Decay Study Methodology

This decay study was conducted to assess and project the effect of radioactive decay on the total radioactivity (total Curie) inventory. For historic shipments, actual received values for total and individual radionuclides are used. For future projections, estimates are based on projected volumes and data from nuclear industry history. Standard Health Physics methods of calculating decay of individual radioisotopes are used, referencing the half-life of the contributing radionuclide.

Nearly all the commercial facility class B and C waste that has been buried has been disposed of at the Barnwell disposal site. Records were obtained from the US Department of Energy for every shipment made to Barnwell from 1999 to 2008. These records include the generating facility, the quantity of every radionuclide present in each shipment, the general form of the waste, waste class, and volume.

This data was segregated into two major waste streams, irradiated hardware (internal to Reactor Vessel components) and resins (plus other non-hardware). This simplification is necessary and is considered appropriate due to the significant differences between hardware radioactivity levels and the other waste forms. It is also appropriate since the make-up of the two are significantly dissimilar to one another in the nature of the contributing radionuclides. The percentages of major isotopes such as Cobalt, Cesium, Iron, Nickel, Strontium, etc. are reasonably predictable between different generators when hardware and resins are looked at separately. From these records, averages are used to determine a standard total specific activity for the two general waste forms. General abundances of contributing radioisotopes were also calculated to be able to project the amount of all individual radioisotopes.

The decay study projects radioactivity based simply on the empirical information and projected volumes of each type of waste received. Estimated volumes are multiplied by the calculated total specific activity and individual radioisotope levels are based on the "abundances" or percentage of total. These values are decayed according to individual half lives and summed on an annual basis and added to the projected receipts for the reporting year.