

WASTE STREAM**9E39****Miscellaneous Activated Components**

SITE Oldbury
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW; SPD3

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	1.0 m ³
Total future arisings:		0 m ³
Total waste volume:		1.0 m ³
Comment on volumes:	Waste stocks and arisings are likely to be cables and items from contaminated and irradiated Maintenance equipment.	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x
	Stock (lower): x 0.8	Arisings (lower) x

WASTE SOURCE Cables and items from contaminated and irradiated Maintenance equipment.

PHYSICAL CHARACTERISTICS

General description: Cables and irradiated maintenance components. No large items are anticipated.
 Physical components (%vol): Miscellaneous components (100%).
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): ~1
 Comment on density: The assumption of 1 t/m³ as the average bulk density may be subject to revision.

CHEMICAL COMPOSITION

General description and components (%wt): Irradiated components removed from the reactor. The material will be principally steel.

Chemical state: Neutral

Chemical form of radionuclides:
 H-3: Tritium will be present in the form of tritium contaminated steel.
 C-14: Carbon-14 will be present as graphite dust contamination.
 Cl-36: Chlorine-36 will be present in graphite dust contamination.
 Se-79: The selenium content is insignificant.
 Tc-99: The technetium content is insignificant.
 Ra: The radium isotope content is insignificant.
 Th: Thorium isotope content is insignificant.
 U: Uranium isotopes will be present in trace quantities as natural uranium metal contamination.
 Np: The neptunium content is insignificant.
 Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): Not fully assessed.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	>75.0		
Iron.....			
Aluminium.....	0		
Beryllium.....	TR		
Cobalt.....			
Copper.....	0		
Lead.....	0		

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Magnox/Magnesium.....	NE	
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	0	
Zircaloy/Zirconium.....	NE	
Other metals.....	NE	Not fully assessed.

Organics (%wt): Only trace quantities may be present.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	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.....	TR		

Other materials (%wt): Traces of graphite may be present.

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	TR		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			

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Moderately friable.....

Highly friable.....

Free aqueous liquids..... 0

Free non-aqueous liquids..... TR

Powder/Ash..... 0

Inorganic anions (%wt): None expected but possibly present in trace quantities.

(%wt) Type(s) and comment

Fluoride..... 0

Chloride..... 0

Iodide..... 0

Cyanide..... 0

Carbonate..... 0

Nitrate..... 0

Nitrite..... 0

Phosphate..... 0

Sulphate..... 0

Sulphide..... 0

Materials of interest for
waste acceptance criteria: -

(%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.....

Putrescible wastes..... 0

Non-putrescible wastes.....

Corrosive materials..... 0

Pyrophoric materials..... 0

Generating toxic gases..... 0

Reacting with water..... 0

Higher activity particles.....

Soluble solids as bulk chemical
compounds.....Hazardous substances /
non hazardous pollutants: -

(%wt) Type(s) and comment

Acrylamide.....

Benzene.....

Chlorinated solvents.....

- Formaldehyde.....
- Organometallics.....
- Phenol.....
- Styrene.....
- Tri-butyl phosphate.....
- Other organophosphates.....
- Vinyl chloride.....
- Arsenic.....
- Barium.....
- Boron.....
 - Boron (in Boral).....
 - Boron (non-Boral).....
- Cadmium.....
- Caesium.....
- Selenium.....
- Chromium.....
- Molybdenum.....
- Thallium.....
- Tin.....
- Vanadium.....
- Mercury compounds.....
- Others.....
- Electronic Electrical Equipment (EEE)
 - EEE Type 1.....
 - EEE Type 2.....
 - EEE Type 3.....
 - EEE Type 4.....
 - EEE Type 5.....

Complexing agents (%wt): No

(%wt) Type(s) and comment

- EDTA.....
- DPTA.....
- NTA.....
- Polycarboxylic acids.....
- Other organic complexants.....
- Total complexing agents..... 0

Potential for the waste to contain discrete items: Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs. NB If recycled then DI Limits n/a

PACKAGING AND CONDITIONING

Conditioning method: The waste is not expected to be supercompacted. The treatment envisaged is the placement of the waste in baskets followed by encapsulation.

Plant Name: None

Location: Oldbury Power Station

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Plant startup date: 2096

Total capacity
(m³/y incoming waste): ~5000.0Target start date for
packaging this stream: 2096Throughput for this stream
(m³/y incoming waste): ~1.0

Other information: The current proposal is that this waste will remain as it is until Final Site Clearance.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	4m box (no shielding)	100.0	16.2	18.9	< 1

Likely container type comment: The container choice may be influenced by the Transport Regulations at the time of Final Site Clearance. The waste is assumed to be in baskets in the waste package so the occupied volume in the package is greater than the original waste volume.

Range in container waste volume: Not yet determined. No significant variability is expected.

Other information on containers: The container material is expected to be stainless steel.

Likely conditioning matrix: Blast Furnace Slag / Ordinary Portland Cement

Other information: The waste is assumed to be encapsulated.

Conditioned density (t/m³): ~3.0

Conditioned density comment: The conditioned waste density assumes that the waste will be encapsulated.

Other information on conditioning: The waste will be in baskets placed in the waste packages. Baskets of different Final Site Clearance ILW wastes may be in the same waste packages. The encapsulation matrix would be likely to be BFS/OPC. The density of the encapsulated waste would probably be about 3 t/m³.

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

RADIOACTIVITY

Source: Irradiated components removed from the reactors, the majority of their activity being due to activation products.

Uncertainty: Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be expected.

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: Estimates are based upon theoretical assessments.

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	<1.64E+00	D 3			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.00E-02	CD 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	3E-05	CC 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54	1.04E-03	CD 2			Pb 205		8		
Fe 55	1.18E+01	CD 2			Pb 210		8		
Co 60	2.25E+00	CD 2			Bi 208		8		
Ni 59	4E-02	CD 2			Bi 210m		8		
Ni 63	3.68E+00	CD 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	<4.55E-05	D 3			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94	4E-05	CD 2			Th 234	<7E-09	D 3		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	<1E-08	D 3			U 232		8		
Ru 106	<1.39E-08	D 3			U 233		8		
Pd 107		8			U 234	<7.07E-09	D 3		
Ag 108m	3.92E-05	CD 2			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	<7E-09	D 3		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	<2.73E-06	D 3		
Sn 123		8			Pu 239	<3E-06	D 3		
Sn 126		8			Pu 240	<4.00E-06	D 3		
Sb 125		8			Pu 241	<1.15E-04	D 3		
Sb 126		8			Pu 242	<2E-09	D 3		
Te 125m		8			Am 241	<1.24E-05	D 3		
Te 127m		8			Am 242m	<1.88E-08	D 3		
I 129		8			Am 243	<6.00E-09	D 3		
Cs 134	<1.51E-07	D 3			Cm 242	<1.55E-08	D 3		
Cs 135		8			Cm 243	<4.6E-09	D 3		
Cs 137	<1.52E-04	D 3			Cm 244	<1.27E-07	D 3		
Ba 133		8			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144	<4.40E-09	D 3			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	<5.61E-07	D 3			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	<8.23E-07	D 3			Other a				
Eu 152	1.12E-05	CD 2			Other b/g				
Eu 154	8.4E-06	CD 2			Total a	2.23E-05	CD 2	0	
Eu 155		8			Total b/g	1.94E+01	CD 2	0	

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