Comments on NRC Draft Proposed Rulemaking to 10 CFR 61

Comments from the Utah Division of Radiation Control:

We especially appreciate NRC's overall approach in developing the proposed as stated in Section E of the Discussion section, on page 15, as follows:

The NRC considered a number of options in developing this proposed rule. In the end, the NRC decided that an amendment that requires site-specific analyses for all waste inventories would be the most comprehensive approach. This would ensure that as future waste streams are generated that analyses would be performed to demonstrate that the performance objectives would be met. This approach is similar to the regulatory approach established by the Utah Radiation Control Board in adopting, during 2010 and 2011, new rules addressing performance assessments for disposal of DU and performance assessments for LLRW meeting certain conditions.

We also note the benefit and value the associated guidance document will have in implementing the regulatory amendments to Part 61 and express added appreciation to NRC for its concurrent development with the proposed regulation changes.

The comments below focus on the draft federal register notice (DFRN) or Enclosure 1 from the September 30, 2011 letter to Agreement State Radiation Control Program Directors (RCPD-11-016).

Enclosure 1: DFRN entitled "Part 61 Site-Specific Analyses for Demonstrating Compliance with Subpart C Performance Objectives."

1. Waste Classification System and Intruder Protection (p. 8-9) – we agree that Class A waste requires the fewest controls. However, it is important to note that under the existing rule at 10 CFR 61.7(b) (4), intruder protection is not required for either Class A or B wastes. We also agree with the NRC statement (p. 9) that containerized waste disposal is required for Class B waste, and not Class A [10 CFR 61.61.7(b) (2)].

2. Original Uranium Concentrations Estimated in 1981 DEIS (p. 12) – the first paragraph makes reference to the technical basis for 10 CFR 61 and states that the NRC estimated 17 Ci of U-238 and 3 Ci of U-235 were assumed in to be disposed in the generic LLRW disposal site over a 20 year life. These activity values are actually low by 1-2 orders of magnitude. See the 1981 NRC Draft Environmental Impact Statement (DEIS), NUREG-0782, Volume 2, Tables 3.3 and 3.4, where a much larger activity was predicted: 3,407 Ci for U-238 and 479 Ci for U-235.

3. Clarification Needed for Inadvertent Intruder Requirements (pp. 19-20 and 67) – to a degree we agree with the statement in the second paragraph (p. 19), where the NRC explains "… *the safety of the inadvertent intruder is ensured by the waste classification system and the disposal requirements imposed for each class of waste.*" We also recognize that the existing requirements at 10 CFR 61.7(b) (4) and (5) only require an

inadvertent intruder protection (and therefore analysis) for Class C waste. We see how NRC is proposing a new section in 10 CFR 61.7(c)(6) to provide an overriding requirement for an inadvertent intruder analysis (IIA), irrespective of the waste class, this over-riding mandate should apply to all classes of LLRW, in order to provide uniformity of LLRW regulation nationally. As a result, we recommend the following change in the proposed wording at new section 10 CFR 61.7(c) (6) [changes in redline text]:

> "(6) Regardless of the waste classification, and requirements found at 10 CFR 61.7(c)(4) and (5), all waste will require an inadvertent intruder assessment, and some waste may require enhanced controls or limitations at a particular land disposal facility to provide reasonable assurance that the waste will not present an unacceptable hazard over the compliance period…."

4. Definitions Needed for PA Compliance Period and Performance Period (p. 67) – with regard to the new wording proposed at 10 CFR 61.7(c)(6), the term "compliance period" is undefined. The same is true for the term "performance period", as described in the DFRN (p. 34). We suggest that a formal definition of both terms be added to 10 CFR 61.2, so as to make explicit the minimum time required for these periods in the PA. This could be done as part of the proposed definition for Performance Assessment in 10 CFR 61.2. This might also help prevent confusion, in that the DFRN also refers to a "period of performance" in its discussion of the new IIA requirements proposed in 10 CFR 61.42 (see DFRN, p. 48). Also, a NRC compatibility category should also be assigned in Section VI of the DFRN (pp. 50-53).

5. Period of Time Required for Inadvertent Intruder Analysis (pp. 23 -24 and 71-72) – we appreciate the point of view that use of cultural information in determining a time period for the IIA be limited to a few hundred years. We also note the much longer 20,000 year period proposed as a new IIA requirement in draft 10 CFR 61.42. However, possible consideration may be appropriate for a longer time period for IIA given:

   a. Long half life of DU.

   b. Significant in-growth of radium-226 that NRC did not recognize in its May 3, 2011 DFRN and attending regulatory basis document (ML111030586) (see discussion below). We also agree that given such a long and uncertain period of time in the analysis, that a simple approach is preferred, that is the use of only two generic NRC scenarios: 1) dwelling construction and 2) mineral resource /water well drilling.

6. NRC Request for Comments on Proposed Tiered Dose Limit for IIA (pp. 21-22) – we appreciate how the tiered approach is an attempt to provide flexibility in estimating assumed waste concentrations that a future inadvertent intruder may be exposed. As proposed, the IIA in NRC Tier 2 considers protection of the intruder from 95% of the waste volume they might be exposed to. Since the IIA will need to assume an activity

concentration in the waste form (e.g., Ci/m3), Tier 2 would require the licensee and/or the regulator know:

a. *Waste Concentration Range and Physical Distribution* – meaning both the range of concentrations in a disposal cell and their 3-dimensional distribution, as actually placed. While the licensee may have this information, Utah DRC does not, nor are State inspections used to verify any distribution claim the licensee may make. In addition, the uncertainties discussed below undermine any confidence a regulator may have during review of licensee's distribution claim.

b. *Dilution by Mixing of Bulk Waste Forms As Placed* – common disposal practice at the Clive site often calls for mixing of various bulk waste shipments on the same disposal lift area, as a means to exploit complimentary engineering properties of different wastes, and maximize facility ultimate disposal capacity.

c. *Dilution by Use of Backfill Materials* – many waste shipments disposed at Clive are placed with native soil, flowable sand backfill or concrete low-strength material (CLSM) to reduce void ratio, improve strength properties of the waste form, and to minimize potential for future differential settlement. Given these uncertainties, we recommend the NRC apply a simpler approach to IIA. An acceptable method would be the use of either the average waste concentration or the maximum waste concentration, for key isotopes in a disposal cell.

7. Need for Long-term Maximum Dose Limits for PA Predictions (p. 24-25 and 34-35) – The proposed rule does not call for a quantitative maximum dose limit for the public beyond 20,000 years, which may be important in light of the significant dose potential that will occur as daughter products in-grow in the waste beyond 20,000 years, see discussion below on Ra-226. We recognize that omission of a maximum dose limit for periods of time beyond 20,000 years provides flexibility; however, it leaves each Agreement State prone to second guessing by both the licensee and critical third parties; which in turn may lead to a delay in a decision. In the absence of setting a maximum dose limit for long-term PA model predictions will likely shift the burden to the Agreement States. A possible approach would be to establish a maximum dose limit at a point of compliance for the lengthy POP in the PA model. We fully recognize the multiple uncertainties in long-term PA predictions, and we appreciate the NRC statement that (p. 24): "*The proposed approach is based on the position that there are a large number of uncertainties of the risks imposed on future generations, especially from processes or events other than radioactive waste disposal. In addition, there is uncertainty in the projected risk to future populations from waste disposal, which may be based on a number of assumptions about the behavior and characteristics of future society.*" Considering these uncertainties, and in light of the paleoclimate, geologic, and half-life issues that exist, we believe it to be more protective of public health and the environment if NRC determines quantitative maximum dose limits in the rule for long-term PA model predictions (>20,000 years).

8. Suggested Change to Draft 10 CFR 61.13(b) [p. 70] – in addition to the changes suggested by the NRC, we suggest the following improvement (NRC changes in yellow highlight, State changes in red text): *"(b) Analyses of the protection of individuals from inadvertent intrusion must demonstrate that there is reasonable assurance that the waste classification and segregation requirements will be met, that adequate barriers to inadvertent intrusion will be provided for Class C wastes pursuant to § 61.7(b)(5), and that the exposure to any inadvertent intruder will not exceed the limits set forth in § 61.42 as demonstrated in an intruder assessment.*"

9. Implications of Agreement State Ra-226 Class C Limits – the NRC has no LLRW waste concentration limits for Ra-226 in 10 CFR 61.55. However, Utah does, where the Ra-226 Class C concentration limit is 100 nCi/gm (100,000 pCi/gm). Class A concentrations are reached when a waste has less than 10% of this value, or 10 nCi/gm (10,000 pCi/gm) [ibid.]. Utah is not the only Agreement State with such limits, all four of the host States for LLRW disposal have these same Ra-226 waste concentration limits (see below).

   Comparison of Agreement State LLRW Concentration Limits for Ra-226 State Class A Limit Class C Limit Greater than Class C:

   - South Carolina < 10 nCi/gm < 100 nCi/gm 18 > 100 nCi/gm
   - Texas < 10 nCi/gm < 100 nCi/gm 19 > 100 nCi/gm
   - Utah < 10 nCi/gm < 100 nCi/gm 11 > 100 nCi/gm
   - Washington < 10 nCi/gm < 100 nCi/gm 20 > 100 nCi/gm

   We recognize the NRC staff's May 3, 2011 DFRN calculation of Ra-226 in-growth for a LLRW waste form containing a large quantity of DU, as found in the attending NRC regulatory basis document (ML111030586), Figure 2. DRC review of this graph indicates the Utah Ra-226 Class A waste limit would be reached after about 20,000 years of in-growth (see NRC ML111030586, Figure 2), whereafter the DU waste would become Class C material under Utah rule. The same NRC graph also indicates that the DU waste would become a Greater than Class C (GTCC) waste at about 400,000 years post-disposal, per the NRC Ra-226 in-growth graph. It appears that the NRC Figure 2 Ra-226 in-growth calculations may have failed to consider the sensitivity of several factors, including the initial U-234 concentration in the waste form, and the DU chemical form (zero valent [ZV] metal, U3O8, or UO3). These factors came to DRC attention when staff was asked to examine Ra-226 in-growth for 5,300 drums of DU waste shipped to Clive in early 2010 from the DOE Savannah River site (SRS).

   Time to Become Class C Waste

   The URS calculations indicate that time needed for DU waste (post-disposal) to exceed the State's Ra-226 Class A concentration limit (Ra-226 ≥ 10 nCi/gm or 10,000 pCi/gm), and thus become Class C waste, would range from 5,400 years to 61,200 years. The lower end of this time range is where DU waste (irrespective of chemical form) starts with U-234 concentrations in natural or secular equilibrium with U-238. In this scenario, the Ra-226 in the DU material would in-grow to become a Class C waste sometime between 5,400 and 6,200 years. This time interval is significantly shorter than predicted

by the NRC in its May 3, 2011 DFRN. For DU from typical spent fuel reprocessing, this Ra-226 in-growth time would be between about 20,700 and 24,200 years (ibid.). For the DOE SRS DU waste, now held in a temporary storage building at Clive, the Class C threshold would be exceeded somewhere between 25,500 and 29,800 years post-disposal, assuming DU waste remains in a closed system and is not leached from the disposal cell. The NRC 20,000- year POP would allow DU from spent fuel reprocessing to continue to be designated as Class A waste.

10. GTCC Implications for DU – as seen in the table above, all four Agreement States have a Ra-226 waste concentration standard for LLRW, where a waste becomes GTCC at concentrations above 100 nCi/gm (100,000 pCi/gm). Again, there is no NRC corollary for this State requirement.

Time to Become GTCC Waste

URS calculations also indicate that the Ra-226 in-growth time needed for DU waste to exceed the Utah's Ra-226 Class C concentration limit, and thus become "… generally unacceptable for land disposal," or Greater than Class C (GTCC) waste, ranges from 40,800 years and 269,000 years post-disposal. Again, the most rapid transformation is found in DU waste where the initial U-234 concentration is in secular equilibrium with U-238, and could occur between 40,800 and 50,400 years post-disposal (irrespective of chemical form). Again, this estimate is about 10-times earlier than calculated by the NRC in their May, 2011 DFRN documents. For DU from spent fuel reprocessing, the material could become GTCC at about 171,000 to 223,000 years post-disposal. As for the DOE SRS DU waste currently stored at Clive, the GTCC threshold would be exceeded at sometime between 187,000 and 223,000 years post-disposal. Both of these estimates are about half of the time predicted in the May, 2011 NRC DFRN documents. It is important to note that the NRC rule and State rules in Texas, Utah, and Washington are equivalent on the point that GTCC LLRW is found unacceptable for *near-surface* disposal. In contrast, the LLRW rules in South Carolina are more restrictive in that GTCC waste, containing long-lived radionuclides like Ra-226, is unacceptable for *land disposal*. Given the arguments made in the January, 2005 NRC Memorandum and Order, that GTCC waste is in fact LLRW, and could be land disposed at intermediate depths (>30 meters), and in light of the current State LLRW regulations on Ra-226 content, it would appear that intermediate land disposal of DU would be possible only in Texas, Utah, and Washington; all three of which are arid disposal sites (in contrast to South Carolina, a humid site).

11. Agreement States Compatibility Evaluation (Section IV) – An in-depth review of the proposed compatibility categories has not been performed, but we anticipate offering additional comments once a review is completed.

Comments from the Washington State Office of Radiation Protection:

1. Washington State fully supports the idea that each LLRW facility has a site-specific performance assessment.

2. Washington is concerned over extending the Period of Performance from currently accepted (but not in reg) 10,000 years to 20,000 years. In-growth of uranium daughters could cause issues with the extended Period of Performance.

Comments from the Texas Commission on Environmental Quality:

In the initial rulemaking, Texas did not provide specific comments to the NRC.

Comments from the Pennsylvania DEP:

1. As it relates to the performance assessment (PA) requirements of the proposed rule, there is a need to make a distinction between unique waste streams and particularly depleted uranium, and routine commercial waste streams to account for the differences in toxicity of the two (physical and chemical form and radiological properties).

2. Additional clarification and guidance is needed regarding the proposed requirement to use peak annual dose for continuous assessment of the long-term performance of the disposal facility, beyond the compliance period of 20,000 years.

3. The uncertainties associated with the proposed PA timeframe of 20,000 years are large enough that it would be difficult to make a credible prediction about the long-term performance of the disposal facility. This could potentially complicate the licensing process for future commercial low-level waste (LLRW) disposal facilities.

4. Provide the basis for defining long-lived waste as waste that contains more than 10 percent of its initial radioactivity after 20,000 years. Does this correlate to the annual dose limit of 500 mrem for the inadvertent intruder scenario?

5. For the purpose of consistency and risk harmonization, consider an annual dose limit for an inadvertent intruder (currently 500mrem/year) consistent with 10 CFR Part 61.41 or 10 CFR Part 20 for the protection of the general public.

6. NRC and the host Agreement States should collaborate to determine an appropriate compatibility category and to minimize the potential for unintended consequences that could result from the implementation of the final rule.

Preliminary Comments (Post January 19, 2012 SRM on Revisions to Part 61)
(Comments not formally submitted but discussed at conference call with the NRC staff)

1. NRC should consider potential impact(s) of proposed changes [to Part 61] on Agreement States and specifically, the sited states.

2. Where practical, NRC should avoid "one size fits all" approach in the development of new regulations or requirements for disposal of LLRW. For example, the design of the Pennsylvania (PA) regional facility requires an above-grade construction with multiple barriers (engineered cover, overpacks and disposal modules). Shallow land burial is prohibited and PA regulations establish a concentration limit for disposal of Ra-226 at the regional facility. The facility design and other State specific requirements would not allow disposal of large quantity of certain types of waste (low-activity/high-volume waste and depleted uranium) at a future PA facility.

3. PA supports allowing licensees the flexibility to use ICRP dose methodologies in a site-specific performance assessment.

4. PA supports a two-tiered approach for conducting site-specific performance assessment. However, agreement states should be allowed to select a period of performance assessment consistent with State policies, site-specific physical and design feature, projected waste streams, and the waste acceptance criteria for the proposed facility. It is recommended that the licensee (disposal facility operator) be required to perform periodic review and update site-specific performance assessment during the facility operations to ensure compliance with the performance objectives of Subpart C.

5. PA supports the use of TEDE in Section 61.41 and the dose limit of 25 mrem/year, which is consistent with the ICRP-26 methodology adopted by Part 20 dose limit.

6. PA regulations require an "active" institutional control period of 100 years. We recognize the need for a "passive" institutional control period beyond the first hundred years and for the remainder of the projected hazardous life of the facility (about 500 years). The timeframe for the institutional period should be established on a site specific basis. A minimum of 100 years for active institutional period should be adequate for a typical Part 61 facility that accepts routine waste streams for disposal.

Comments from The Conference of Radiation Control Program Directors:

1. Some sited states were initially concerned there would be a need to remediate existing waste disposal facilities due to proposed revised requirements for long-term site performance standards for unique waste streams (e.g., large volumes of depleted uranium). This concern was addressed through "grandfathering."

2. The CRCPD is concerned that it is difficult to assure performance objectives after 20,000 years. The CRCPD supports the ACRS position of a rational site specific approach regarding period of performance.

NRC's Summary of Comments from March 2, 2012 Public Meeting on Potential Revisions to 10 CFR PART 61:

1. Several stakeholders expressed a preference for a 'round-table' type of meeting format instead of the meeting structure employed in Phoenix. Moreover, at future public meetings, stakeholders requested that the staff identifying and summarizing stakeholder comments from previous public meetings.

2. A number of stakeholders also expressed a preference for the staff to expand the scope of the proposed rulemaking amendments to other areas of the Part 61 regulation. Those other areas included:
   - Updating the waste concentration tables at Section 61.55 to reflect the latest dose conversion factors and dose methodologies.
   - Revisit the current basis for the duration of institutional controls, currently specified as 100 years in Section 61.30.
   - Revisit the earlier assumptions concerning the so-called phantom 4 isotopes (i.e., carbon-14, chlorine-36, iodine-126, and tritium) in LLW manifest reporting.

3. *Criteria for the disposal of greater-than-Class C (GTCC) LLW.* A DOE representative suggested that the GTCC disposition issue needs to be factored into any broader discussions concerning revisions to Part 61 now that work at Yucca Mountain, Nevada, has been essentially terminated and the Department has issued a draft Environmental Impact Statement addressing this particular LLW class.

4. *Criteria for the disposal of low-activity LLW.* Several comments were received that Part 61 needs to be amended to include criteria for the management of LLW that is very short-lived and amendable to disposal in municipal waste facilities.

5. Some stakeholders also expressed the view that SECY-10-0165, concerning options for a comprehensive revision to Part 61, was no longer relevant in light of the current January 2012 SRM and that staff should disengage from further work in this area. In response, the staff noted that until it receives direction from the Commission to the contrary, it is obliged to complete the SECY-10-0165 public outreach assignment.

NRC Summary of May 2011 Public Meeting 10 CFR Part 61: Site-Specific Analysis for Demonstrating Compliance with Subpart C Performance Objectives:

Significant stakeholder comments included:

1. The proposed period of performance (20,000 years) is more appropriate for waste streams containing large volumes of highly-concentrated depleted uranium than the majority of LLW which contains mostly short-lived radionuclides.

2. The "reasonably foreseeable" exposure scenarios should be specified for the intruder assessment.

3. The compatibility Category A, requiring Agreement States to adopt essentially identical regulations, should be assigned for the proposed performance objectives.

NRC Summary of September 2009 Public Workshops on Unique Waste Streams including Depleted Uranium:

Several significant comments that were made include:

1. The period of performance should be specified in rule language with other criteria, such as exposure scenarios, specified in guidance.

2. Not to define the term "significant quantity" of depleted uranium in the regulation, as the performance assessment would determine the amount of waste appropriate for disposal.

3. General agreement not to define the term "unique waste streams" during the initial rulemaking.

Comments from the Advisory Committee on Reactor Safeguards on the CAP BTP and Relate to the 10 CFR 61 Revision:

1. The revised BTP should be issued for public comment after consideration of the Committee's comments.

2. The guidance provided in the revised BTP on alternative approaches provides flexibility to LLRW generators and disposal licensees, and is a good first step in improving management of LLRW.

3. The guidance provided in the revised BTP for blending is also a good approach for managing LLRW. However, the staff should continue to develop appropriate guidance to

ensure that constituents in blended wastes are compatible and will result in satisfactory waste forms.

4. The staff's approach to protect an inadvertent intruder from exposure to disposed LLRW uses generic, stylized bounding calculations that assume a fixed set of conditions to judge the acceptability of disposal of LLRW. This approach does not consider site specific physical or design features that would impact the likelihood of inadvertent intrusion. The use of stylized scenarios should be replaced with an approach that takes into consideration site specific geohydrological features, depth of burial, waste characteristics, engineered disposal features, and their degradation over time.

5. The staff's approach to protect an inadvertent intruder from exposure to disposed LLRW uses generic, stylized bounding calculations that assume a fixed set of conditions to judge the acceptability of disposal of LLRW. This approach does not consider site specific physical or design features that would impact the likelihood of inadvertent intrusion. The use of stylized scenarios should be replaced with an approach that takes into consideration site specific geohydrological features, depth of burial, waste characteristics, engineered disposal features, and their degradation over time.