

WASTE STREAM

2F06/C

Encapsulated Barium Carbonate Slurry/MEB Crud

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	TR		
Iron.....			
Aluminium.....			
Beryllium.....	TR		
Cobalt.....	0		
Copper.....			
Lead.....			
Magnox/Magnesium.....	0		
Nickel.....			
Titanium.....	TR		
Uranium.....	<0.01		
Zinc.....	0		
Zircaloy/Zirconium.....	TR		
Other metals.....	0		

Organics (%wt): There are no organic materials in the waste.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0		
Paper, cotton.....	0		
Wood.....	0		
Halogenated plastics	0		
Total non-halogenated plastics.....	0		
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	0		
Total rubber.....	0		
Halogenated rubber	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	0		

Other materials (%wt): -

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	(%wt)	Type(s) and comment		% of total C14 activity
Inorganic ion exchange materials..	0			
Inorganic sludges and flocs.....	30.0			100.0
Soil.....	0			
Brick/Stone/Rubble.....	0			
Cementitious material.....	70.0			
Sand.....	0	No added sand in encapsulation grout.		
Glass/Ceramics.....				
Graphite.....	0			
Desiccants/Catalysts.....				
Asbestos.....	0			
Non/low friable.....				
Moderately friable.....				
Highly friable.....				
Free aqueous liquids.....	0			
Free non-aqueous liquids.....	0			
Powder/Ash.....	0			

Inorganic anions (%wt): Carbonates, nitrates, nitrites, chlorides, iodides and iodates are present in the waste.

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	P	
Iodide.....	P	
Cyanide.....	0	
Carbonate.....	~2.3	
Nitrate.....	~1.5	
Nitrite.....	TR	
Phosphate.....	0	
Sulphate.....	0	
Sulphide.....	0	

Materials of interest for waste acceptance criteria: No hazardous materials are present.

	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....	0	
Putrescible wastes.....	0	
Non-putrescible wastes.....		

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Corrosive materials.....	P	Encapsulation grout is alkaline.
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....	0	
Soluble solids as bulk chemical compounds.....	P	Some calcium and sodium compounds.

Hazardous substances / non hazardous pollutants: Toxic metals are unlikely to be present in significant quantities. Barium compounds: BaCO3, Ba(NO3)2, Ba(OH)2, BaI2, Ba(IO3)2. <8% by weight.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....	0	
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....	0	
Styrene.....		
Tri-butyl phosphate.....	0	
Other organophosphates.....		
Vinyl chloride.....	0	
Arsenic.....	0	
Barium.....	<8.0	
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....	0	
Caesium.....		
Selenium.....	0	
Chromium.....	P	Small amounts present in encapsulation grout OPC.
Molybdenum.....	0	
Thallium.....		
Tin.....	P	Trace present in encapsulation grout OPC.
Vanadium.....	0	
Mercury compounds.....		
Others.....	0	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

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Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....	0	No organic complexing agents are present in the waste.
Total complexing agents.....	0	

Potential for the waste to contain discrete items: No.

PACKAGING AND CONDITIONING

Container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l drum	100.0	0.472	0.472	1350

Container type comment: Conditioning factor is 1, packaging factor is 1.21.

Range in container waste volume: -

Other information on containers: Stainless steel drum with indrum mixing paddle. Drum is fitted with a lid that contains a filter.

Conditioned density (t/m³): 1.95

Conditioned density comment: -

Other information on conditioning: Waste is already conditioned.

RADIOACTIVITY

Source: The waste will be residue from C-14 scrubbers. Consequently, C-14 will be dominant, although there will be fission products present associated with some fuel carry-over. For MEB crud, the main source will be Co-60 activation product in steel corrosion product.

Uncertainty: -

Definition of total alpha and total beta/gamma: Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities: The activities are a combination of measurements and calculated activities, based on characteristics of fuel reprocessed to date for stocks and that still to be reprocessed for arisings.

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	5.72E-05	BB 1	1.56E-04	BB 1	Gd 153	4.52E-13	BB 2	1.82E-10	BB 2
Be 10	2.71E-11	BB 2	2.79E-11	BB 2	Ho 163	6.72E-15	BB 2	6.91E-15	BB 2
C 14	6.49E-02	BB 1	3.78E-02	BB 1	Ho 166m	3.97E-10	BB 2	4.88E-10	BB 2
Na 22					Tm 170	2.28E-20	BB 2	1.17E-16	BB 2
Al 26					Tm 171	7.70E-11	BB 2	2.35E-09	BB 2
Cl 36	6.10E-10	BB 2	4.57E-10	BB 2	Lu 174		8		8
Ar 39	9.42E-12	BB 2	7.42E-12	BB 2	Lu 176		5		5
Ar 42		8		8	Hf 178n		8		8
K 40	1.66E-14	BB 2	1.27E-14	BB 2	Hf 182		5		5
Ca 41	2.51E-10	BB 2	1.89E-10	BB 2	Pt 193		8		8
Mn 53	9.24E-18	BB 2	7.00E-18	BB 2	Tl 204		8		8
Mn 54	4.43E-13	BB 2	8.16E-11	BB 2	Pb 205		5		5
Fe 55	1.40E-04	BB 1	7.49E-04	BB 1	Pb 210	2.26E-08	BB 2	1.55E-14	BB 2
Co 60	9.58E-04	BB 1	2.59E-03	BB 1	Bi 208		8		8
Ni 59	2.52E-10	BB 2	1.39E-10	BB 2	Bi 210m		5		5
Ni 63	1.40E-03	BB 1	1.41E-04	BB 1	Po 210	2.13E-08	BB 2	1.48E-14	BB 2
Zn 65	3.03E-15	BB 2	1.16E-12	BB 2	Ra 223	2.28E-12	BB 2	1.21E-12	BB 2
Se 79	7.52E-09	BB 2	7.72E-09	BB 2	Ra 225	2.27E-14	BB 2	2.15E-14	BB 2
Kr 81	1.63E-14	BB 2	1.76E-14	BB 2	Ra 226	1.03E-07	BB 2	9.83E-14	BB 2
Kr 85	3.02E-04	BB 2	8.03E-04	BB 2	Ra 228	4.13E-10	BB 2	1.60E-17	BB 2
Rb 87	2.79E-12	BB 2	2.87E-12	BB 2	Ac 227	2.29E-12	BB 2	1.21E-12	BB 2
Sr 90	1.02E-03	BB 1	1.04E-03	BB 1	Th 227	2.25E-12	BB 2	1.19E-12	BB 2
Zr 93	2.38E-07	BB 2	2.45E-07	BB 2	Th 228	7.89E-08	BB 1	2.27E-09	BB 2
Nb 91		5		5	Th 229	2.27E-14	BB 2	2.15E-14	BB 2
Nb 92	1.00E-18	BB 2	1.00E-18	BB 2	Th 230	1.53E-05	BB 1	1.10E-05	BB 1
Nb 93m	1.64E-07	BB 2	1.02E-07	BB 2	Th 232	4.66E-10	BB 1	3.10E-17	BB 2
Nb 94	1.84E-11	BB 2	1.76E-11	BB 2	Th 234	6.15E-08	BB 2	5.54E-08	BB 2
Mo 93	2.49E-10	BB 2	1.61E-10	BB 2	Pa 231	4.85E-12	BB 2	4.32E-12	BB 2
Tc 97	2.25E-17	BB 2	2.30E-17	BB 2	Pa 233	2.81E-08	BB 2	2.84E-08	BB 2
Tc 99	2.37E-05	BB 1	1.99E-06	BB 2	U 232	1.92E-09	BB 2	2.39E-09	BB 2
Ru 106	1.21E-06	BB 2	1.45E-04	BB 2	U 233	5.26E-12	BB 2	3.36E-12	BB 2
Pd 107	1.20E-08	BB 2	1.23E-08	BB 2	U 234	2.09E-07	BB 2	2.06E-07	BB 2
Ag 108m	1.68E-12	BB 2	1.77E-12	BB 2	U 235	3.37E-09	BB 2	3.03E-09	BB 2
Ag 110m	7.38E-11	BB 2	2.63E-08	BB 2	U 236	4.39E-08	BB 2	4.71E-08	BB 2
Cd 109	5.24E-15	BB 2	3.67E-13	BB 2	U 238	6.15E-08	BB 2	5.54E-08	BB 2
Cd 113m	9.48E-07	BB 2	2.09E-06	BB 2	Np 237	2.81E-08	BB 2	2.84E-08	BB 2
Sn 119m	4.04E-12	BB 2	8.91E-10	BB 2	Pu 236	1.86E-10	BB 2	2.75E-09	BB 2
Sn 121m	2.29E-06	BB 2	2.88E-06	BB 2	Pu 238	1.76E-04	BB 2	2.34E-04	BB 2
Sn 123	1.61E-15	BB 2	8.06E-12	BB 2	Pu 239	4.33E-05	BB 2	3.70E-05	BB 2
Sn 126	4.00E-08	BB 2	4.12E-08	BB 2	Pu 240	7.62E-05	BB 2	7.68E-05	BB 2
Sb 125	7.50E-06	BB 2	1.22E-04	BB 2	Pu 241	3.73E-03	BB 2	7.46E-03	BB 2
Sb 126	5.60E-09	BB 2	1.33E-08	BB 2	Pu 242	1.74E-07	BB 2	1.91E-07	BB 2
Te 125m	1.88E-06	BB 2	2.85E-05	BB 2	Am 241	2.41E-04	BB 1	1.88E-04	BB 2
Te 127m		8	2.59E-12	BB 2	Am 242m	5.31E-07	BB 2	6.37E-07	BB 2
I 129	4.56E-04	BB 1	3.50E-04	BB 1	Am 243	1.12E-06	BB 2	1.32E-06	BB 2
Cs 134	1.76E-05	BB 1	4.72E-04	BB 2	Cm 242	4.38E-07	BB 2	5.32E-07	BB 2
Cs 135	6.15E-08	BB 2	6.80E-08	BB 2	Cm 243	6.04E-07	BB 2	1.03E-06	BB 2
Cs 137	7.05E-04	BB 1	6.87E-04	BB 1	Cm 244	3.93E-05	BB 2	8.50E-05	BB 2
Ba 133	1.71E-13	BB 2	4.60E-13	BB 2	Cm 245	9.00E-09	BB 2	1.19E-08	BB 2
La 137	3.71E-13	BB 2	3.79E-13	BB 2	Cm 246	1.39E-09	BB 2	1.99E-09	BB 2
La 138	3.15E-17	BB 2	3.20E-17	BB 2	Cm 248	7.65E-15	BB 2	1.24E-14	BB 2
Ce 144	1.54E-07	BB 2	3.67E-05	BB 2	Cf 249	6.81E-14	BB 2	1.18E-13	BB 2
Pm 145	3.61E-14	BB 2	7.27E-14	BB 2	Cf 250	1.26E-13	BB 2	4.00E-13	BB 2
Pm 147	1.08E-04	BB 2	1.90E-03	BB 2	Cf 251	2.48E-15	BB 2	4.42E-15	BB 2
Sm 147	9.75E-13	BB 2	9.42E-13	BB 2	Cf 252	1.48E-15	BB 2	2.63E-14	BB 2
Sm 151	3.27E-05	BB 2	3.58E-05	BB 2	Other a	1.87E-07	BB 2	1.97E-07	BB 2
Eu 152	1.88E-07	BB 2	4.37E-07	BB 2	Other b/g	5.23E-05	BB 2	4.19E-05	BB 2
Eu 154	1.62E-04	BB 1	6.36E-04	BB 1	Total a	5.94E-04	BB 2	6.35E-04	BB 2
Eu 155	1.07E-05	BB 2	6.90E-05	BB 2	Total b/g	7.41E-02	BB 2	5.53E-02	BB 2

Bands (Upper and Lower)

- A a factor of 1.5
- B a factor of 3
- C a factor of 10
- D a factor of 100
- E a factor of 1000

Note: Bands quantify uncertainty in mean radioactivity.

Code

- 1 Measured activity
- 2 Derived activity (best estimate)
- 3 Derived activity (upper limit)
- 4 Not present
- 5 Present but not significant
- 6 Likely to be present but not assessed
- 7 Present in significant quantities but not determined
- 8 Not expected to be present in significant quantity