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Mr. Andrew Persinko, Deputy Director
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Division of Waste Management and Environmental Protection
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Subject: Docket ID NRC–2011–0012 Proposed Rulemaking for 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste"

Dear Mr. Persinko,

The Electric Power Research Institute (EPRI) is an independent non-profit organization that conducts scientific research and development relating to the generation, delivery and use of electricity for the benefit of the public. We thank the NRC for allowing EPRI to provide comment on the proposed rulemaking to *10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."*

The purpose of this letter is summarize some of the technical conclusions from EPRI low-level waste (LLW) research and to technically inform the change process in support of the Nuclear Regulatory Commission's direction resulting from SRM-SECY-08-0147, SRM-SECY-10-0043 and COMM-SECY-2011-0002.

The original knowledge base for the development of 10 CFR 61 was limited by the data and methodology available at the time. LLW volumes for disposal were expected to be approximately one million cubic meters (m^3) total in each of four regional facilities (50,000 m^3 per year for 20 years) (U.S. Nuclear Regulatory Commission, 1981). While nuclear utility waste is the dominant source of radioactivity in both volume and activity, (U.S. Nuclear Regulatory Commission, 1981) volumes have significantly decreased. The cumulative generation of LLW from all nuclear utilities is closer to the equivalent of only one of the envisioned disposal sites, about 30,000 m^3 per year. The data available showing actual generation of LLW along with the scientific advancements in our understanding of the effects of radiation and in our ability to model the performance of disposal sites present a considerable advantage over the original basis for the regulation. EPRI believes this new information should be used in the course of new rulemaking actions to facilitate the objective of the regulation.

EPRI agrees with long-standing NRC policy that the disposal of low-level waste is safer and more desirable than interim storage. The lack of access to safe disposal facilities for class B and C wastes results in the interim storage at plant sites of large volumes of operational wastes. The opening of the Waste Control Specialists (WCS) disposal site to out of compact wastes is a positive step, but does not provide significant relief from the need for interim storage because of the annual activity limitations at the WCS facility. Therefore, Class B and C waste volumes will continue to increase at plant sites. While the industry has made significant progress in reducing the generation rates of the Class B and C waste, it cannot be totally avoided under the current classification system.

A change to 10 CFR Part 61 that better risk informs the regulation by focusing on dose to real people rather than hypothetical inadvertent intruders into the disposal site after closure could facilitate broader access to safe LLW disposal in the United States. To that end, EPRI supports and encourages the development of consistent, risk-informed regulations and guidance based on the latest scientific knowledge. With regard to the current topics of the proposed, limited rulemaking, EPRI offers the following specific observations and recommendations.

Use of Site-Specific Waste Acceptance Criteria

EPRI research supports a combination of generic concentration limits identified in Tables 1 and 2 of 10 CFR 61.55 in the regulation and the option to use site-specific concentration values as an alternative to the 'generic' values where a disposal site operator and relevant regulatory authority agree to the use of a site-specific performance assessment using sound scientific principles and reasonable assumptions to establish alternate limits and site-specific waste acceptance criteria (WAC). Such an analysis would provide a better risk-informed basis for disposal applicable to the actual site rather than a set of generically applicable limitations.

It is important to note that while an option in the regulation for use of a site-specific performance assessment and site-specific WAC are positive steps in resolving the depleted uranium (DU) disposal issue because it provides a risk-informed outlet in the regulation for DU; it does not truly risk-inform the regulation and will have little impact on reducing stored volumes of Class B and C waste.

NRC developed the Table values in 10 CFR 61.55 to establish a waste classification system that would be generally applicable to potential disposal sites throughout the United States (U.S. Nuclear Regulatory Commission, 1981). These values were derived based on a particular set of encompassing assumptions used in the Draft Environmental Impact Statement that were based on deterministic inadvertent intrusion scenarios and did not accurately identify the radionuclides that would be most significant to radiation exposure at a particular site. EPRI research indicates that the radionuclides of significance are quite different in dry-climate sites than wet-climate sites. Transport mechanisms are also different and many other site-specific variables can affect both the identity and concentration of the significant radionuclide (EPRI, 2010)

It is clear that the intention of the original rule was to permit alternate waste acceptance criteria and concentration limits based on the performance of the site as evidenced by section 10 CFR 61.58 (U.S. Nuclear Regulatory Commission). NRC has the authority to adjust the concentration limits and categories defined by 10 CFR 61.55 as long as the definition of LLW – that is, the Class C limit that represents the state's limit of responsibility – is not affected (Low Level Radioactive Waste Policy Amendments Act, 1985).

Updating Tables 1 and 2 of 10 CFR 61.55 Using Dose Conversion Factors

Current EPRI research supports updating the current concentration limits in Tables 1 and 2 of 10 CFR 61.55 using more recent methodologies and Dose Conversion Factors.

Fundamental Dose Conversion Factors (DCF) used in the 10 CFR 61 Environmental Impact Statement are identified in NUREG/CR 1759. The basic source of DCFs for ingestion is drawn from ICRP-2 published in 1957. Inhalation DCFs are drawn from studies by the Task Group on Lung Dynamics and are published in *Health Physics*(1966) (U.S. Nuclear Regulatory Commission, 1981). These values do not reflect the latest scientific consensus on the biological effects of radiation provided by the International Commission on Radiological Protection (ICRP, 1996) NRC has updated protection requirements in regulations based on scientific developments; the changes made to 10 CFR Part 20 (*Standards for Protection Against Radiation*) to implement newer ICRP methodology is one example. A similar update to 10 CFR 61.55 could be implemented in a relatively straightforward manner by using existing methodologies such as the updated IMPACTS code described in NUREG-CR-4370 (U.S. Nuclear Regulatory Commission, 1986). Implementation in this manner would not change the radionuclides in the tables nor the basic waste classification system. As discussed above, the only limitation to such changes should be the Class C limit which defines LLW disposal responsibilities in the LLW Policy Amendments Act. (Low Level Radioactive Waste Policy Amendments Act, 1985)

EPRI research indicates that updating the ICRP reference used in the Part 61.55 tables would facilitate the disposal of most LLW from nuclear utilities and result in less stranded waste requiring interim storage because the allowable concentrations of the primary classification driving radionuclides would increase. Coincident with this change, the allowable concentrations

for many other radionuclides would decrease. However, because the majority of the radionuclides with decreasing allowable concentrations are not present in significant quantities in normal utility LLW and do not drive the waste classification, thus the decrease in the allowed concentration would not inhibit access to disposal (EPRI, 2010).

Treatment of Specific Radionuclides (10 CFR Part 20 Appendix G)

Four radionuclides were specifically identified in NUREG-0782 as critically important for the long term performance of LLW disposal sites: carbon-14 (^{14}C), technetium-99 (^{99}Tc), iodine-129 (^{129}I) and tritium (^{3}H). These four radionuclides are reported on LLW manifests per 10 CFR Part 20, Appendix G (U.S. Nuclear Regulatory Commission) unless they can be deemed not present through process knowledge. EPRI research has shown that two of these nuclides, ^{99}Tc and ^{129}I, are overestimated in nuclear utility LLW (EPRI, 2010). These two nuclides are difficult to detect because of their very long half-life, low specific activity and their low energy beta emission.

While ^{99}Tc and ^{129}I are known or suspected to be present in utility LLW at approximately one to three orders of magnitude below the detection limit (LLD), the practice of summing LLD values as real numbers can result in overestimation on LLW manifests. Normal radiochemistry analyses for ^{99}Tc and ^{129}I are limited by counting statistics such that it could require counting times of several days to accurately count LLD values closer to real activity present. The real activity values are estimated to be 10 to 1,000 times lower than the required LLD concentrations in LLW characterization guidance (1% of the table values) (EPRI, 1996). EPRI research shows that these radionuclides do not represent a strong source of disposal risk because they are not present in sufficient quantities to figure prominently in the risk assessment of a disposal site and are really only of importance in wet environment sites (EPRI, 2010). However, the overestimation of these nuclides in the site inventory can have a significant impact on the disposal site performance assessment and the ability to meet the performance objective of 25 mrem/yr (EPRI, 2010). NRC guidance directs the summing of the LLD values in the preparation of LLW manifests for shipment (U.S. Nuclear Regulatory Commission, 1998). This practice overestimates the quantity of these radioisotopes in LLW, thereby artificially limiting the total capacity of a LLW disposal facility

EPRI recognizes that there are alternate methodologies that can be used to estimate the quantities of some of these radionuclides, including the use of computer programs and more expensive analysis techniques (EPRI, 1996). The concern is that the guidance encourages a practice that is not substantiated by scientific methods and can result in skewed data that adversely affects LLW disposal site estimates of performance.

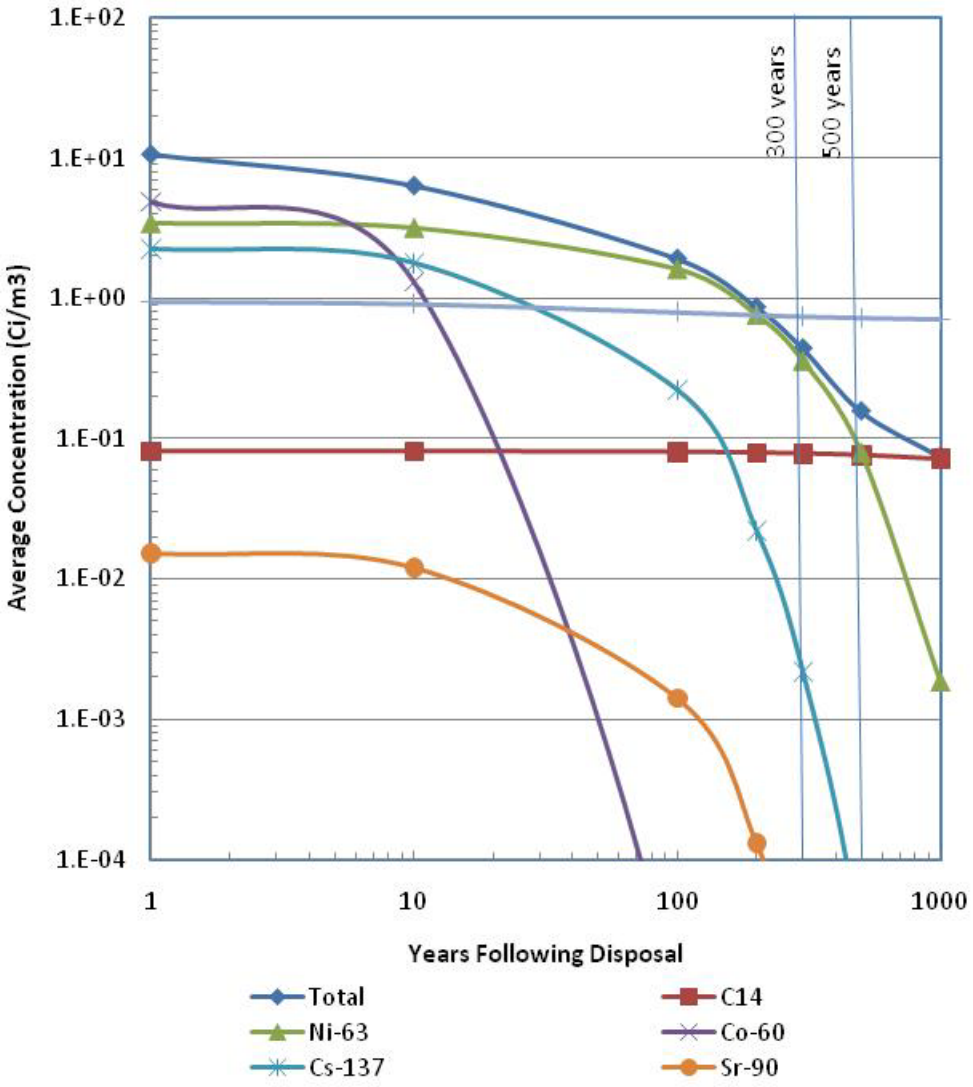
EPRI recommends that NRC amend its guidance (U.S. Nuclear Regulatory Commission, 1998) to eliminate generic requirements for the specific reporting (summing) of these radionuclides as required in 10 CFR 20, Appendix G unless otherwise known to be not present through process

knowledge. Revised guidance should allow treatment of these four nuclides in the same manner as other radionuclides identified in 10 CFR 61 (that is, demonstrably not less than 1% of the Class A limit). This change would be consistent with the change in NRC guidance for effluent reporting from Regulatory Guide 1.21 Revision 1 (1974), which required the listing of LLD values in effluent reporting, and with the change made in the Regulatory Guide 1.21 Revision 2 (2009) to not list nuclides that were looked for and not detected.

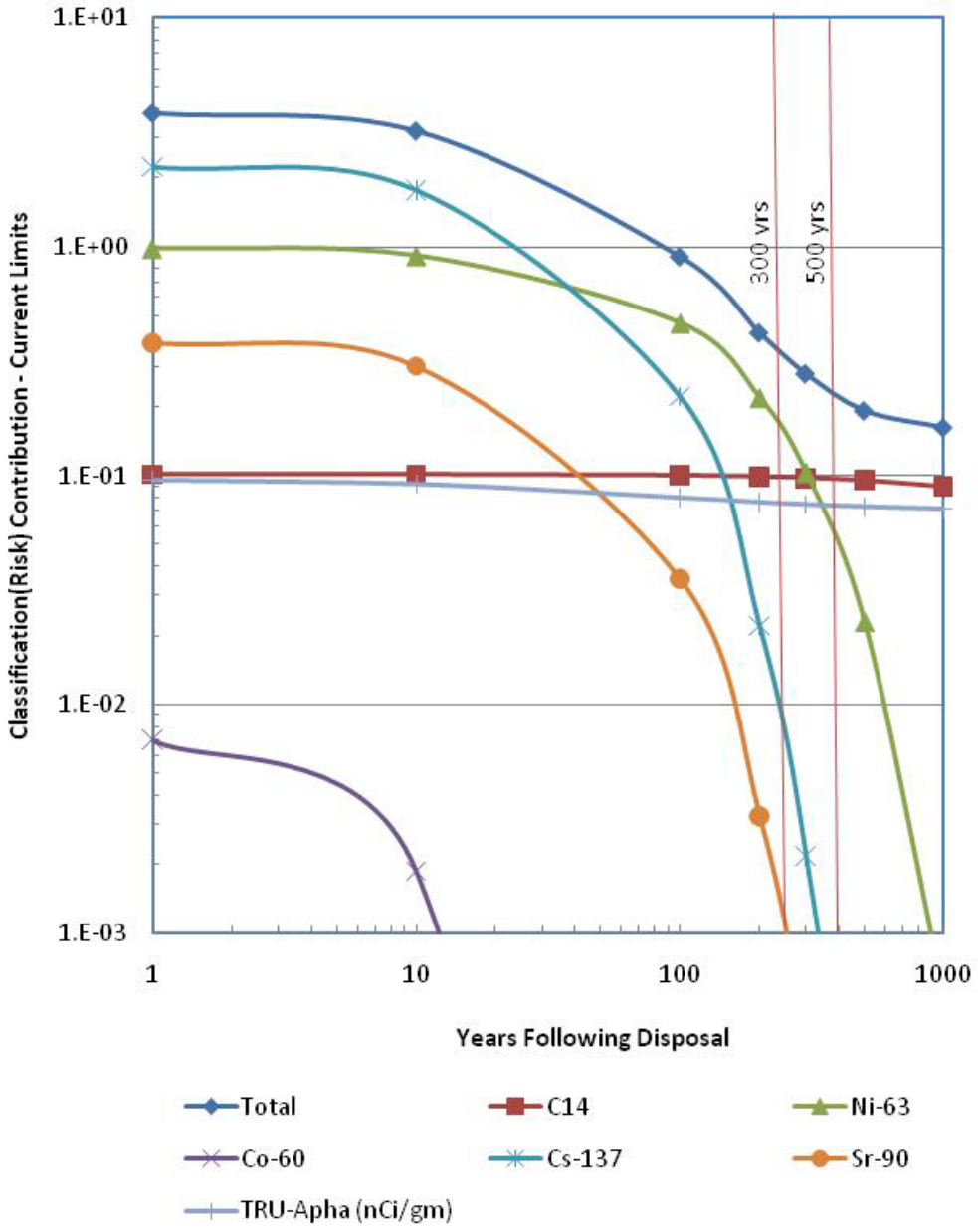
Period of Performance

The preliminary proposed rule language identifies a period of performance for all LLW disposal of 20,000 years (U.S. Nuclear Regulatory Commission, 2011). A more reasonable Period of Performance for LLW is 1,000 years which is a factor of 2 above the basis for 10 CFR 61 and within reasonable expectations of the precision of current performance modeling methods. Something longer than 1,000 years may be appropriate for depleted uranium (DU) as analyzed in a site-specific performance assessment.

EPRI research indicates that the majority of activity in LLW from nuclear utilities consists of radioisotopes that will decay to minimal levels within 500 years. This recognition was fundamental to the original framing of 10 CFR 61, which concentrated primarily on non-fuel waste generated from power plant operations (EPRI, 2010). A graph of average concentrations of primary radionuclides from nuclear utilities is shown below.



The concentration values identified above can be divided by the existing 10 CFR 61.55 concentration limits as a measure of risk. The results are shown below.



Note that in these waste streams, there are no other radionuclides that figure prominently in the classification calculation. For the first 300 years disposal risk is driven almost entirely by ^{137}Cs and ^{63}Ni. After 500 years, only ^{14}C and TRU continue to stand as dominant risk contributors, but at reduced levels from that observed during the first 300 years. Neither ^{14}C nor TRU in this mixture are ever more than about 10% of the Class A limits (EPRI, 2010).

This argument is applicable to the types and concentrations typical of 90% of the overall activity in commercially generated LLW. Shallow land disposal of DU presents a unique hazard that should be subject to a site-specific performance assessment and not lumped with the shallow land disposal of LLW in 10 CFR Part 61. Site-specific performance assessments for DU may require a period of performance longer than 1,000 years but DU disposal hazards should not generically create an unnecessary period of performance for LLW (that is, >1,000 years) in the absence of DU. The regulation should allow for site-specific WAC for LLW disposal sites and should require a site-specific WAC for DU disposal sites.

Duration of the Institutional Control Period

EPRI recommends that the duration assumed for an institutional control period for site-specific performance assessments not be limited to the 100 years assumed in the development of 10 CFR Part 61. Institutional control periods of up to 300 years can be justified based on regulatory requirements, land use data, historical records and financial assurances and should be allowed to be considered as part of new assessments.

The institutional control period used in NUREG-0782 was 100 years. This assumption establishes the point in time at which an inadvertent intruder may encounter Class A waste and thereby establishes the allowable activity concentrations in Class A waste (U.S. Nuclear Regulatory Commission, 1981). This time period was based on U.S. Environmental Protection Agency research. EPRI is conducting research and the data indicates that longer institutional control periods can be and have been justified for other types of hazardous waste disposal situations. Institutional control periods of 300 years are common in international regulations.

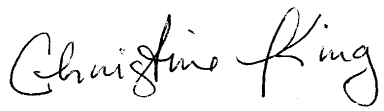
The implementation of a longer institutional control period would be an enhancement to public safety as EPRI research has shown that a significant amount of LLW radioactivity decays in 300 to 500 years (EPRI, 2010). Class A waste concentrations based on a delayed intrusion date would increase disposal flexibility without compromising the protection objectives for Class A wastes.

The results of EPRI research related to this topic have been published in several publicly available technical reports:

- *An Evaluation of Alternative Classification Methods for Routine Low Level Waste from the Nuclear Power Industry*. EPRI, Palo Alto, CA, 2007, 1016120
- *Proposed Modifications to the NRC Branch Technical Position on Concentration Averaging and Encapsulation (BTP): Technical Bases and Consequence Analysis*. EPRI, Palo Alto, CA, 2008, 1016761
- *Options for Improved Low Level Waste Disposal Using 10 CFR 61.58*. EPRI, Palo Alto, CA, 2010. 1021098.
- In 2012, another technical report will be published providing more detailed analysis of these recommendations.

Thank you for consideration of this letter in development of the rulemaking for 10CFR Part 61.

Best Regards,
Christine King



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Attachment 1: References

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Attachment 1 References

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EPRI. (2010, December). Options for Improved Low Level Waste Disposal Using 10 CFR 61.58, 1021098. Palo Alto, CA: Electric Power Research Institute.

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U.S. Nuclear Regulatory Commission. (1998, July). Instructions for Completing NRC's Uniform Low Level Radioactive Waste Manifest. *NUREG/BR-0204, Rev 2*.

U.S. Nuclear Regulatory Commission. (2011, May). Part 61: Site Specific Analyses for Demonstrating Compliance with Subpart C Performance Objectives: Preliminary Proposed Rule Language. *NRC-2011-0012-0001*.

U.S. Nuclear Regulatory Commission. (n.d.). Licensing Requirements for Land Disposal of Radioactive Waste. *Code of Federal Regulations; Title 10 Part 61*.

U.S. Nuclear Regulatory Commission. (n.d.). Standards for Protection Against Radiation. *Title 10 Code of Federal Regulations Part 20, Appendix G*.