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Executive Director

DIVISION OF WASTE MANAGEMENT
AND RADIATION CONTROL

Douglas J. Hansen
Director

January 25, 2023

Vern C. Rogers, Director of Regulatory Affairs
Energy*Solutions*, LLC
299 South Main Street, Suite 1700
Salt Lake City, UT 84111

RE: Federal Cell Facility Application Request for Information

Dear Mr. Rogers:

The Division of Waste Management and Radiation Control (Division) hereby provides Requests for Information (RFI) regarding the Federal Cell Facility Application dated August 4, 2022. Each individual paragraph in the attached document is numbered and represents an issue discovered in a review of the application. When responding to an RFI, please use the assigned number representing the question. The Division will track all responses and provide regular updated information to the public and reviewers.

The current review does not represent a comprehensive evaluation of the Application's merit and additional RFI's will follow where appropriate.

If you have any questions regarding this letter, please call Otis Willoughby at (801) 536-0220.

Sincerely,

Douglas J. Hansen, Director
Division of Waste Management and Radiation Control

DJH//JK/wa

Enclosure: Federal Cell Application Review, Requests for Information or Updates to the Application (RFI) (DRC-2023-000644)

c: Jeff Coombs, EHS, Health Officer, Tooele County Health Department
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Federal Cell Application Review

Request for Information or Updates to the Application (RFI)

General

- Each RFI has been assigned an identifier with a numbering convention as follows:
    - Application/Appendix Section
        - Section/Appendix Subsection
            - Section/Appendix Subsubsection (when applicable)
                - Sequential numbering

Example: A question in Section 1, subsection 1, subsubsection 1 -The first RFI # would be 1.1.1-1, the next question in that section/subsection would be numbered 1.1.1-2

Please refer to the assigned RFI number when submitting a response.

Appendix O:

SRS DU Radioactive Waste Inventory

- **O-19**

  Please clarify which units are to be used in the heading of NAC-0023_R5, Table 2; "(pCi/g of DU waste)" or "(pCi/g of DUO_3 waste)" as used by Beals, et al and GEL.

- **O-20**

  Please modify GoldSim v2.0 to use the appropriate units for the SRS DUO_3 concentration means and standard deviations.

- **O-21**

  Please justify why the data standard deviation is used for Tc-99 but the standard deviation of the mean is used for all other radionuclides.

- **O-22**

  Please clarify the use of 'mean' and 'standard deviation' when analyzing several radionuclides in Table 2 from Neptune 2021 versus use of the term, 'standard error' as applied in Table 5 and Table 6 from the same document.

- **O-23**

  Please provide justification for continuing to utilize Beals, et al 2000 Ra-226 data when newer, more refined data is available. Continued use of the 1,000 pCi/g detection limit from Beals et al will result in erroneously high calculated dose rates versus using a more appropriate detection limit of about 0.6 pCi/g from Nielson & Sandquist (2011).

  - Nielson & Sandquist (2011) report that a 2010 Energy*Solutions* sampling program that collected 22 samples and found 11 sample with Ra-226 activities above a much lower detection limit (GEL 2010d).

- **O-24**

  Please clarify the continued use of Sr-90, I-129, and Cs-137 in the DU PA, as their contribution to dose is very small over the performance period.

- **O-25**

  If Am-241 is to be included in the DU PA, then consider applying the following ratio to determine the amount present:

  - Using the Am-241 to Tc-99 ratio given in Hightower, et al (2000), as (i.e., 4.55 pCi/g Am-241 to 270.3 pCi/g Tc-99).

GDP Clean DU Radioactive Waste Inventory

- **O-26**

  Please correct errors found in Section 2.1 of NAC-0023 R5.

  1. In section 2.1 of NAC-0023 R5 regarding depleted uranium, the second paragraph above Table 3 and Table 3 itself are incorrect in their description of the isotopes that occur in uncontaminated (clean) depleted uranium.
  2. U-232, U-233, and U-236 are formed via the following reactions:

$^{235}U\ (n,\gamma) \rightarrow {}^{236}U\ (n,\gamma) \rightarrow {}^{237}U(\beta-) \rightarrow {}^{237}Np\ (n,2n) \rightarrow {}^{236}Np(\beta-) \rightarrow {}^{236}Pu\ (\alpha) \rightarrow \mathbf{^{232}U}$
$^{232}Th\ (n,\gamma) \rightarrow {}^{233}Th\ (\beta-) \rightarrow {}^{233}Pa\ (\beta-) \rightarrow \mathbf{^{233}U}$
$^{235}U\ (n,\gamma) \rightarrow \mathbf{^{236}U}$

After making the corrections requested for O-26 above in section 2.1, the following items need to be changed FCF License Application:

- **O-27**

Section 6.1.1.1 and Table 6-1.

- **O-28**

The GoldSim v2.0 model needs to be corrected and re-run.

- **O-29**

Consider using the following table to utilize for the GDP Clean DU Uranium Distributions:

Table 1: Recommended GDP Clean DU Uranium Distributions

Uranium Isotope	Weight Percentage				
	Low-Low	DOE-Middle	High-High		
U-235	0.16	0.25	0.33		
U-234	0.00024	0.0005	0.00129	NAC-0023_R5, Mean	
U-238	99.8398	99.7495	99.6687	Table 2	Corrected
	Concentration (pCi/g)				
U-235	3.46E+03	5.41E+03	7.14E+03	2.97E+03	3.57E+03
U-234	1.50E+04	3.14E+04	8.10E+04	3.31E+04	3.98E+04
U-238	3.373E+05	3.370E+05	3.367E+05	2.72E+05	3.27E+05

i. For ease of comparison, Table 1 also provides the mean uranium concentrations from NAC-0023_R5 both as they appear in Table 2 and corrected from "(pCi/g of DUO_3 waste)" to "(pCi/g of DU waste)", as discussed above.
ii. The Table 1 concentrations could be used to form a distribution, e.g., uniform, triangular. However, if this is done, then specifying the U-235 Weight Percent determines not only the U-235 concentration but also the concentrations of U-234 and U-238.

GDP Recycle DU Radioactive Waste Inventory

- **O-30**

Please clarify the continued inclusion of U-236 in the DU PA.