Revision of the Branch Technical Position on Concentration Averaging and Encapsulation - 16315

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ABSTRACT

On February 25, 2015, the U.S. Nuclear Regulatory Commission (NRC) issued Revision 1 of the Branch Technical Position on Concentration Averaging and Encapsulation (CA BTP), culminating a six-year process. This revision provides updated guidance on the interpretation of § 61.55(a)(8) of Title 10 of the Code of Federal Regulations, ''Determination of concentrations in wastes,'' as it applies to the classification of a variety of different types and forms of low-level radioactive waste (LLW) as Class A, B, or C waste. The waste class determines the minimum safety measures to be applied in order to provide reasonable assurance of safe disposal of the waste.

The CA BTP is used by thousands of LLW generators, by the waste processing industry, by all operating LLW disposal sites in the U.S. and by Agreement States.

The previous version of the CA BTP, published in 1995, was issued before the NRC adopted its risk-informed and performance-based regulatory policy. The revised CA BTP has been informed by that policy. The revised CA BTP also contains new guidance on acceptable methods that can be used to perform concentration averaging of LLW for the purpose of determining its waste class for disposal.

This paper provides background information on why the CA BTP was issued and subsequently updated. This paper summarizes the new guidance found in the revised CA BTP. This paper also explains some of the key issues that required NRC's resolution, and the reasoning that underpins the major decisions reflected in Revision 1 of the CA BTP.

INTRODUCTION

At its core, the Branch Technical Position on Concentration Averaging and Encapsulation (CA BTP) provides guidance on how to average the concentration of radionuclides in low-level radioactive waste (LLW), for the purpose of determining the waste classification per 10 Code of Federal Regulations (CFR) 61.55 (i.e., as Class A, B or C). These concentration averaging positions are developed to ensure protection of individuals that might inadvertently intrude into a closed and unrecognized LLW disposal facility.

This paper reviews the:

- History of the CA BTP
- Reasons the 1995 CA BTP Was Revised
- U.S. Nuclear Regulatory Commission's (NRC's) Process for Revising the CA BTP
- Link Between CA BTP Positions and Inadvertent Intruder Exposure Scenarios
- Overview of the Revised CA BTP
- Revised Guidance on Waste Encapsulation
- Revised Positions for Disposal of Sealed Sources
- Revised Guidance on Blending and Demonstration of Adequate Mixing
- Risk-Informed Treatment of Cartridge Filters
- Risk-Informed Averaging of Other Discrete Waste Items
- Alternative Approaches
- Contaminated Materials and Unfinished Business
- Training

DISCUSSION

History of the CA BTP

To ensure the safe and permanent disposal of LLW, the NRC's "Licensing Requirements for Land Disposal of Radioactive Waste," found in 10 CFR 61, set four performance objectives, including protection of the general public from releases of radioactivity from the disposal facility, protection of individuals against inadvertent intrusion, worker protection and site stability. The second of these performance objectives states that:

> "Design, operation, and closure of the land disposal facility must ensure protection of any individual inadvertently intruding into the disposal site and occupying the site or contacting the waste at any time after active institutional controls over the disposal site are removed." 10 CFR 61.42

In its evaluation of the second performance objective, the NRC assumes that an individual unknowingly intrudes onto an unrecognized disposal facility and interacts with the waste sometime after the end of the 100-year active institutional control period. To protect this hypothetical individual, the NRC developed a waste classification system that requires greater control measures for waste with greater radionuclide concentrations. Licensees shipping waste for disposal are required to certify each waste package listed on the manifest is properly classified as Class A, B, or C in accordance with this waste classification system presented in 10 CFR 61.55.

The 10 CFR 61.55 waste classification system is based on the *concentration* of specific radionuclides contained in the waste, where concentration is measured in curies per cubic meter or nanocuries per gram of waste. In determining these concentrations, the regulation states in 10 CFR 61.55(a)(8) that radionuclide concentrations in the waste can be averaged over the volume of the waste or its weight if the units are expressed as nanocuries per gram. Simple averaging[1] is allowed by 10 CFR 61.55(a)(8) because the 61.55 classification system is based on the assumption that wastes are soil-like and radiologically homogenous at the time of inadvertent human exposure [1, Vol. 2, p. 4-8 & Table 3.3].

The CA BTP provides guidance on complying with § 61.55(a)(8). The NRC staff published a technical position on radioactive waste classification, initially developed in May 1983. Section C.3 of the 1983 technical position provided guidance on averaging of radionuclide concentrations for the purpose of classifying the waste.

In 1995, the NRC staff updated a portion of the 1983 technical position, publishing as a separate document the ''Branch Technical Position on Concentration Averaging and Encapsulation'' announced in the Federal Register on January 23, 1995 [2]. The 1995 CA BTP was issued, in part, in response to accidents involving small (i.e., "pocketable"), durable, highly radioactive, sealed sources. Those sealed source accidents led the NRC to consider *discrete wastes* that might survive in a LLW disposal facility, and to consider the possibility that not all LLW would be soil-like and radiologically homogenous at the time of inadvertent human exposure.

> A major intent of the … [1995 BTP] *… is to define positions for the disposal of discrete wastes,* or mixtures of such wastes that fall within the "envelope of safety" defined in the [Part 61] EIS." (emphasis added) [2, p.1 of Enclosure 2].

Reasons the 1995 CA BTP Was Revised

In 2007 the NRC staff performed a strategic assessment of the NRC's regulatory program for LLW in recognition of significant new and emerging LLW disposal issues. Revising the 1995 CA BTP was ranked as a high priority in this strategic assessment (SECY–07–0180).

In 2010, the Commission directed the staff to develop guidance regarding the large scale blending of homogenous waste types, as described in SECY-10-0043, as part of its revision of the CA BTP. The 1995 CA BTP constrained the concentration of certain waste types put into a mixture (e.g., spent ion exchange resins) to within a factor of 10 of the average concentration of the final mixture. The Commission directed the staff in SECY-10-0043 to replace this position and to implement a risk-informed, performance-based approach for blending. In the revised CA BTP position, the hazard (i.e., the concentration of nuclides) of the final mixture is the primary consideration for averaging constraints.

Additionally, the NRC adopted a risk-informed, performance-based regulatory approach for its programs in the late 1990's, after the 1995 CA BTP was published. The revised CA BTP more fully reflects that approach, not just for the blending position, but for other topics as well.

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[1] Simple averaging is concentration averaging based on the sum of fractions using the total inventory in the waste package, divided by total volume or mass of the waste in the package, as appropriate.

NRC Process for Revising the 1995 CA BTP

The revised CA BTP was deliberately built on the foundations of the 1995 CA BTP to maintain regulatory stability. There were no safety-related reasons to fundamentally change the 1995 CA BTP, which has been used in whole or in part for many years as a licensing condition for commercial disposal facilities in the U.S.

A small team of NRC staff and contractors prepared initial revisions to the CA BTP. Members of the team brought different and complementary experiences and perspectives to the table. After consensus within the team, consensus was sought with NRC management and the Office of General Council; then the revisions were released for input from the public, industry and other government entities.

There were three draft revisions. The first draft (Agencywide Documents Access and Management System (ADAMS) Accession No. ML103430088) was noticed in the Federal Register on January 26, 2011 (76 FR 4739). The second draft (ADAMS Accession No. ML112061191) was made available to the public in September 2011, in advance of a public workshop held in Albuquerque, New Mexico. The third draft (ADAMS Accession No. ML121170418) was noticed in the Federal Register for public comment on June 11, 2012 (77 FR 34411). Each successive draft was responsive to comments received from public stakeholders, industry and other government agencies.

In addition to soliciting comments on the three successive drafts, the NRC conducted three public workshops to inform stakeholders and gather their input. Two of the workshops were held in the Washington, DC area (January 14, 2010 and February 24, 2011) and the third workshop was conducted on October 20, 2012 in Albuquerque, New Mexico. Written responses were provided on all written comments received during the five-year public participation process, and are available in the NRC's ADAMS. Multiple drafts, written responses to all written comments and the three workshops are all examples of the open and transparent process followed by the NRC in updating this BTP.

Link between CA BTP Positions and Inadvertent Intruder Exposure Scenarios

As discussed above, the NRC's licensing standards require "… protection of any individual inadvertently intruding into the disposal site and occupying the site or contacting the waste at any time after active institutional controls over the disposal site are removed. …" The NRC's 10 CFR 61 licensing standard employs several mechanisms to protect the inadvertent intruder, including the requirements for active land use controls, passive land use controls, long-term government ownership of the site, waste form stability and intruder barriers.

Waste concentrations are also limited to protect the intruder, should intrusion occur. To develop the 10 CFR Part 61 Waste Class limits, the NRC calculated radionuclide concentrations that would provide reasonable assurance an inadvertent intruder would not receive more than 5 mSv/yr (500 mrem/yr).[2] To develop the averaging constraints of the revised CA BTP, NRC used the same 5 mSv/yr limit.

With a defined dose limit, setting the dose-based concentration limits then depends on the timing and the nature of the intruder's exposure. For a short-lived radionuclide, the amount of decay assumed to occur before intrusion significantly affects the allowable radionuclide concentrations at the time of disposal. For the CA BTP, NRC staff hypothesized intrusion 100 years after site closure for Class A waste, 300 years after closure for Class B waste, and 500 years after closure for Class C waste.[3] Similarly, the nature of the hypothesized exposure also affects the calculated concentration limits. If the intruder's exposure is assumed to be extensive, then the concentration limits must be low to protect the intruder. Conversely, if the intruder's exposure is assumed to be more limited in scope, then the concentration limits can be less restrictive. Thus, there is a link between the concentration limits and the timing and nature of the inadvertent intruder exposure scenario(s).

In updating the CA BTP's averaging constraints, the NRC team had a preference for the approach used earlier by the NRC to develop the inadvertent intruder exposure scenarios used to set the 10 CFR 61.55 Class A, B and C limits, though the team was also familiar with different approaches for establishing inadvertent intruder exposure scenarios [e.g., 3 and 4]. In setting the Class A, B and C limits, the NRC recognized that the actual nature of the intruder's exposure scenario(s) is unknowable. Therefore in the Draft Environmental Impact Statement (DEIS) for Part 61, the NRC reviewed two basic alternatives for proceeding:

1. Based on judgment, devise a number of intruder exposure scenarios, from the likeliest to the unlikeliest, assign a probability to each, and perform a risk analysis of the impacts; and
2. Based on judgment, determine a limited number of high consequence intruder exposure scenarios, assume the scenarios occur, and perform a consequence analysis of the impacts of each.

For the first alternative (define scenarios and assign probabilities), a weakness is that a very large number of scenarios could be invented, and …

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[2] Part 61 sets a 0.25 mSv/yr (25 mrem/yr) dose standard to protect the general population, but a 5 mSv/yr (500 mrem/yr) standard was used by the NRC to protect the inadvertent intruder because "… intrusion may never occur and if it should occur, would only be expected to involve local exposure of a few individuals." [1, Vol 2, p. 4-56]

[3] One hundred years is assumed to be the end of active institutional controls required for all waste classes, 300 years is assumed to be the limit of waste stability required for Class B and C waste, and 500 years is assumed to be the limit of the intruder barrier required for Class C waste.

> "It would be impossible to consider all of these scenarios. In addition, it would be extremely difficult if not impossible to determine and assign numerical probabilities. Inadvertent intrusion is a hypothetical event that may or may not occur in the future." [1, Vol. 2 p. 4-6][4]

Given the difficulty of implementing #1, NRC staff stated that #2 is the better approach, but that …

> "… this also has its drawbacks. If extremely conservative, yet clearly unlikely scenarios are used, then the calculated results (which may involve conservatisms multiplied by conservatisms) can quickly become unrealistic and overly restrictive. … NRC has, therefore, adopted a somewhat combined approach … [where] … A limited number of intrusion scenarios are conservatively assumed to occur *based upon consideration of typical human activities.* The potential consequences are then calculated …" [and used to set the Class A, B and C limits found in 61.55] (emphasis added) [1, Vol. 2, p. 4-6]

Similarly, the Final EIS (FEIS) for Part 61 states that the …

> "NRC has assumed *reasonably conservative* (but not overly conservative) actions on the part of the intruder. In addition, some judgment was also made as to the likelihood and extent of the events occurring depending upon specific waste forms and disposal practices." (emphasis added) [6, Vol. 1, p. 4-13].

In summary, in developing the scenarios that underlie the 61.55 Class A, B and C concentrations limits, the NRC considered using a "probabilistic" approach (with judgment-based scenarios and associated probabilities), but chose instead to use judgment to determine a limited number of "reasonably-conservative" intruder exposure scenarios, assume the scenarios occur (assume a probability of 1), and perform a consequence analysis of the impacts of each. Based on the consequence analysis, the NRC then back-calculated the Class A, B and C concentration limits.[5]

In revising the CA BTP to protect the intruder, NRC staff also chose to select a limited number of reasonably foreseeable, reasonably-conservative intruder exposure scenarios. Four exposure scenarios were developed by the staff: one to set the limits for pocketable gamma-emitting discrete items, one to set the Factor of 2 limits for pieces of activated metal and two to define the boundary for when it is necessary to demonstrate the adequacy of the mixing of blendable wastes. Waste forms that are expected to be radiologically homogenous at the time of the inadvertent human exposure (as envisioned with the development of the Class A, B

[4] Later the National Academy of Sciences stated that there is no scientific basis for quantitatively predicting the nature or probability of a future human activity [5, p.97].

[5] Some of these calculated limits were adjusted, as discussed on pages 88–89 of Volume 2 of the revised CA BTP [7].

and C concentration limits) are appropriate for simple averaging, and the CA BTP does not place any averaging constraints on these waste forms.

These four CA BTP exposure scenarios were then presented for public comment in workshops and in the draft versions of the CA BTP. This process, wherein the regulator defines the intruder exposure scenario(s) in a public participation process, is consistent with the recommendations of the National Academy of Sciences for defining human exposure scenarios [5, p.98].

The final version of these scenarios is presented in Volume 2 of the revised CA BTP [7]. Importantly, the revised CA BTP allows Alternative Approaches, and licensees may develop site-specific and/or waste form-specific intruder exposure scenarios, and associated concentration limits.

Overview of the Revised CA BTP

The revised CA BTP divides wastes into two broad categories:

1. Blendable waste, and
2. Discrete items

Blendable waste is waste that is not expected to contain radiological hot spots <u>or</u> waste that can be physically mixed to create relatively uniform radionuclide concentrations (e.g., spent ion exchange resins). A radiological hot spot is a portion of the overall waste volume whose radionuclide concentration exceeds the radionuclide concentration limit for classification that is applicable to the overall waste volume. By volume, the vast majority of LLW is blendable waste and can be concentration averaged without constraint.[6] Examples of blendable waste include soil, ash, spent ion exchange resins and contaminated trash.

Discrete items are items belonging to certain waste types that often have high activities or concentrations. Discrete items may contain durable hot spots (i.e., hot spots that will remain intact in a LLW disposal facility for 100+ years). Examples of discrete items include sealed radioactive sources and pieces of activated metal. Discrete items that are smaller than 280 cc (0.01 ft^3) are "pocketable" by an inadvertent intruder and given special consideration in the CA BTP. Discrete items are subject to more complex averaging constraints, as discussed below.

[6] Constraints on the volume of the product or adequacy of blending are introduce only in certain circumstances when wastes with very different concentrations (i.e., more than a factor of 10) are combined.

Revised Guidance on Waste Encapsulation

Encapsulation is the process of surrounding a radioactive item (such as a sealed source or a cartridge filter) in a binding matrix, in a container where the radioactivity remains in the original dimensions of the encapsulated item. Encapsulation can mitigate waste dispersion, provide shielding to limit external radiation doses to workers, and satisfy the stability requirement of 10 CFR 61.56(b) and technical requirements for land disposal facilities of 10 CFR 61.52(a).

When conditions defined in CA BTP are met, credit can be taken for the volume or mass of the non-radioactive binding matrix, when determining the concentration of the final waste form. The constraints for encapsulating individual items are similar to the constraints on disposal of a mixture of discrete items in a container, and include the use of the Table 2 and Table 3 values found in the revised CA BTP. Table 2 specifies maximum activities for individual items[7] for each waste class for primary gamma emitting radionuclides.[8] Table 3 similarly specifies maximum activities for certain non-primary gamma emitters.

Table 2 values were derived from the Small (< 280 cc) Gamma-Emitting Item Carry-Away Inadvertent Intruder Exposure Scenario detailed in Section 4.3.1 of Volume 2 of the revised CA BTP. The Table 3 limits for non-primary gammas are the amount of 61.55 activity that could be averaged over 0.2 m^3 (55 gallons) and meet the waste Class limit.

The encapsulation position limits extreme measures for averaging radioactivity in a discrete item over the nonradioactive encapsulating material. Because the basis for the encapsulation position is to limit extreme averaging, different constraints are applied for low and high waste loadings. For low waste loadings (i.e., waste is < 14% of the final volume), and averaging over a large percentage of clean material, the activities cannot be averaged over more than 0.2 m^3 or 500 kg. For high waste loadings (i.e., > 14%), licensees may average the radioactivity of an encapsulated item (or items) over volumes of up to and including 9.5 m^3 (331 ft^3). This position (of requiring > 14% waste loading) limits extreme measures when waste is averaged over volumes larger than 0.2 m^3. The staff has previously approved a minimum waste loading of 14% in a topical report relevant to encapsulation [8], and this value has been incorporated in the revised CA BTP.

Independent of the waste loading, if the primary gammas control classification of the encapsulated waste form, then the primary gammas *in each item* must be less than a Factor of 2 above the class limit or less than the Table 2 activity limit on a sum-of-fractions (SOFs) basis (licensee can chose) AND, if Table 2 is used, then the curies in all items smaller than 280 cc should be summed first. If primary gammas do not control classification of the encapsulated waste form, then the primary gammas in each item must be (1) less than a Factor of 10 above the class limit or

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[7] As discussed in the CA BTP, items 280 cc or smaller should considered collectively for comparison to Table 2 values.

[8] The CA BTP defines the primary gammas as: Cobalt-60, Niobium-94 and Cesium-137.

less than the Table 2 activity limit on a SOFs basis (licensee can chose) AND, if Table 2 is used, then the curies in all items smaller than 280 cc should be summed first.

Independent of whether primary gammas or non-primary gammas control the classification, the concentrations of non-primary gamma emitters in each item must be: less than Table 3 or less than a Factor of 10 above the class limit (licensee can choose) and small items do not need to be summed. As always, the total activity in the waste form divided by final volume (or mass) of the encapsulated waste form cannot exceed the appropriate class limit.

The revised CA BTP offers the licensee greater flexibility than was offered in the 1995 CA BTP when encapsulating discrete items, while still protecting the intruder. This flexibility includes the ability to take credit for encapsulated volumes greater than 0.2 m^3 (when the waste loading is above 14%), and the use of the Table limits or the Factor limits. However, this greater flexibility makes the revised CA BTP more complex.

Sealed sources are commonly encapsulated prior to disposal, and the revised positon for concentration averaging sealed sources is discussed below.

Revised Positions for Disposal of Sealed Sources

Because of their high activity and small size, if sealed sources became unsecured or abandoned, there could be negative consequences for public health or environmental damage. This is particularly true because the human senses cannot detect the radiation hazard, and a sealed source may look like a small, interesting piece of metal. Further, some of these sources, if used either individually or in aggregate in radiological dispersal devices commonly referred to as "dirty bombs," could cause significant social disruption and economic impacts in the billions of dollars [9]. Two major studies of sealed-source security have recommended steps to increase disposal options for sealed sources [10 and 11].

The staff has increased some of the disposal guidelines while ensuring continued protection of an inadvertent intruder by basing recommended activity constraints on intrusion scenarios that are more realistic than the intrusion scenarios used in the 1995 CA BTP.[9] For example, for Cesiums-137, the recommended activity constraint for discrete items has been increased from 1.1 TeraBecquerel (TBq) (30 Ci) to 4.8 TBq (130 Ci).

Importantly, the revised CA BTP specifies a different process that entities can use to propose disposal of higher activity discrete items such as sealed sources, based on site- or waste-specific factors (see discussion below on Alternative Approaches).

[9] This more realistic exposure scenario is detailed in Section 4.3.1 of Volume 2 of the Revised CA BTP.

Revised Guidance on Blending and Demonstration of Adequate Mixing

The revised CA BTP also addresses the Commission direction to ‘‘develop a clear standard for determining homogeneity’’ of blended waste. The 1995 CA BTP constrained the concentrations of inputs to a mixture of blended waste and therefore did not need to address the homogeneity of the final mixture. It included a ‘‘Factor of 10’’ concentration limit on waste blending, which limited blending of waste streams with radionuclide concentrations to within a factor of 10 of the average concentrations in the blended product.

The revised CA BTP contains specific guidance regarding blending of wastes with very different radionuclide concentrations. This guidance was developed because insufficiently blended waste could contain pockets with radionuclide concentrations more than an order of magnitude greater than the relevant class limits which could increase risk to an intruder by increasing the consequences of intruder interaction with the waste, if the intruder happened to exhume a pocket with elevated radionuclide concentrations.

The revised CA BTP specifies certain volume thresholds over which the concentrations of blended waste can be averaged, based on the radionuclide concentrations of the waste streams that are blended together.[10] Above these thresholds, licensees should demonstrate that waste is adequately blended. Considerations for this demonstration are also discussed. The thresholds for demonstrating adequate blending and the guidance on demonstrating waste is adequately blended are based on a probabilistic dose assessment using two inadvertent intruder exposure scenarios (see Section 4.6 of Volume 2 of the revised CA BTP). This revision is risk-informed because of the method used to establish the threshold for the homogeneity demonstration. It is also performance-based because the position no longer constrains concentrations of inputs to a blending process but instead specifies criteria that the output (i.e., the blended waste) must meet to protect an inadvertent intruder from potential hot spots in the waste.

Risk-Informed Treatment of Cartridge Filters

In the 1995 CA BTP, cartridge filters, a waste type generated during the operation of nuclear power plants, were defined as discrete items subject to certain averaging constraints on each filter. Each filter had to be radiologically characterized and fit within the specified averaging constraints of the 1995 CA BTP. While that default position remains in place, the revised CA BTP also allows for the treatment of such filters as blendable waste, with a documented justification available for inspection. Individual filters that are not justified as blendable per the guidance provided in Section 3.3.3 of the revised CA BTP, are subject to the averaging constraints for discrete items. This more risk-informed position is justified because a review of a

[10] *Generator Facilities* can mix multiple blendable waste streams of the same waste type for the purposes of operational efficiency, occupational safety, or occupational dose reduction and the aggregated waste can be treated as a single waste stream (i.e., averaged without constraint).

large number of disposal records demonstrates that many filters do not present a gamma hazard to an intruder.

Risk-Informed Averaging of Other Discrete Waste Items

The 1995 CA BTP constrained the averaging of discrete items with its Factors of 1.5 (which applied to primary gamma emitters) and 10 (which applied to other radionuclides). The factors applied to the average radionuclide concentrations in a mixture of certain discrete items, such as activated metals, such that the radionuclide concentrations in all items in a mixture had to be within those factors for the average of the mixture. These factors ensure uniformity of radionuclide concentrations in mixtures of items, but such mixtures could be uniformly low in concentration and risk. Thus, there is no relationship between the 1995 CA BTP position and risk (or dose). The revised CA BTP ties the averaging factors to the class limit for radionuclide concentrations (not the average of the mixture), which has a relationship to risk because the class limits are based on a dose of 5 mSv/yr (500 mrem/yr) exposure to an inadvertent intruder. The staff also revised the Factor of 1.5 to 2. Figure 1 graphically illustrates the differences between the 1995 Factor of 1.5 and the Factor of 2 in the revised CA BTP.

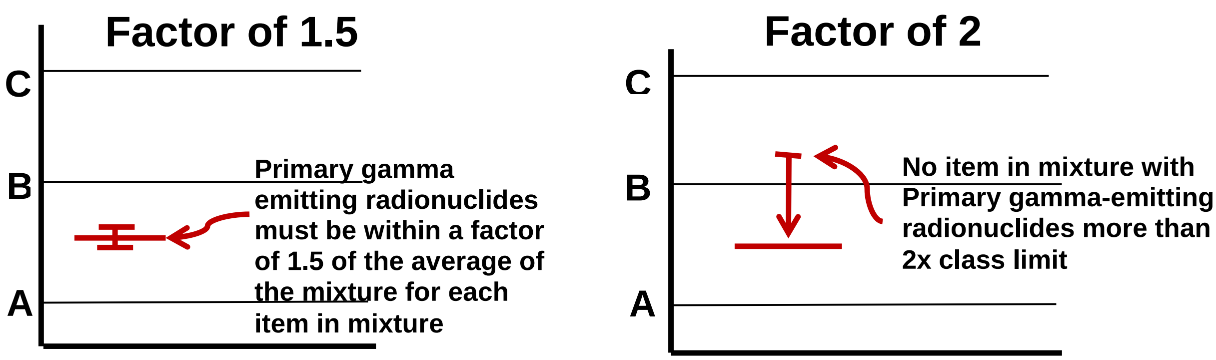

Fig. 1. Difference between Factor of 1.5 (1995 CA BTP) and Factor of 2 (2015 CA BTP)

Alternative Approaches

Another revision to the CA BTP is the addition of specific guidance for licensees to use in proposing site- and/or waste-specific averaging approaches, rather than the generic approaches specified in the body of the CA BTP. The 1995 CA BTP stated that alternative approaches for averaging should be approved under NRC's regulation in 10 CFR 61.58. By referencing a provision in the regulations (and not NRC staff guidance like the CA BTP), performance-based approaches to intruder protection were discouraged. In addition, not all regulatory authorities in Agreement States that license disposal sites have this provision in their regulations, and so the regulatory mechanism for obtaining approval of alternatives was not available to all licensees. The revised CA BTP acknowledges that facility-specific and/or waste form-specific deviations from revised CA BTP may be used in the same manner as deviations from other NRC guidance.

Acknowledging that alternatives to the CA BTP positions may be appropriate is consistent with the Commission's position of using performance-based regulation of licensees. One of the components of the Commission's definition of "performance-based" regulation is that ". . . licensees have flexibility to determine how to meet the established performance criteria in ways that will encourage and reward improved outcomes." [12]

The revised CA BTP provides guidance on considerations for licensees and Agreement State regulators in developing and reviewing alternative approaches. For example, if a site-specific analysis can show that encapsulated sealed sources buried more than 10 meters (33 feet) below the surface are not subject to human intrusion, then that could be a basis for not having to meet the averaging constraints in the revised CA BTP for encapsulation and disposal of sealed sources.

The revised CA BTP provides flexibility to generators and processors, while at the same time ensuring that intruder protection will be maintained. Licensees can routinely use the concentration averaging provisions in the body of the revised CA BTP. Licensees may also, however, use different approaches when warranted. The revised CA BTP explicitly acknowledges the appropriateness of alternative approaches.

Contaminated Materials and Unfinished Business

In developing the revised CA BTP, the staff identified one issue that may need further clarification. One of the categories of discrete wastes that are subject to special concentration averaging constraints is ''contaminated materials.'' The 1995 CA BTP defines contaminated materials as components or metals on which radioactivity resides on or near the surface in a fixed or removable condition. To demonstrate compliance with these averaging constraints, the radiological characteristics and volumes of individual items are typically determined. However, items with surface contamination may also be categorized as contaminated trash which is not subject to any special averaging constraints. Items in contaminated trash do not need to be individually characterized. Instead, a container of contaminated trash can be surveyed to determine its overall radioactivity and its classification determined by dividing the overall activity by the waste volume.

Neither the 1995 CA BTP nor draft revisions published for public comment provided guidance for categorizing items as either contaminated materials or contaminated trash. In addition, the staff received no comments from stakeholders on this issue. The staff will consider whether additional guidance, such as a Regulatory Issue Summary (RIS), is warranted for distinguishing contaminated materials from contaminated trash. The staff may also formally clarify or supplement other positions in the CA BTP at a later time, as necessary. In the meantime, the staff believes that practices developed by licensees and inspected by NRC since 1995 should continue to be followed.

Training

With the finalization of the revised CA BTP, the NRC developed training materials that may be used by NRC inspectors, Agreement State regulators, and NRC staff. Generators, processors, disposal facility operators, and others will have access to this training material once all training has been completed. Additionally, NRC staff has published several Questions and Answers regarding implementation of the revised CA BTP on its public website. More Questions and Answers will be posted as needed.

CONCLUSIONS

On February 25, 2015, the NRC issued Revision 1 of the CA BTP [7], culminating a six-year process. NRC staff took a team approach with multiple revisions based on extensive stakeholder input and workshops.

The revised CA BTP has improved organization and clarity, and better documented bases for the positions. The revised CA BTP meets the goal of providing a more risk-informed and performance-based document while also maintaining protection of the inadvertent intruder as required by 10 CFR Part 61.

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