

NRC Request Q-2-A

From the Audit Spreadsheet after Clarification Meetings: FCS should provide a written response on why Np-237 is the basis for implementing the alternative approach using relative peak dose (LTP Section 6.13). Additionally, justify why the current year mixture fractions can apply to the radionuclides mixtures at year 341 given that decay and ingrowth occur over time (i.e., justify why it is acceptable to apply mixture fractions established at year zero for all years beyond year zero).

FCS Response

The Industrial Use (IU) scenario was added to Chapter 6 Revision 2 to address the excavation of concrete > 3 m bgs when the Resident Farmer excavation scenario was limited to walls ≤ 3 m bgs. The IU excavation dose for four radionuclides (Np-237, Pu-241, Sr-90, Tc-99) is at a maximum at a year other than year zero (DCGL minimized). The previous versions of Chapter 6 conservatively applied the DCGLs from the year of maximum dose regardless of the year at which it occurs in order to eliminate the potential question of uncertainty in the radionuclide mixture. But this approach is implausible and ignores the fact that dose can only occur in a given year. This implausible, bounding approach resulted in acceptable DCGLs in past LTP versions but is problematic for the IU excavation scenario in Revision 2 because it caused Np-237 to be an ROC notwithstanding the fact that Np-237 has never been positively detected and is not expected to actually be present. Therefore, the method for calculating DCGLs was changed, for the IU industrial excavation scenario only, to select DCGLs, for all radionuclides, from the year that results in the maximum relative dose. The year of the maximum relative dose was found to be year zero using Equation 6-15 in Chapter 6 Revision 2.

The primary uncertainty in the application of Equation 6-15 is in the radionuclide mixture. The mixture uncertainty was addressed by selecting the mixture using the ‘75th percentile of the Cs-137 fractions’. The 75th percentile provides reasonable overall conservatism and is consistent with the use of the 75th percentile to address uncertainty in the parameter selection process for dose modeling and DCGL calculations. Another consideration is the application of a radionuclide mixture that is based on radionuclide decay to the year of license termination (year 0) to future years. The effect of decay and ingrowth on the dose in future years is fully accounted for in the RESRAD model and is therefore not a consideration in the calculation of relative dose for all years using Equation 6-15.