Plutonium in the Bruce "A" nuclear steam generators

Here is a partial list of radioactive contaminants inside a single used steam generator from each one of the two reactors (Units 1 and 2 of Bruce A), according to CNSC (document CMD-10-H19B). The mass (in grams) of each of the radioactive materials listed is estimated by CNSC staff.

RADIONUCLIDE		***MASS***	
Name of Isotope (with Atomic Mass)	Half-Life (years)	Unit 1 (grams radioactive material)	Unit 2 (grams radioactive material)
Americium-241	430 y	0.103412	0.102412
Americium-243	7 400 y	0.002162	0.002432
Carbon-14	5 700 y	0.009065	0.072501
Curium-244	18 y	0.002644	0/000347
Cobalt-60	5.3 y	0.001781	0/000881
Cesium-137	30 y	0/000249	0.000238
Europium-154	8.8 y	0.000027	0.000290
Iron-55	2.7 y	0.000272	0.000290
Hydrogen-3 (Tritium)	13.0 y	0.000057	0.000051
Hafnium-181	2.7 y	0.000001	0.000001
Iodine-129	17 000 000 y	0.000060	0.000060
Niobium-94	20 000 y	0.002159	0.002158
Nickel-59	75 000 y	0.173601	0.036723
Nickel-63	96 y	0.030194	0.006526
Neptunium-237	2 100 000 y	0.028703	0.033295
Plutonium-238	*88 y*	*0.007507*	*0.004703*
Plutonium-239	*24 000 y*	*2.124977*	*2.471769*
Plutonium-240	*6 500 y*	*0.827304*	*0.957105*
Plutonium-241	*14 y*	*0.021309*	*0.030809*
Plutonium-242	*380 000 y*	*0.048762*	*0.056317*
Antimony-125	2.8 y	0.000001	0.000001
Strontium-90	29 y	0.009097	0.007581
Technetium-99	210 000 y	0.000143	0.000092
TOTALS			
Long-lived (> one year half-life)		**3.416108**	**3.787315**
Mass of plutonium isotopes only		**3.029859**	**3.520703**
Percent plutonium		**88.7%**	**93.0%**
TOTAL MASS			

(Source: CNSC)

There are 5 plutonium isotopes present in the steam generators.
In addition there are 18 other long-lived isotopes listed.

In the 16 Bruce A steam generators (8 from Unit 1 and 8 from Unit 2), the total mass of radioactive material is estimated to be about 57.6 grams, of which 52.4 grams is plutonium. So plutonium makes up 91.0 percent of the mass of radioactive material in the steam generators.

Plutonium is extremely dangerous even in minute quantities. The maximum permissible "body burden" of plutonium-239 for an atomic worker (for instance, someone working in the nuclear weapons industry) is 0.7 micrograms. Inside the steam generators there are 36.8 grams of this one particular isotope – enough, in principle, to give over 52 million atomic workers their maximum permissible body burden of plutonium-239. If we include all five isotopes of plutonium, the number of atomic workers who could be overdosed, in principle, is just about doubled.

Plutonium isotopes also have very long half-lives, ranging from decades to hundreds of thousands of years. This means that any accident which resulted in a spill could pose long-lasting dangers.

- Gordon Edwards, Ph.D., November 8, 2010