averaging. This provision is included in Section 3.2.1, "Concentration Averaging for a Single Blendable Waste Stream," of Revision 1 of the CA BTP, but is not repeated in Section 3.2.2, "Concentration Averaging for Multiple Blendable Waste Streams." Does the provision apply to waste discussed in Section 3.2.2?**

   Section 3.2.1 of Revision 1 of the CA BTP addresses concentration averaging for a single blendable waste stream. There are three topics addressed in Section 3.2.1: 1.) using the nominal fill volume for containers filled to at least 90 percent; .2) the averaging volume for absorbed liquids; and, 3.) the treatment of small check sources. For efficiency, these provisions were not repeated in Section 3.2.2, "Concentration Averaging for Multiple Blendable Waste Streams." However, each of these three provisions also is applicable to blended waste (*i.e., mixtures of two or more blendable waste streams*) if the additional constraints in Section 3.2.2 are met. Similarly, each of these three provisions are applicable to mixtures of multiple blendable waste types if the constraints of both Sections 3.2.2 and 3.4 are met.

3. Section 3.4 of Revision I of the CA BTP addresses mixtures of two or more different waste types. However, for blendable waste, it only discusses physical and chemical compatibility of the waste types, it does not provide averaging constraints. What are the averaging constraints for mixtures of two or more blendable waste types?

Section 3.2.2 of Revision 1 of the CA BTP addresses blending of different waste streams within the same waste type. The phrases "of the same waste type" or “of a single waste type” were used in several places in Section 3.2.2 because additional constraints are recommended for blending waste streams of different waste types in Section 3.4 of the guidance. The guidance on blendable waste in Section 3.4 applies in addition to the guidance in Section 3.2.2. For efficiency and clarity, the guidance in Section 3.2.2 was not repeated in Section 3.4; however, the guidance in Section 3.2.2 is applicable to blending waste streams of different waste types, provided the additional constraints in Section 3.4 are met.

4. If a generator pours resin into a HIC containing cartridge filters, and the cartridge filters are justified as being treated as blendable waste, does the operational efficiency clause apply?

Cartridge filters and resins are different waste types, even if the cartridge filters are justified as being treated as blendable waste. Therefore, as discussed in response to Question #3, the guidance in Section 3.2.2 and Section 3.4 is applicable to such a case. The generator determines if combining the waste types was done for operational efficiency, occupational safety, or occupational dose reduction. The NRC staff encourages licensees to communicate with disposal site State regulators on acceptable averaging practices; however, because this language in the 2015 CA BTP is very similar to language in the 1995 CA BTP, this provision should not result in a significant change in current practice. Because the resins and cartridge filters are different waste types, at least one of which is blendable, the licensee should document the physical and chemical compatibility of the waste types and make the documentation available for inspection.

5. Given that Revision 1 of the CA BTP relies on the Uniform Waste Manifest (UWM) to identify waste types, can anion and cation exchange resins be considered a single waste type even though they are listed on the UWM separately?

Yes. Anion and cation resins need not be treated as separate waste types for the purposes of the CA BTP. Anion and cation resin are considered a single waste type for the purposes of the CA BTP just as primary and secondary resins are considered a single waste type (*but still different waste streams*). Similarly, for the purposes of the CA BTP, a bed of mixed ion exchange media is considered a single waste type (*even when charcoal is a constituent of the mixed bed*). Staff will look into further clarifying the UWM, which is currently undergoing revision.

6. Revision 1 of the CA BTP provides guidance for single blendable waste streams, mixtures of two or more blendable waste streams of the same waste type, and mixtures of two or more blendable waste streams from different waste types. What guidance applies to single waste streams from multiple waste types?

As defined in the CA BTP, a waste type has a "unique physical description" and a waste stream has both "relatively uniform radiological and physical characteristics." Under the CA BTP, waste streams are subsets of waste types. That is, a waste type could contain separate waste streams, but a single waste stream would not include more than one waste type. Stakeholders have noted that there appears to be a different standard for physical uniformity applied to waste types as compared to waste streams, noting "a unique physical description" could be interpreted to be a more stringent standard than "relatively uniform" physical characteristics. Under the CA BTP, there is no distinction between these two phases. The term "unique physical description" was used for consistency with the definition of waste type in 10 CFR Part 20. For the purposes of the CA BTP waste types are not more physically uniform than waste streams.

Other stakeholders asked specifically if mixed-bed resins represented a single waste stream that contains more than one waste type. For the purposes of the CA BTP, the purpose of distinguishing blendable waste types from one another is to determine when physical and chemical compatibility should be documented. In this case, because the different physical materials in a mixed bed resin are used in contact with one another, the physical and chemical compatibility are generally apparent, and the mixed bed resin can generally be treated as a single waste type for the purposes of the CA BTP.

7. If a waste container is approximately 80 percent full, it is common practice to add nonradioactive material so that it reaches 85 percent full, which is a waste acceptance criterion (WAC) at Barnwell. What happens if nonradioactive material is added to make the container 90 percent full? Can averaging then be used over the entire internal volume? Guidance in Revision 1 of the CA BTP says that added material should have a purpose other than lowering the classification. However, adding material to meet a WAC of 85 percent could be considered "necessary," and adding more nonradioactive material would make the waste package more stable (i.e., less void space), and would therefore have a purpose other than lowering the classification.

In general, it is not clear why licensees would add nonradioactive materials to containers to achieve an 85 percent - 90 percent fill volume when they could add radioactive material, which would likewise reduce void space. However, staff does not believe an increase of 5 percent constitutes an extreme measure; therefore, averaging could be used over the entire internal volume.

8. In the encapsulation guidance (Section 3.3.4), the CA BTP specifies that containers "up to" 9.5 m^3 may be used. Did staff mean to state "up to and including" 9.5 m^3?

Yes, as found in the CA BTP, staff interprets "up to" to mean the same as "up to and including."

9. If a generator has two partially filled waste containers, and combines them to fill void space and reduce the number of containers for disposal, is that "operational efficiency?"

In general, yes, this would be considered operational efficiency for the purposes of the CA BTP.

10. What does staff interpret as "extreme measures" to avoid when performing solidification, encapsulation, or thermal processing?

The term "extreme measures" is used in the 1995 BTP. As in the 1995 CA BTP, the staff interprets the phrase to mean that any non-radioactive material added to the waste should have a purpose other than lowering the waste classification (*e.g., stabilization or thermal process control*). Revision 1 of the CA BTP does not change the meaning of the term "extreme measures." As in the 1995 CA BTP, the staff has not specify any particular numerical constraints, and instead has chosen to allow state regulators flexibility in their determination of what constitutes "extreme measures."

11. Absent a specific numerical standard for "extreme measures," can the 14 percent waste loading criterion used for encapsulation in containers larger than 0.2 m^3 also be used for solidification and thermal processing?

The 14 percent waste loading value used in the encapsulation guidance is based on a topical report* for an encapsulation process submitted to NRC and is not necessarily transferrable to solidification or thermal processing. The key factor in determining whether or not a particular waste loading would be appropriate for another process is to determine whether the material added has a purpose other than changing the waste classification. If a particular waste loading is the highest waste loading that allows for a solidified waste form to have the necessary properties to meet stability requirements (*or other waste acceptance criteria*) that waste loading would generally not be considered an extreme measure. Similarly for thermal processing, if the material added is needed for process control or to control some property of the final waste form, it would generally not be considered an extreme measure. The NRC staff encourages communication with disposal State regulators on these issues.

* Letter from Essig, Thomas H., Branch Chief, to Charles E. Jensen, President, Diversified Technologies Services, Inc., December 30, 1999, Agencywide Documents Access and Management System (ADAMS) Accession No. ML003672170.