

NUCLEAR REGULATORY COMMISSION

[NRC-2011-0022]

Branch Technical Position on Concentration Averaging and Encapsulation

AGENCY: Nuclear Regulatory Commission.

ACTION: Draft Branch Technical Position; request for comment.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC or the Commission) is soliciting public comments on a revised draft Revision 1 of its Branch Technical Position on Concentration Averaging and Encapsulation (CA BTP). An earlier draft was completed in August 2011 and made available to the public in September 2011 (ADAMS Accession No. ML112061191). The NRC staff held a workshop in Albuquerque, New Mexico, on October 20, 2011, to receive public comments. This revised draft addresses the stakeholder comments received at the workshop, and others received after the workshop. After receiving and addressing public comments on this revised draft, the staff will finalize the CA BTP to replace the 1995 version now in effect.

DATES: Submit comments by October 8, 2012. Comments received after this date will be considered if it is practical to do so, but the NRC is able to assure consideration only for comments received on or before this date.

ADDRESSES: You may access information and comment submissions related to this document, which the NRC possesses and are publicly available, by searching on <http://www.regulations.gov> under Docket ID **NRC-2011-0022**. You may submit comments by any of the following methods:

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2011-0022**. Address questions about NRC dockets to Carol Gallagher; telephone: (301) 492-3668; e-mail: Carol.Gallagher@nrc.gov.

- **Mail comments to:** Cindy Bladey, Chief, Rules, Announcements, and Directives Branch (RADB), Office of Administration, Mail Stop: TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

- **Fax comments to:** RADB at 301-492-3446.

For additional direction on accessing information and submitting comments, see “Accessing Information and Submitting Comments” in the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: James Kennedy, Office of Federal and State Materials and Environmental Management Programs, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; telephone: 301-415-6668; e-mail: James.Kennedy@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Accessing Information and Submitting Comments

A. Accessing Information

Please refer to Docket ID **NRC-2011-0022** when contacting the NRC about the availability of information regarding this document. You may access information related to this document, which the NRC possesses and are publicly available, by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2011-0022**.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**
You may access publicly-available documents online in the NRC Library at

<http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select “ADAMS Public Documents” and then select “Begin Web-based ADAMS Search.” For problems with ADAMS, please contact the NRC’s Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document is provided the first time that a document is referenced.

- **NRC’s PDR:** You may examine and purchase copies of public documents at the NRC’s PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

B. Submitting Comments.

Please include Docket ID **NRC–2011-0022** in the subject line of your comment submission, in order to ensure that the NRC is able to make your comment submission available to the public in this docket.

The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov>, as well as enter the comment submissions into ADAMS, and the NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment submissions into ADAMS.

II. Background

Revising the CA BTP was ranked as a high priority in the NRC staff's Commission paper, SECY-07-0180, "Strategic Assessment of Low-Level Radioactive Waste Regulatory Program," ADAMS Accession No. ML071350291. The existing version of the CA BTP, published in 1995, (ADAMS Accession No. ML033630732) is not fully risk-informed and performance-based, and does not always describe the bases for its concentration averaging positions. It also needs to be revised to incorporate new provisions related to blending of low-level waste (LLW), as directed by the Commission in its Staff Requirements Memorandum for SECY-10-0043, "Blending of Low-Level Radioactive Waste," (ADAMS Accession No. ML102861764).

The NRC's regulations at Title 10 of the *Code of Federal Regulations* (10 CFR) Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," establishes a waste classification system based on the concentration of specific radionuclides contained in the waste. The regulations in 10 CFR 61.55(a)(8) state that "[t]he concentration of a radionuclide [in waste] may be averaged over the volume of the waste, or weight of the waste if the units [on the values tabulated in the concentration tables] are expressed as nanocuries per gram." The purpose of the waste classification system is to contribute to protection of individuals that inadvertently intrude into a waste disposal facility, a requirement in the NRC's disposal regulations at 10 CFR 61.42. Waste is classified according to the hazard it presents to an inadvertent intruder, and risk to the intruder is managed by having increased disposal facility control measures, such as depth of disposal, as the hazard increases. The concentration averaging provisions of the 1995 CA BTP were specifically developed to ensure that individual items (e.g., disused sealed sources or other radiological "hot spots") with significantly greater radioactivity than the average activity in a package are safely disposed. Constraints on radiological hot spots are needed to ensure intruder protection, and the CA BTP identifies these constraints.

The NRC staff initially developed a technical position on radioactive waste classification in May 1983 (ADAMS Accession No. ML033630755). That technical position paper described overall procedures acceptable to NRC staff which could be used by licensees to determine the presence and concentrations of the radionuclides listed in 10 CFR 61.55, and thereby classify waste for near-surface disposal. In 1995, the NRC staff published the CA BTP, expanding on Section C.3, "Concentration Volumes and Masses," (i.e., concentration averaging) of the 1983 Technical Position. The 1995 CA BTP recommended constraints on averaging of homogeneous waste types¹ (e.g., ion exchange resins, soil, ash), mixtures of discrete items (such as irradiated reactor hardware) and sealed sources for the purposes of ensuring intruder protection against hot spots, as well as constraining the amount of averaging that licensees could perform that would lower the classification of wastes.

There have been a number of changes in the LLW program since the 1995 CA BTP was published; these changes were drivers for the current revision. First, the Commission reviewed the CA BTP's position on blending of LLW. The 1995 version constrained the concentration of input waste streams to mixtures of mixable wastes (i.e., waste that is not composed of discrete items) to within a factor of 10 of the average concentration of the final mixture. Also, the 1995 version does not constrain mixing of these wastes if operational efficiency or worker exposures were affected by the blending. The Commission directed the staff to implement a risk-informed, performance-based approach for LLW blending that made the hazard (i.e., the radioactivity concentration) of the final mixture, the primary consideration for averaging constraints. Second, 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. This new revision of the CA BTP more fully reflects that regulatory approach, not just for the blending positions, but for all of the other

¹ Waste in which the concentrations of radionuclides of concern are likely to approach uniformity in the context of reasonably foreseeable intruder scenarios.

topics it addresses as well. Finally, the 1995 CA BTP significantly constrained disposal of encapsulated sealed sources below the Class B and C limits in the 10 CFR 61.55 waste classification tables. The threat of a radiological dispersal device using sealed radioactive sources caused the staff to re-examine the 1995 assumptions underlying the radioactivity constraints on sealed source disposal, and to better balance the risk associated with inadvertent intrusion with national security and safety issues associated with sealed sources that have no disposal pathway. Licensees must store sealed sources for potentially long periods of time if there is no disposal option, and the sources are subject to loss or abandonment. The CA BTP's revised positions will allow for disposal of more sealed sources than the 1995 CA BTP which will enhance national security by ensuring that the safest and most secure method to manage them is available to licensees.

III. Stakeholder Comments on the August 2011 Draft CA BTP

The draft Revision 1 of the CA BTP that is being made available for public comment is a revision to an August 2011 draft that was provided to the NRC's Advisory Committee on Reactor Safeguards (ACRS) for review and comment. The NRC staff briefed the ACRS on October 4 and December 1, 2011, and the ACRS provided their views to the Commission in a December 13, 2011, letter (ADAMS Accession No. ML11354A407). The NRC staff also held a public meeting to solicit comments on the August 2011 draft in Albuquerque, New Mexico, on October 20, 2011. The meeting summary is in ADAMS Accession No. ML113330167. At that meeting, stakeholders requested that NRC staff revise the existing version to address their comments before publishing it for public comment again. The staff agreed to that request.

In addition, the staff met with the Low-Level Radioactive Waste Forum's (LLW Forum) Disused Source Working Group on February 9, 2012, in Dallas, Texas, to explain the bases for the revised CA BTP and to answer questions. The Agreement States that regulate the four active LLW disposal sites (Texas, South Carolina, Utah, and Washington) and that are

members of the Disused Source Working Group provided formal comments on the August 2011 draft.² The LLW Forum also provided written comments (ADAMS Accession No. ML120530573).

All of these comments, from the ACRS; stakeholders at the October 20, 2011, workshop; and the members of the Disused Source Working Group--have been considered in the revised draft that is being made available in this document. Appendices D, E, and H of draft Revision 1 contain the staff's analysis and responses to comments from stakeholders at the October 20, 2011, workshop; from members of the LLW Forum's Disused Source Working Group; and from the ACRS, respectively. Several other stakeholders also provided additional comments in February and April 2012 (ADAMS Accession Nos. ML120520558, ML120890046, and ML121220126), and these were considered to the extent possible in developing this revised draft. The staff did not document responses to their comments because of schedule constraints. For any of these comments that the staff has not fully responded to, the staff will address them in preparing the final version of the CA BTP. A redline-strikeout comparison between the May 2012 draft and the August 2011 draft is contained in ADAMS Accession No. ML12137A262.

The staff is interested in stakeholder views on all responses to issues that were raised in the above comments, but is particularly interested in stakeholder views on the following topics:

Selection of inadvertent intruder exposure scenarios: In the original and revised CA BTP, the staff postulated generic exposure scenarios to evaluate the doses to an inadvertent intruder exposed to radiological hot spots in mixable wastes and in individual items to establish concentration averaging constraints. Because it is not possible to predict human behavior with

² Texas Commission on Environmental Quality, ADAMS Accession No. ML120530077; South Carolina Department of Health and Environmental Control, ADAMS Accession No. ML120520496; Utah Department of Environmental Conservation, ADAMS Accession No. ML120520498; Washington Office of Radiation Protection, ADAMS Accession No. ML120520505)

complete accuracy over the time frames associated with the hazard from LLW, the staff has used what it believes to be reasonable, yet conservative scenarios, such as well drilling into waste. The ACRS and others have commented on the selection of scenarios. The staff is interested in receiving public input on the specific scenarios used for this revised draft, as well as factors to be considered in selection of generic radiation exposure scenarios for an inadvertent intruder. Information on the selection of scenarios is provided in the CA BTP in Appendix B; Appendix D (responses to comments 1(c) and 6(a); and the staff's February 3, 2012, response (ADAMS Accession No. ML120090314)³ to the ACRS letter (ADAMS Accession No. ML11354A407).⁴ An important impact of scenario selection is the constraint on the activity of sealed sources for disposal under the CA BTP. The revised CA BTP uses a new scenario that would allow for disposal of higher activity sources to be disposed of in commercial LLW disposal sites that would result in these sources no longer posing a threat to national security. Some stakeholders, including ACRS, have argued for the use of scenarios that would result in fewer constraints on sources, and higher activities for disposal than what the staff has proposed.

Other ACRS recommendations and issues: The ACRS and staff were in agreement on a number of positions in the revised CA BTP, such as blending of LLW, and the new Alternative Approaches section. However, the ACRS had a number of recommendations that could potentially significantly change the CA BTP, including allowing for reliance on perpetual care funds for institutional controls to prevent or mitigate the impacts of inadvertent intrusion and using probability of intrusion in developing averaging positions. The staff is interested in stakeholder views on the pros and cons of the ACRS recommendations, given their potentially

³ The February 3, 2012, staff response is contained in Appendix H of the CA BTP.

⁴ The December 13, 2011, ACRS letter is contained in Appendix G of the CA BTP.

significant impacts on current practices. The ACRS letter to the Commission (ADAMS Accession No. ML11354A407) is contained in Appendix G of the revised CA BTP.

Classification of cartridge filters as a homogeneous waste: Cartridge filters are used to remove radioactive solids from various systems in a nuclear power plant. Filters are typically composed of thin metal or plastic frames with a corrugated or wound paper or synthetic filter media enclosed within the frame. Although the frames and filter media are contained in fairly robust metal housings, the housing is perforated so that radioactivity from the filters could be dislodged during handling by an inadvertent intruder. In addition, although filters may contain high levels of non-gamma emitting radionuclides, they typically contain low amounts of long-lived gamma radionuclides that would pose a hazard to an intruder handling a discrete item. The current CA BTP classifies cartridge filters as discrete wastes, so that each filter must be individually characterized for the concentrations and amounts of radionuclides that may affect waste classification. Several stakeholders have argued that the characteristics of cartridge filters previously described are significantly different from discrete items such as sealed sources or activated metal and justify their treatment as homogeneous wastes. Homogeneous wastes are subject to less stringent averaging constraints. The revised CA BTP continues to classify filters as discrete wastes, but provides an option for licensees to document justifications for treatment of them as homogeneous wastes. Section 4.3.4, "Cartridge Filters as Homogeneous Waste," and the staff's response to comment 3(a) in Appendix D describes the revised position on cartridge filters and its basis. The staff is specifically seeking stakeholder views on this revision to the previous draft.

Homogeneity Test for Mixable Wastes: The staff received significant comments on the proposed testing for homogeneity of blended waste in the August 2011 draft Revision 1 of CA BTP. The staff has addressed these comments and made significant revisions. See Section

4.2.2 of the revised CA BTP, "Homogeneity of Mixable Waste," as well as Section 4.9, "Alternative Approaches." See also responses to comments 1(c) and 1(g) in Appendix D.

Specification of Waste to Binder Ratio and Not Container Size for Encapsulation of LLW:

The 1995 CA BTP provided for encapsulation of discrete, higher-activity items in a non-radioactive medium such as concrete, and averaging the activity in the discrete item over a 55 gallon drum volume. The amount of non-radioactive material over which averaging could take place was constrained to 55 gallons, so that extreme averaging measures would not be employed. Several stakeholders requested that the *waste-to-binder ratio* be specified so that larger volumes could be employed. The constraints would be based on the average activity of the encapsulated package, and the ratio of the volume of the radioactive item to the volume of the encapsulating media. Such an approach would still constrain the use of non-radioactive materials in averaging. This approach had been approved by the NRC in a topical report for encapsulating and averaging cartridge filters. The staff has addressed this comment in revisions to Section 4.5, "Encapsulation of Sealed Sources and Other Solid Low-Level Radioactive Wastes," and in response to comment 7(a) in Appendix D.

Dated at Rockville, Maryland, this 30th day of May, 2012.

For the Nuclear Regulatory Commission.

/RA/

Andrew Persinko, Acting Director
Division of Waste Management
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