February 21, 2012

Mr. Andrew Persinko, Deputy Director
Environmental Protection and Performance Assessment Directorate
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Management Programs
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852-2738

Subject: Solicitation for Public Comment on the Draft Branch Technical Position on Concentration Averaging and Encapsulation, Rev. 1, August 2011, ML112051191

Dear Mr. Persinko:

Please find attached Energy*Solutions*' comments on the draft revised Branch Technical Position (BTP) on Concentration Averaging and Encapsulation. We appreciate the opportunity to provide these comments.

In general we consider the revised draft to be a significant improvement over the existing version and we appreciate the staff's efforts to revise the BTP. This guidance document is widely-used throughout the industry and provides vital technical guidance for generators and processors; we fully support updating the current positions to allow more flexibility in packaging and shipping low level radioactive waste.

We believe that the updated guidance should recognize the need to balance protection of workers and the public with protecting a theoretical intruder at some time in the distant future. We are concerned that the current draft uses very conservative and arguably unrealistic modeling scenarios to quantify some risks, particularly those to the future inadvertent intruder. In particular, the current draft does not recognize the additional burden that will be placed on processors and generators stemming from assumptions used in the staff's intruder analysis. We propose this be addressed in accordance with specific comments we provide.

We appreciate the opportunity to comment on this draft. Questions regarding these comments may be directed to me at (240) 565-6148 or temagette@energysolutions.com.

Sincerely,

Thomas E. Magette, P.E.
Senior Vice President
Nuclear Regulatory Strategy

Comments on the Branch Technical Position on Concentration Averaging

1. Energy*Solutions* requests clarification of the statement in the Introduction, page 3 that "Guidance for averaging across multiple waste containers is outside the scope of this BTP."

   This section makes reference to "each disposal container in a shipment" and "each waste package listed on the manifest." Generators sometimes manifest a single cargo container (e.g., an 8' x 8' x 20' intermodal seavan) as the waste package, with the waste class evaluation performed over the entire displaced volume and waste mass of the content. This can be loose materials loaded directly into the container, or discrete inner volumes may be present (e.g., soft-sided sacks). This practice should be retained, as alternatives will have immediate significant cost impacts, particularly for decommissioning projects, with uncertain benefits to the theoretical receptor in the future. This is particularly the case for wastes disposed in bulk lifts.

   Energy*Solutions* proposes that NRC delete the comment restricting the application of the guidance.

2. Section 3.1 Waste Characterization (p. 6) states that "If the sum of fractions exceeds 1 for the Table 1 values or exceeds 1 for the column 3 of the Table 2 values, then the mixture exceeds the Class C limits and the licensee should determine if the mixture can be reconstituted to bring the sum of fractions below 1."

   As worded, this implies that it is acceptable to process greater than Class C waste (GTCC) such that it is no longer GTCC. This seems to conflict with recent NRC guidance regarding blending, as well as the *Low Level Radioactive Waste Policy Act*. The NRC should clarify how a waste processor is to interpret the term "reconstituted" for GTCC waste. NRC also should clarify how the term "reconstituted" would apply to other classes of waste.

3. Section 3.2.1 Homogeneous Waste Types states that "Certain wastes maybe be treated as homogeneous waste types for the purpose of waste classification." The section goes on to provide a rationale for this conclusion, and to further note why the risk to an intruder is low even in the event that such wastes were not homogeneous. However, the conclusion that these wastes "…may be considered homogeneous…" is qualified by the requirement to consider "…available information…" that indicates the presence of a hotspot.

   Given the robust defense of the assumed homogeneity, this language should be deleted. NRC has provided a strong rationale for the assumption of homogeneity in the waste types cited including an assumption that an intruder would further mix the waste and any hotspots; thus the basis for the assumption of homogeneity is well founded and should be not qualified or conditioned. If the NRC sees the need for this qualification, it should provide specific guidance regarding the type of "available information" to which it refers, while recognizing there will certainly be occupational dose consequences associated with locating and evaluating the volume and specific activity of hotspots.

4. Section 3.2.2 Intentional Blending During Waste Processing (p. 11) states that "if dose-to-curie ratios are reliable, homogeneity of waste in a container may be shown if surveys of waste in outlet piping show no notable deviations exceeding 10 times the classification limit." Scaling factors developed under NRC-approved power reactor radioactive waste management programs should be explicitly cited as reliable (and acceptable) factors.

5. The guidance for demonstration of homogeneity contained in Section 3.2.2 repeatedly mentions surveys in outlet piping. Due to the presence of dewatered filters and other internal hardware, persistent hot spots may exist even in otherwise well mixed (e.g., recirculated) ion exchange resins in a disposal package. The guidance should also note that surveys of waste packages are acceptable to demonstrate homogeneity. To minimize geometry effects on dose rates, radiation surveys for the demonstration of homogeneity should not be performed at contact with the package, but at a distance. We recommend 1 meter as a nominal value, as measured from the container surface.

6. Section 3.2.2 makes the presumption that mixing blending by generators "...is not expected to cause the same risk to an inadvertent intruder as intentional blending during waste processing..." The NRC has presented no technical basis for this conclusion, and indeed none exists. The BTP also describes blending by generators as "incidental" whereas blending by processors is "intentional." These unsubstantiated and unscientific assertions should be deleted. Generators routinely mix intentionally. This is not intended to criticize their activities conducted in accordance with existing guidance. Rather, it is intended to note that the proper focus of any guidance should be on the final waste form rather than the source of the waste. Failure to recognize this endpoint introduces unwarranted conservatism in the revised BTP.

7. Section 3.2.3 Classification of Homogenous Waste proposes adding variance to the sample mean. This is unnecessarily restrictive, given the total uncertainty inherent in the survey process. Other sources of variability include energy response of dose rate instruments (particularly for a broad range of photon energies), the accepted variability in scaling factors between typical 2 year analytical cycles (for derivation of gamma to hard-to-detect alpha/beta emitters) at power reactors, use of "standard" densities, assumed mass of residual water in processed resins and sludge, modeling error (e.g., simplification of buildup factors), and analytical error associated with subdividing a sample for multiple chemical separations and subsequent nuclide-specific analyses. The simple mean value should be considered adequate for demonstrating homogeneity.

   This proposal is also inconsistent with other relevant NRC guidance. Refer to the following NRC position excerpted from HPPOS 223[1] (in this case, relative to transportation-related surveys):

   > The NRC position is that the result of a valid measurement obtained by a method that provides a reasonable demonstration of compliance or of noncompliance should be accepted and that the uncertainty inherent in that

[1] Consideration of Measurement Uncertainty When Measuring Radiation Levels Approaching Regulatory Limits See memorandum from J. W. N. Hickey and L. J. Cunningham to M. R. Knapp, *et al.*, August 3, 1990.

measured value need not be considered in determining compliance or non-compliance with a regulatory limit. Thus, only the measured value (and not the sum of the measured value and its uncertainty) need be less than the value of the limit to demonstrate compliance with the limit.

8. Throughout Section 3.2.3, there appears to be a heavy reliance on sampling to determine homogeneity. Sampling and sample analysis impose inherent ALARA issues. An allowance for other more sophisticated techniques to determine homogeneity should be an alternative explicitly allowed for in the BTP.

9. The phrase "10 times the classification limit" is used throughout this section with the exception of the first full paragraph on page 12, "10 times the concentration limit" appears. The citation on page 12 should be revised to read "10 times the classification limit."

10. Section 3.3 Classifying a Mixture of Activated Metals or Contaminated Materials or Cartridge Filters (p. 15) provides guidance for the classification of activated metals that are very complex and make implementation extremely difficult, if not totally impractical. Variation in activation levels over the length of a component (e.g., a control rod drive shaft) will greatly complicate evaluation of field measurements to determine optimum segmentation points. This will require modeling of line-source dose rate behavior for an item with an unknown rate-of-change in specific activity per unit length. Due to the limitations in practical field measurements, accurate determinations will only be possible after the segmentation has occurred and smaller pieces are individually evaluated.

11. Melting and casting of contaminated and activated metals to form volumetrically-contaminated forms for disposal may become an attractive option. It achieves the maximum theoretical density for disposal, but requires mixing of various metals to achieve a reasonable metal chemistry. BTP constraints on mixing and blending should not be applied to foundry operations; applicability should be restricted to the final monolithic form for disposal. Methods used to demonstrate homogeneity must necessarily be limited to dose rate surveys of the final form, combined with limited sampling and established elemental behavior during the melting process.

12. Section 3.7 Quality Assurance Program requires that "the licensee classifying the waste must have in place a quality assurance program to ensure compliance with the waste classification provisions of 10 CFR § 61.55." Processors should have explicit authorization to use characterization data, including scaling factors, provided from licensees operating under a QA program approved by the NRC or an Agreement State. No re-analyses should be required unless the original generator requests validation of the data.

13. Appendix B Technical Basis for Concentration Averaging and Encapsulation Guidance

    In the update of the BTP, the NRC was encouraged to evaluate "reasonably foreseeable intruder scenarios" in order to evaluate risk to workers, the general public, and intruders. Consistent with NRC policy, NRC staff was also encouraged to make the revised BTP "more risk informed and performance-based than the 1995 BTP." Finally, the NRC staff was requested by the Commission to develop homogeneity criteria to "ensure that any hot spots

do not expose an inadvertent intruder to an unacceptable dose." Unfortunately, staff utilized an unreasonably conservative drilling scenario and deterministic calculations to require a high degree of homogeneity in single waste packages. The result is overconservatism that affects fundamental approaches throughout the BTP and is overprotective of a future hypothetical inadvertent intruder at the cost of additional dose received by today's workers.

"The NRC based the homogeneity guidance in this document on the doses to an individual unknowingly drilling a well into a waste site (acute scenario) and another individual subsequently living and gardening in the area in which the drill cuttings were spread (chronic scenario)." A high degree of homogeneity would not be required had the NRC selected reasonable drilling methods, as opposed to drilling methods that would generate the most conservative result. Specifically, the selection of cable tool or auger drilling is not a reasonably foreseeable drilling method for the installation of domestic water wells. Auger drilling is almost exclusively used for the installation of shallow monitoring wells in unconsolidated sediments for environmental monitoring purposes. Auger drilling in a LLW landfill is highly unlikely for the following reasons:

1) Most states require that potable wells be installed a minimum of 100 feet below the ground surface. In addition, potable water wells are typically installed a minimum of 100 feet below the ground surface in order to capture better drinking water.
2) Auger rigs would not be successful in drilling through a LLW landfill because of the types of materials that are disposed. Auger rigs would most likely hit refusal and alternative drilling locations selected.
3) Auger rigs limit the well size that can be installed, usually 2-inch in diameter for a monitoring well. Potable wells are a minimum of 4-inch in diameter to support the installation of a submersible pump.

Cable tool drilling was also considered by the NRC; however, the assumption that a cable tool drill rig could pull up a discrete, 1 foot section of "poorly mixed" waste is not reasonable. In unsaturated sediments, large volumes of water are required to be added down the casing order to support the removal of cuttings. The removal of cuttings using a dart bailer with water will thoroughly and completely mix the waste in the process of removal. In addition, the use of a cable tool rig to drill through a LLW landfill is also suspect due to the likelihood of bit refusal.

Mud rotary drilling is more commonly used when drilling a potable water well. Mud rotary has the drilling capacity to drill deeper and larger boreholes which support the installation of larger wells in more desirable aquifers. The use of mud rotary drilling as a "more reasonable" drilling scenario will mean that "waste" materials would be thoroughly mixed with drilling muds, other wastes, and soil. This more reasonable scenario would eliminate the need to conduct additional monitoring of wastes to ensure homogeneity. We recommend that the NRC conduct its analysis on a more reasonable drilling scenario.

Risk informed and performance-based – The assumptions made in the drilling scenario are neither reasonable nor risk informed/performance based. Instead, the current evaluation is based on deterministic calculations of the worst case scenario. Specifically, reasonable drilling scenarios (or the probability of using a reasonable drilling scenario) were not

evaluated; instead, a drilling scenario that produced the worst case result was used. In addition, other assumptions include:

1) Assuming the waste was mixed poorly
2) Assuming the waste contained pockets with significantly greater than average concentrations
3) Assuming that the waste would be exhumed at 10 times the classification limit
4) Assuming that half of the projected dose would come from the small volume of waste exhumed (again, poor mixing)
5) Assuming that a driller could drill through and bring to the surface a foot deep pocket of waste material

Although the NRC utilized the simulation software package GoldSim to conduct its analysis, these assumptions turned a probabilistic scenario into a deterministic, worst case scenario. We recommend that the NRC conduct its analysis using probabilities of occurrence, as opposed to definitive calculations of the worst case scenarios.

Based on the outcome of the drilling scenarios, the NRC found that "exhumed volumes exceeding ten times the classification limit should be limited to less than approximately 0.3m (1 ft) depth to protect individuals from chronic expose to drill cuttings." This conclusion then necessitated a deterministic approach to ensure that homogeneity in a single package meet a definitive criteria. Although Energy*Solutions* shares the NRC's concerns for the protection of an inadvertent intruder, the additional sampling, characterization, and evaluation of waste packages will most certainly contribute real dose to current radiation workers in order to ensure that a homogeneity requirement is met to protect the unlikely scenario of a driller using a auger rig discovering and exhuming a 1 foot section of waste that just happens to be 10 times the classification limit. This deterministic approach is not consistent with the ALARA principle. We recommend that NRC conclude that homogeneous waste, as defined by the BTP, be treated as homogenous wastes, not as worst case scenarios. The burdensome requirements to demonstrate homogeneity in the draft BTP should be removed.