# LOW-LEVEL RADIOACTIVE WASTE FORUM, INC.

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Dear Andrew Persinko:

On behalf of the Low-Level Radioactive Waste Forum's (LLW Forum) Disused Sources Working Group (DSWG), please accept the attached comments on the U.S. Nuclear Regulatory Commission's (NRC) Draft Branch Technical Position on Concentration Averaging and Encapsulation (Draft CA BTP).

The LLW Forum formed the DSWG in September 2011 at the request of and with financial support from the National Nuclear Security Administration (NNSA). The purpose of the working group is to study issues related to the management and disposition of sealed sources, using a holistic approach that considers both the front-end and back-end, and to develop a list of potential action items and recommendations to address the issues. The working group is composed of eight (8) members representing New York, Texas, Utah, Washington, Atlantic Compact, Midwest Compact, Rocky Mountain Compact, and Southeast Compact.

Due to the potential impact of the Draft CA BTP to significantly increase the disposal of sealed sources, the DSWG members undertook a comprehensive review of the Draft CA BTP to develop comments for consideration by the NRC in advance of publication of the document for stakeholder comment on May 31, 2012.

Given the role of the sited states in regulating low-level radioactive waste disposal facilities, DSWG members relied heavily upon input from representatives of the four sited states of South Carolina, Texas, Utah and Washington in conducting its review of all elements of the Draft CA BTP.

On February 8-9, 2012, the DSWG met in Dallas, Texas to review the document and associated comments. Two representatives from NRC participated in the meeting, as did officials from NNSA and all four sited states. After a day and a half of detailed presentations and discussion, the DSWG finalized the attached comments on the Draft CA BTP for consideration by the NRC.

On behalf of the DSWG, I want to thank the NRC—including, in particular, James Kennedy and Christianne Ridge—for their assistance during our review of the Draft CA BTP and for the agency's consideration of the DSWG's comments. We believe this is an important document that has potentially significant impacts on the disposal of sealed sources and other low-level radioactive wastes and we sincerely appreciate the opportunity to provide the attached feedback and comments.

If you have questions or require additional information, please feel free to contact Todd D. Lovinger, Esq.—the DSWG's Management Contractor—at (202) 265-7990 or at LLWForumInc@aol.com.

Regards,

Leonard C. Slosky
Chair of the LLW Forum's Disused Sources Working Group
Executive Director of the Rocky Mountain LLRW Board

Enclosure

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## Sited State Comments

### A. Increase in Sealed Source Activity

1. Andrews: It is unknown what the implications of the significant increases for sealed source disposal will be in Texas. The pressure for Texas to open up sealed source disposal to allow for these increases, as well as alternative disposal of even larger sources, is already evident. It is difficult to make such a shift to increase sealed source disposal at this critical time in just approaching opening of the Texas disposal facility, with the immediate consideration and review of intrusion scenarios that are less restrictive.

2. Barnwell: This revision would have minimal effect on disposals at the Barnwell Disposal Facility. The license requirements for sealed source disposal at Barnwell are more stringent than the 1995 BTP. For example, the license limits disposal of sealed source containing any Table 2 radionuclide (including Cs-137 and Co-60) to a maximum activity of 10 Ci per container. Variances up to the limit of the 1995 BTP may be approved on a case-by-case basis. A variance allowing disposal of unlimited activity of Co-60 and up to 130 Ci of Cs-137 would be at least 13 times the current license limit as opposed to 3 times the limit. There are no plans to amend this condition of the license.

3. Barnwell: Increasing the maximum activity for Co-60 (unlimited) & Cs-137 (130 Ci) that may be encapsulated into a single package increases the associated dose rates. The increased dose rates will likely change the handling of the sources by workers (generators, processors, shippers, disposal operations) in order to maintain doses ALARA. Also in order to meet the DOT requirements, these encapsulated sources will likely require additional or more robust shielding for the associated dose rates.

4. Barnwell: Such an increase would also increase disposal site inventory which could affect a disposal facility's ability to meet performance objectives depending on total activity received.

5. Barnwell: Disposal fees and taxes at the Barnwell Disposal Facility are based on volume, not activity. An increase in the maximum activity for sealed sources per container would mean more source term for the Disposal Facility with no corresponding increase in funds for long-term care at the facility.

6. Clive: The LLRW classification system (Class A, B, C concentrations) is based on protection of the inadvertent intruder at 100, 300, or 500 years after waste disposal. The 1982 NRC Final EIS was able to eliminate certain intruder scenarios on the basis that if future excavation exposed a drum of waste, the intruder would recognize it as artificial. The 1995 NRC Concentration Averaging BTP built on this intruder scenario by assuming a Cs-137 sealed source (30 Ci) was centered in a 55-gallon drum and encased with cement grout at the time of disposal. In the 1995 BTP, the NRC made several other assumptions, including:

- 500 years of time elapsed before excavation / discovery,
- The drum would be physically intact on discovery,
- Drum would produce an acceptable contact dose rate $\leq$ 0.2 mR/hr, which is compliant with current NRC decommissioning rules for unrestricted areas, and
- The drum would not be carried away to someone's residence for continued exposure.

We are concerned about the dramatic increase in the allowed sealed source concentration limit, e.g., from 30 Ci to 130 Ci for Cs-137. While we recognize that the August, 2011 draft BTP was based on a "carry-away" scenario it is unclear how a higher sealed source concentration limit could be derived, given that:

- Less Shielding Present – considering short term direct skin contact with the source (and not the drum) for 4 hours while in transit to the residence, and for the longer term exposure, less dense intervening materials (less than cement) to shield the intruder while inside his/her residence.
- Greater Exposure Time – in that now the intruder would reside in the home for about 16 hours/day for many years, and not 8-hours during a temporary excavation project.

Additional explanation and justification seams warranted to address the increased Cs-137 sealed source concentration limit. Careful coordination is also needed to ensure the back-calculations are consistent with the inadvertent intruder scenario.

7. Clive: Sealed sources are of a concern in that they generally constitute large activity, small volume sources of radioactivity, and thus appear to conflict with the original mission and purpose of the Clive facility (large volume, low activity). Thus, increased Class A activity limits resulting from the proposed sealed source disposal have to potential to be in conflict with Clive's original mission, and deserve careful consideration. Review of the historic NRC findings on sealed sources is also in order. In the 1981 NRC DEIS the inadvertent intruder analysis concluded that elimination of sealed sources from LLRW classification would result in a decrease of dose on the order of more than 2-orders of magnitude.

8. Clive: The CAE BTP increases the maximum activity allowed in a sealed source for more than 1 nuclide at the time of encapsulation for land disposal as shown. As can be seen in Table 1, the CAE BTP proposes no changes in activity limits for the non-gamma emitting nuclides. In contrast, changes are proposed for the gamma emitters.

The decrease in the Class A limit for Co-60 (700 to 140 Ci) appears to be driven by the new "carry-away" intruder scenario where NRC staff assumed where the intruder comes into intimate contact with the cladded source 100 years after

disposal. The removal of any activity limit for Class B or C waste, appears to be largely driven by the isotope's short half-life (5.27 years) and the longer decay time assumed before intruder contact, i.e., 300 and 500 years, respectively; made possible by an assumed lengthy delay for intrusion.

The activity limit increase proposed for Cs-137/Ba-137m for all classes appears to be the product of the same "carry-away" intruder scenario, and related assumptions. No changes were proposed for Nb-94.

9. Clive: All of these proposed NRC class limits are based on the assumption that the cladded source remains physically intact and sealed for 100, 300, and 500 years, respectively. Given the saline soils and groundwater at the Clive site, it is difficult to conceive this would be the case. Hence, the NRC assumptions behind the proposed sealed sources activity limits for gamma emitters appear to be better suited for land disposal in Washington, Texas, and South Carolina, not Clive, Utah.

10. Working Group: Sited state stakeholders could challenge the significant increase in the sealed-source activity limits, which are based on a new intrusion scenario that is less restrictive.

11. Working Group: Since there are a limited number of Cs source a more prudent approach may be to encapsulate and store for decay to a much lower activity than 130 Ci.

12. Working Group: The BTP should clearly make a statement against the destruction of sealed source in order to meet the blending definition and requirements.

**B. Blending**

1. Andrews: Blending is still an unresolved issue with a Texas rule/policy against reclassification of waste due to the intentional mixing for any purpose. When the Texas rule was put in place decades ago, there was no distinction between dilution and blending, as NRC is making now. With BTP as guidance, it is assumed that the state's compatibility with blending will come into play with the rulemaking, and not this BTP.

2. Andrews: The footnote on avoiding extreme measures to lower waste classification misses the mark of providing necessary guidance. The footnote was added in response to comment but does not provide guidance as to how this might be implemented.

3. Barnwell: The allowance for blending waste is not expected to have a practical effect on disposal at the Barnwell Disposal Facility. Facility operations are such that all classes of waste (A, B, and C) are disposed in a manner that meets disposal requirements for Class C waste. State regulation requires the use of

vaults for all classes of waste. The vaults function as an engineered intruder barrier and also provide structural stability. Disposal site criteria requires that Class A waste that has a concentration greater than 1 microCi/cc of any radionuclide with a ½ life greater than 5 years is required to be stabilized (typically by solidification or use of a high integrity container). This waste is referred to as Class A Stable. Class A waste not requiring stabilization is referred to as Class A Unstable. The Disposal Site Criteria prohibits acceptance of absorbed liquids regardless of waste classification. All liquids must be solidified. (Incidental liquids are allowed up to 1 percent of the waste volume for stabilized waste and up to 0.5% waste volume for waste that is not stabilized.) Furthermore, all waste (other than irradiated hardware components) regardless of waste class is now disposed of in the same trench and is only segregated by placement in different vaults.

4. Hanford: What kind of "mixtures" will be produced under this CA BTP (if adopted as is)? Suggest you add what mixtures (e.g., Class B/C resins mixed with Class A) are anticipated to the BTP.

5. Hanford: In Section 3.2.2 (page 11), the BTP says approval to blend dissimilar flowable waste streams should be handled on a case-by-case basis. In this vein, I suspect generators will blend Class B ion exchange resins and slightly contaminated Class A soil-like material to maximize the load/minimize voids and reduce disposal expense. Will this layer blending increase the risk to the inadvertent intruder?

**C. Absorbed Liquids**

1. Andrews: The Texas license does not specifically prohibit absorbed liquids, although it is a topic of discussion. Since Texas might be alone in allowing absorbed liquids (with other sites prohibiting), there should be some discussion of how long sorption can be relied upon in NRC analysis where the possible presence of free-liquids in the future could impact the analysis.

2. Barnwell: The Barnwell Disposal Site Criteria requires that all liquids must be solidified.

3. Hanford: Why are "absorbed" liquids still mentioned in the BTP? Does any site still dispose of sorbed (onto an approved agent) liquids? I believe the disposal facilities require solidification or stabilization of liquids.

**D. Factor of 10**

1. Andrews: This elimination relies on hotspot detection that will be difficult to practically accomplish in many cases. This provides another disconnect between the mostly state regulation and inspection at the point of waste generation/ processing and the implications for the regulation at the disposal sites. There are both practical and perception issues for the implementation of this part of BTP.

2. Andrews: It is difficult to foresee impacts of this change at this critical time in just approaching opening of the Texas disposal facility. This might be an area that the sited states would want to keep the factor of 10 (as Barnwell has in its license). What are the implications for sited states in taking this approach as far as the differences between the draft BTP and say using the Rule of 10 at Barnwell? Knowing the practical implications for Class B & C waste disposal is important for the policy considerations for possible implementation of this change.

3. Barnwell: The Disposal Site Criteria implements the Barnwell Rule of 10. The Barnwell Rule of 10 is used to compare whole irradiated components for acceptability in blending waste within each package to meet the Class C concentration limits. The Barnwell Rule of 10 must be satisfied in addition to requirements in the 1995 BTP.

4. Barnwell: In addition to the 1995 BTP and revised BTP requirements, the Barnwell Rule of 10 requires that all components of the same type must have 10 CFR, Part 61, Table I and Table II sums of the fractions within a factor of 10. Likewise, components of different types must have averaged batch Table I and Table II sums of the fractions within a factor of 10.

5. Barnwell: It is SC DHEC's understanding that all NRC licensees have agreed to adhere to the Barnwell Rule of 10 when classifying hardware shipments for disposal at the Barnwell Disposal Facility.

6. Barnwell: The new BTP may allow a few additional pieces of hardware (of higher concentration) to be disposed compared to current guidance but the effect is expected to be minimal compared to the continued adherence to the Barnwell Rule of 10.

7. Barnwell: Factor of 10 in determining waste homogeneity (hotspots should not be greater than 10 times the class limit in determining homogeneity) is different than Factor of 10 for classifying hardware and other types of waste. It appears as though TX and WA comments are about hotspots and the SC comment is about hardware classification.

8. Clive: This is a more complex classification process and doing away with the Factor of 10 Rule and substituting instead a 2 page, 13 step decision tree adds more complexity to waste classification, and provides more opportunities for generators to err. It also places more burden for generator State regulators to inspect waste treatment and classification.

9. Hanford: In Section 3.2.1, page 10, last paragraph, hotspot detection is discussed. How is detection done? "If" seems to be a key assumption in the phrase, "If it is detected in a container ...." Also, how would you know if it is less than or greater than 10 times the class limit?

10. Hanford: It is not uncommon to find a hotspot on the outside of a disposal package. What additional measurements (page 11, last paragraph of Section 3.2.1) should be made on the disposal package to confirm its waste class? Perhaps an example and further explanation would be helpful. At the Washington LLRW disposal facility, the state's inspector could perform an internal package inspection to identify the reason for any "hot spot" if health physics calculations indicated high activity levels.

**E. BTP as Guidance**

1. Andrews: The BTP seems be to the precursor to rulemaking in many areas. Although the BTP added a sentence in the introduction in response to comment that it is expected that Agreement States that regulate processing and those that regulate disposal "would consult one another", this is the only reference to how this will be applied across the states. Without NRC leading the way to foster this approach, the statement falls short of having any impact. This passive approach leaves the disconnect that currently exists fully intact related to classification of waste and regulation of that waste from the handling/processing licensee to the disposal licensee.

2. Barnwell: Language in the Disposal Site Criteria (a procedure tied to the license) states "all customers shipping radwaste material to the Barnwell Site shall comply with the US NRC Branch Technical Position on Concentration Averaging and Encapsulation, dated 1/17/95". The Disposal Facility License is currently under appeal and has been since 2004. While the Disposal Site Criteria could be revised to reflect the new BTP without amending the license, it is a decision that will be carefully considered. Since the appeal, the license has only been amended to incorporate more stringent requirements and minor or administrative changes. If the perception is that the new BTP is less stringent, its adoption prior to a final decision on the appeal, may be of concern. Use of the new BTP would be expected to have minimal impact on disposal at the Barnwell Disposal Facility as disposal is limited to generators in the three states of the Atlantic Compact (Connecticut, New Jersey and South Carolina). Also, as described there are several additional site specific requirements that further limit the effect of increased disposal options afforded by the new BTP.

3. Clive: The ACRS stated that the CAE BTP sealed source intruder scenario was overly conservative, did not recognize the depth of burial, and that the "carry-away" scenario had already been ruled unlikely in the Final EIS. Further, they concluded that the most appropriate scenario for sealed source disposal was the "discovery-scenario" in the 1982 Final EIS; which is actually an abbreviated version of the dwelling construction scenario from the 1981 DEIS. In this 1981 scenario, excavation workers recognize the waste form is artificial and stop digging. This assumes the drum and encapsulation matrix remain intact. It also denies the habitation / agriculture scenario from ever happening.

The ACRS also went on to say: *"...the use of overly conservative scenarios "for inadvertent intrusion into presumably abandoned, unmarked, and unsecured LLRW disposal facilities can change the focus of the facility design from the protection of the health and safety of the public during the period of operation of the facility (and a reasonable period thereafter), to the protection of hypothetical intruders many thousands of years in the future."* Unfortunately, the ACRS provided no definition of what it considered a "reasonable period" after disposal.

At the root of the discussion, it appears the ACRS prefers NRC use a short period of performance, in that they envision the drum and encapsulation matrix is intact, allowing the intruder to easily recognize the waste form is artificial, and prevent exposure. In contrast, NRC staff appears to view the problem in terms of "deep time", and acknowledge the shortcomings in the 1981 DEIS, 1982 FEIS in that the 10 CFR classification system is flawed, as follows:

- Short Lived Waste Assumption – that LLRW will experience significant decay in 100 (Class A), 300 (Class B), and 500 years (Class C) after disposal. Unfortunately, the current NRC rule fails to acknowledge long-lived isotopes, known to exist in LLRW and power plant wastes, e.g., Tc-99 (half-live = 211,000 years), that will not significantly decay in 500 years or less.
- Opposite Behavior of Depleted Uranium – where long term ingrowth of decay products increase the risk to the public. This was the mission the NRC staff were charged with by the Commission, as a means to reconcile the Louisiana Energy Services lawsuit.

So a disparity exists between the NRC staff and the ACRS, that is critical to reconcile before any final NRC rule is revised, adopted, and final guidance issued. From the ACRS letter, it appears the advisory group prefers a shorter 1,000 year period of performance (POP), as is the case with current DOE policy for waste disposal. In contrast, longer time periods are being considered by NRC staff in response to SECY-08-0147.

4. Clive: The CAE BTP, Section 3.8 describes how the new guidance will allow an off-ramp to the proposed CAE BTP decision tree; largely based on disposal site PA results and intruder analysis. This "off-ramp" is consistent with the current alternative waste classification / characteristics requirements found in 10 CFR 61.58. However, one would expect that in 1982 when 10 CFR 61.58 was framed, it was anticipated that when an alternative was proposed, it would be subject to public notice and comment. However, given now that proposed "off-ramp" is in guidance, which is not mandatory for an Agreement State to follow, a potential situation could exist where either the generator or disposal State (or both) could make a change to a license, without public participation. Under these circumstances, the public would be denied the opportunity to comment. Inversely, if a disposal site PA / intruder analysis is approved by a sited State, and forms the basis for waste packaging / classification in a generator State, does or will this compel the generator State to undergo a public comment period?

5. Clive: As laid out in the draft CAE BTP the first test in the CAE BTP guidance in process is to ask if the waste is "homogeneous or a mixture of items". NRC describes homogeneous waste as (CAE BTP, pp. 5, 9-10):
   - Solidified or absorbed liquids,
   - Spent ion exchange (IX) resins, filter media, evaporator bottom concentrates, ash, contaminated soil, and
   - Dry Active Waste (DAW) , and
   - With regard to the "items", that might be mixed into LLRW or are not homogeneous, the NRC CAE BTP (p. 5) mentions:
     - Activated metals (e.g. tools, equipment, large objects, etc.),
     - Contaminated materials,
     - Spent cartridge filters, and
     - Sealed sources.

   It is clear that the new NRC guidance addresses a very wide range of LLRW waste types. Examination of these waste types in context of the 1981 NRC Draft Environmental Impact Statement (DEIS) and the 1982 Final Environmental Impact Statement (FEIS) provides some very interesting information. With the exception of "contaminated materials", all of the waste types discussed in the draft CAE BTP were considered in the 1981 NRC DEIS.

6. Hanford: In Section 3.9, under the Likelihood of Intrusion section, discussion allows a probability of intrusion less than one. With Washington's LLRW disposal site on federal government land, what documentation is needed to use a probability of intrusion less than one in a site-specific performance assessment?

**F. Benefit to Specific Waste Generators**

1. Andrews: It appears the focused is on changes for larger commercial sealed source disposal in sited states. The scope of this issue should not solely focus on the back-end disposal remedy. If front-end issues are not also addressed in recognition of their impact to future available options, the problem will not be solved.

2. Clive: Larger sealed source owners will benefit from the new guidance, and not disposal States. CAE BTP Figure 1 flowchart shows how "coffee cup" sized items with certain activity levels are separated from the waste form, and then undergo another series of tests. In turn, the NRC Figure 2 tests allow "coffee cup" sized items to be diluted by encapsulation and averaging over a larger volume container. This dilution provides a potential for generators to segregate small items with elevated activity and down-grade their classification. Taken to an extreme, GTCC equivalent material could be downgraded to Class C, or Class B/C equivalent materials could become Class A. This potentially would benefit generators with GTCC sources or who are mandated by law to manage GTCC waste.

3. Barnwell: The current Barnwell disposal facility license is more stringent than the 1995 BTP with regards to sealed source activity. Disposal is limited to 10 Ci per container without special approval. Currently in SC, there are only three licensed Cs-137 sources greater than 10 Ci. There is one licensed source between 10 and 30 Ci, one between 30 and 130 Ci, and one that is greater than 130 Ci. The first two would require special approval for disposal at Barnwell even under the new BTP. (We have not collected information from Connecticut and New Jersey - the other states in the Atlantic Compact.) What is expected to be the impact to sited states as far as number of sources that potentially may be disposed based on the new guidance compared to the current? If it is a small number, could these be approved on a case-by-case basis instead?

**G. Homogeneous/ Similar Type Material**

1. Clive: The NRC flowchart (CAE BTP Figure 1) outlines the new classification process, and shows the least scrutiny is given LLRW that is homogeneous and of similar type. Spent ion exchange resins at nuclear power plants certainly meet these criteria. As a result, generator States with nuclear power plants have a more streamlined process and will benefit more than other LLRW generators.

**H. Performance Assessment**

1. Barnwell: The current PA for the Barnwell Facility took several years to complete. After discussions with NRC, SC DHEC convened a Blue Ribbon Panel of experts to provide a third party review of the "Environmental Radiological Performance Verification" submitted by the disposal facility. SC DHEC monetarily compensated the panel for their review. Costs were in the ballpark of $25,000. Would NRC be willing to assist states in the review of future performance assessments either by providing funding for such third party reviews or providing staff support? Increases in license fees to pay for such reviews are not likely to be approved with the current economic environment.

2. Working Group: Sited state stakeholders could challenge the new performance assessment's (PA) generic exposure scenarios for being too conservative or not conservative enough.

3. Working Group: Since it references the proposed site-specific analysis rulemaking, sited states may need to redo their PAs, using the scenarios described in the BTP.

**I. Alternative Approaches**

1. Andrews: Although NRC has opened up these alternative options in the revised BTP, it does not address the underlying reasons why sited states have not taken these considerations up to this point. By less reliance on standard acceptance criteria approved by sited state regulators, there is a level of confidence given to

the abilities and resources available to every waste generator/processor shipping for disposal. For sited states, these are licensed entities which they largely do not regulate nor have impact over waste handling and classification decisions.

2. Barnwell: In general, the allowance for the use of alternative approaches can be positive for regulators. Regulations/guidance that are too specific and too rigid are not easily adaptable to unforeseen/unique situations. For example, the EPA's hazardous waste regulations are very prescriptive making it difficult to find solutions to complex problems at some facilities. It can be helpful to have the option of another approach in some situations where the benefits for clean-up, decommissioning, ALARA, etc. outweigh the other factors being considered and provide the same or greater protection of the environment/health of the state/public.

3. Clive: Alternative approaches off-ramp provided on NRC Figure 1, allows a generator to classify waste on the basis of the disposal site's performance assessment (PA) model analysis (also see CAE BTP pp. 20-23). This is a direct benefit to generators, in that provides an "off-ramp" for generators to avoid following the proposed classification criteria on NRC Figures 1 and 2. It also opens the door for variability in its application on a state-by-state basis.

4. Clive: Use of PA model analysis for alternative approaches has the potential to exploit an inherent disconnect between host States and generator States. If this "off-ramp" is used, host States will need to develop detailed Waste Acceptance Criteria (WAC) to ensure that generators properly prepare, package and ship their waste to be consistent with the specific intruder scenarios and waste form (physical / chemical) assumptions used in the approved PA model analysis for each disposal site. This could lead to extensive WAC guidelines that could vary from host State to host State, and waste class to waste class. This has the potential for additional burden on disposal States to communicate and educate generators and their regulators on how to comply with new WAC guidelines.

5. Working Group: Sited state stakeholders could challenge the use of the alternative approach's position as a way to circumvent the BTP and requirements found in Part 61.58.

6. Working Group: Removes NRC responsibility for reviewing some BTP alternative approach proposals and places the responsibility and cost for review and approval on the sited states.

7. Working Group: What specific requirements will the NRC place on sited states that choose to use the BTP alternative approach that is exempted from Part 61.58?

## J. Enforceability Issue

1. Barnwell: We are never able to absolutely verify the waste classification or homogeneity even under the current BTP. We currently must rely on generators' process knowledge and analytical results (typically dose to Curie conversions using scaling factors). We require the disposal facility to review the paperwork to confirm that the methodology and calculations are satisfactory. Additionally, since about 1997, the disposal facility is required to forward for SC DHEC review all Class C waste disposal requests whether applying the guidance in the BTP or not (although we only require a cover letter describing the request and the classification documentation (i.e., Radman analysis) and not the entire voluminous paperwork package). If we have questions after our review, we may ask to see the entire package or other supporting data.

2. Barnwell: It would be helpful if a disposal facility's waste acceptance criteria required the generator to identify what sections of the guidance in the BTP, if any, are being applied in the waste classification process for each waste package. It could be in the form of a checklist. This is an approach that sited states could use to help identify these waste packages and associated generators thereby providing opportunity for paperwork auditing at the least.

3. Barnwell: What assurances will/can the NRC provide to assure that these various waste types generated at nuclear power plants are in fact homogeneous and processed in accordance with the revised BTP?

4. Barnwell: Would upper level managers at generator facilities be willing to provide certification statements certifying that approved waste classification procedures were followed and BTP guidance was strictly adhered to?

5. Clive: For sited states, waste for disposal comes from generators/processors that they do not regulate nor have impact over waste handling and classification decisions. Other state regulators and the NRC who do have enforcement authority over generators/processors, have different regulatory emphasis than the sited states and are independent. Even if it is assumed that the NRC-prescribed consultation occurs among regulators on each decision, there are inherent drivers that will always impact how disposal concerns from sited states regulators are considered and potentially acted upon.

6. Clive: To a large degree the CAE BTP has the same flaw as the 1995 BTP guidance; in that separate regulatory jurisdictions govern different activities (generators vs. disposal), have different interests and motivations, and are separate and independent of one another. As such, generator States are more apt to worry about elimination and transfer of the waste from their jurisdiction, and pay less attention to disposal site considerations (e.g. design / site factors, PA analysis results, etc.). Because disposal States will live with the long-term fate and consequences of LLRW disposal, they are more likely to be concerned about adverse effects that waste treatment, classification, and packaging may have on

their local environment and public health from the perspective of both near term and "deep time"; but are without legal jurisdiction or reach to oversee or enforce waste characterization / classification by the generator.

In addition, the CAE BTP (Figures 1 and 2) classification guidance for each waste container, is just that - guidance. There is no guarantee that it will be uniformly applied in all generator States. Utah will be dependent on each generator State agency to voluntarily implement the new guidance for each generator. NRC will not be able to compel the generator Agreement States to invoke the guidance. It is likely that there will be a high degree of variability on if, how and when, the new guidance is implemented in generator States. While the CAE BTP calls for generator States to cooperate with disposal State regulators (ibid, p, 4); there is no guarantee it will happen.

7. Clive: It is true that the CAE BTP suggests that in the case of conflict between disposal site waste acceptance criteria (WAC) / License requirements and the generating State waste treatment process / requirements, that the disposal State requirements should prevail (ibid., p. 24). Unfortunately, this posture is unenforceable, in that the disposal State has no legal jurisdiction over the Out-of-State generator, and cannot directly enforce its WAC / License requirements beyond its borders.

8. Clive: The current EnergySolutions (ES) License requires ES to apply the existing 1983 and 1995 NRC guidance documents via the waste prohibitions in License Condition 16.L, that stipulate that ES not accept a package of LLRW unless it has been:

> *i. Classified in accordance with R313-15-1009, "Classification and Characteristics of Low-Level Radioactive Waste." In addition, the Licensee shall require that all radioactive waste received for disposal meet the requirements specified in the Nuclear Regulatory Commission, "Branch Technical Position on Concentration Averaging and Encapsulation", as amended.*
>
> *ii. Marked as either Class A Stable or Class A Unstable as defined in the most recent version of the "Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification." originally issued May, 1983 by the U.S. Nuclear Regulatory Commission. ..."*

From the first paragraph, the intent of the License is to indirectly mandate that generators properly package and classify the LLRW in accordance with the 1995 NRC BTP requirements. However well-meaning this requirement, it is currently un-inspectable; in that the Utah DRC (UDRC) has no authority in the generator States, nor are we easily able to independently verify if generators actually classify their waste as required. Instead UDRC is dependent on the generators to perform and the NRC or other Agreement States to confirm this. UDRC is

without legal power or reach to independently verify if generators actually comply with the NRC classification guidelines.

9. Clive: There appears to be a conflict on performance of drums and encapsulation media. as mentioned above, the NRC requires Class B and C waste to be disposed in robust and stable containers, in that [10 CFR 61.7(b)(2)]:

> "*Those higher activity wastes that should be stable for proper disposal are classed as Class B and C waste. To the extent that it is practicable, Class B and C waste forms or containers should be designed to be stable, i.e., maintain gross physical properties and identity, over 300 years. For certain radionuclides prone to migration, a maximum disposal site inventory based on the characteristics of the disposal site may be established to limit potential exposure.*"

NRC has made clear that container integrity and waste form is key to controlling higher activity Class B and C waste, in that (1981 NRC DEIS, Vol. 1, p. 31)::

> "*The waste form (coupled with site design and operating practices) is probably the most significant factor contributing to site instability -- a factor containing the paradox that much if not most of the problems with site instability and high maintenance costs is caused by the wastes containing the least activity. Most of the waste sent to LLW disposal facilities consists of very low activity material such as trash which is frequently easily degradable. In the past, some of this waste has been packaged in easily degradable packages such as cardboard boxes. Most of the waste, however, is currently packaged in longer lasting, but still degradable, rigid containers such as wooden boxes and 55-gallon steel drums. Large void spaces can also exist within waste packages and the disposal cells after waste disposal. As the waste material degrades and compresses, a process which is accelerated by contact by water, additional voids are produced. This leads to settlement of the disposal cell contents, followed by subsidence or slumping of the disposal cell cover. This increases the percolation of water into disposal cells, accelerating the cycle. This slumping and subsidence is frequently quite sudden.*" (emphasis added)

Accordingly, the 1995 BTP assumed that steel drums corrode leaving only the encapsulation matrix to control the sealed source nuclides (1995 BTP, Appendix C, p. 22). As discussed above, the NRC staff appear to take a "deep time" point of view in the CAE BTP, and assume both the drum and encapsulation matrix degrade to become soil-like, leaving only the stainless steel cladded source behind to be "discovered" (CAE BTP, p. B-2). As discussed above, this view appears to be in direct conflict with those of the ACRS. This disagreement must be resolved before NRC moves forward to either a new rule or guidance on waste concentration averaging.

10. Working Group: Although the NRC guidance in the revised BTP is primarily designed for generators, who are required to certify that they meet the Class A, B, or C waste classifications in Part 61, it should be noted that the sited states may be burdened with increased costs to ensure compliance.

## K. NRC/ACRS

1. Clive: Evolution of NRC Intruder Scenario Assumptions: Sealed Source Disposal – the NRC intruder scenarios on the acceptability of sealed source disposal, and appropriate activity limits for sources at disposal have varied significantly over the past 30 years.

   Recently the Advisory Committee on Reactor Safeguards (ACRS) recognized this and suggested NRC staff reconsider their approach by using "*...the same scenarios used to develop 10 CFR Part 61 without creating additional unrealistic scenarios to determine allowable concentrations or amounts of LLRW to be disposed.*" (12/13/11 ACRS letter, p. 2). This would indicate that the ACRS is encouraging the NRC to also reverse its 1995 BTP intruder scenario assumptions, which applied the 0.02 mR/hr contact dose limit to the steel drum (upon discovery / intrusion). If this is indeed their intent, then it would appear that NRC staff would need to revert to the intruder scenario described in the 1982 FEIS.

   The ACRS also stated that the CAE BTP sealed source intruder scenario was overly conservative, did not recognize the depth of burial, and that the "carry-away" scenario had already been ruled unlikely in the Final EIS. Further, they concluded that the most appropriate scenario for sealed source disposal was the "discovery-scenario" in the 1982 Final EIS (12/13/11 ACRS letter, p. 3-4); which is actually an abbreviated version of the dwelling construction scenario in the 1982 FEIS (Vol. 1, p. 4-14). The "discovery scenario" assumes the drum and encapsulation media remain intact; thus denying the possibility of a habitation / agricultural scenario that may be more applicable under "deep time" considerations.

   The ACRS also went on to say: *"...the use of overly conservative scenarios "for inadvertent intrusion into presumably abandoned, unmarked, and unsecured LLRW disposal facilities can change the focus of the facility design from the protection of the health and safety of the public during the period of operation of the facility (and a reasonable period thereafter), to the protection of hypothetical intruders many thousands of years in the future."* Unfortunately, the ACRS provided no definition of what it considered a "reasonable period" after disposal.

   At the root of the discussion, it appears the ACRS prefers NRC use a short period of performance, in that they envision the drum and encapsulation matrix is intact, allowing the intruder to easily recognize the waste form is artificial, and prevent exposure. In contrast, NRC staff appears to view the problem in terms of "deep time", and acknowledge the shortcomings in the 1981 DEIS, 1982 FEIS in that the 10 CFR classification system is flawed, as follows:

- Short Lived Waste Assumption – that LLRW will experience significant decay in 100 (Class A), 300 (Class B), and 500 years (Class C) after disposal. Unfortunately, the current NRC rule fails to acknowledge long-lived isotopes, known to exist in LLRW and power plant wastes, e.g., Tc-99 (half-live = 211,000 years), that will not significantly decay in 500 years or less.
- Opposite Behavior of Depleted Uranium – where long term ingrowth of decay products increase the risk to the public. This was the mission the NRC staff were charged with by the Commission, as a means to reconcile the Louisiana Energy Services lawsuit.

So a disparity exists between the NRC staff and the ACRS, that is critical to reconcile before any final NRC rule is revised, adopted, and final guidance issued. From the ACRS letter, it appears the advisory group prefers a shorter 1,000 year period of performance (POP), as is the case with current DOE policy for waste disposal. In contrast, longer time periods are being considered by NRC staff in response to SECY-08-0147.

## L. Contaminated Material

1. Hanford: The manifest waste descriptor "Contaminated materials" is a very broad term (e.g., similar to DAW) and should be avoided. In fact, under the new blending concepts, isn't all material in the disposal package supposed to be "(radioactively) contaminated"? As such, this waste descriptor would be added to every package listed on the manifest. Waste descriptors on disposal manifests should relate to the BTP & WAC categories. I recommend more specificity in waste descriptors for the benefit of site operators and state regulators.

## M. Waste Acceptance Criteria (WAC)

1. Clive: Not all disposal sites have detailed WAC to constrain waste physical and chemical form, leachability, etc., before land disposal.

2. Clive: The proposed guidance relies on disposal site WAC's (founded on site-specific PA analysis) to guide generators in the waste classification process. This added complexity for generators (and their regulators) could lead to increased errors in waste preparation, packaging, and classification for disposal.

3. Clive: When disposal states lack legal reach on generators, such errors can increase potential jeopardy for disposal state public health and environment.

4. Clive: Disposal states should have the ability to promulgate rules that are more stringent than NRC to protect their public health and environment.

5. Clive: In deciding compatibility categories for new rules, NRC must provide flexibility in order to allow disposal states to afford this protection to its citizens.

## N. Agreement State Compatibility Categories

1. Clive: Disposal states should have the ability to promulgate rules that are more stringent than NRC to protect their public health and environment.

2. Clive: In deciding compatibility categories for new rules, NRC must provide flexibility in order to allow disposal states to afford this protection to its citizens.

## O. Action Items

1. Clive: Guidance alone is not sufficient to ensure that long-term public health and the environment will be protected in the disposal States; especially under "deep time" conditions. Therefore, after NRC promulgates new federal rules regarding LLRW blending and DU disposal, etc., the agency will need to define compatibility categories for purposes of IMPEP. This is critical for at least two reasons:
   - Generator State Implementation – the compatibility category assigned to the new rule(s) must be substantial so as to mandate the generator State implement equivalent rules on how LLRW is to be classified before shipment for disposal. This is important for trans-boundary reasons. However, if the NRC assigns an insignificant compatibility category (e.g., Category D) the purpose of the new rule would be defeated from the disposal States' viewpoint. As a result, in assigning a compatibility category NRC must seek out and resolve disposal State input.
   - Disposal State Flexibility – in assigning a compatibility category for the new rule(s), the NRC must allow disposal States flexibility to establish LLRW disposal rules that are not only equal, but also more protective of public health and the environment than minimum requirements set by the NRC. Failure to allow this flexibility, would relegate disposal States to a lower degree of standing than generator States, and further exacerbate the imbalance between disposal State long-term protection of public health and the environment in lieu of short term needs of generator States who enjoy the benefits of modern technology; but have chosen not to host a LLRW disposal site.

2. Clive: In light of the January 19, 2012 NRC Staff Requirements Memorandum, where the Commission directed the NRC staff to re-evaluate its approach to the proposed limited rulemaking at 10 CFR 61 (and guidance), it is clear that the compatibility determinations will need to be revisited (see 9/30/11 NRC letter, Enclosure 1, p. 54). Utah and other sited states will need to reserve an opportunity to re-assess the proposed compatibility categories, until after the revised NRC staff position / rules are provided.

3. Barnwell: Upon finalization of the revision to the BTP, will the NRC consider conducting public meetings in sited states to assist states in addressing concerns of the stakeholders adjacent to the disposal sites?

4. Working Group: The NRC should sponsor BTP regulatory oversight training classes for sited state personnel and for states with waste processors.

5. Working Group: The NRC should consider adding a new non-common indicator to the Integrated Materials Performance Evaluation Program (IMPEP) for the revised BTP.

6. Working Group: The NRC should include sited state personnel as IMPEP team members for audits of states with waste processors.

7. Working Group: The BTP should discuss and support independent or joint point-of-origin inspections of waste processors by the sited states.

8. Working Group: There should be a more focused public outreach in each of the sited states, in order to discuss the practical implications of the changes and possible waste disposal alternatives to be considered.

9. Working Group: The NRC should hold public meetings in each of the sited states and should use the sited state interested party notification lists to alert the public.