

WASTE STREAM	3L21	Miscellaneous Activated Components - Spalled Oxide and Dust
--------------	------	---

SITE Heysham 1

SITE OWNER EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE CUSTODIAN EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0.2		
Future arisings:	1.4.2025 - 31.3.2027	< 0.1		
	1.4.2027 - 31.3.2030	= 1.2		
Total future arisings:		1.2		
Total waste volume:		1.4		

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: Current stock volume maintained at 0.2 m3 following station assessment. Waste volumes arisings variable depending on station operating conditions. Annual Future arising is estimated at 0.02 m3/yr during remainder of operational life until 2027 and at 0.4 m3/yr during defueling between 2027 and 2030. Total future arising increased compared to 2022 due to lifetime extension to 2027 and end of defueling in 2030

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper): x 1.50
Stock (lower): x 0.75 Arisings (lower): x 0.50

WASTE SOURCE Irradiated dusts and spalled oxide.

PHYSICAL CHARACTERISTICS

General description: Active dust held in dust tanks. No large items expected.

Changes since waste generated: -

Bulk density (t/m³): ~ 2.5

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Irradiated dust in dust tanks could include spalled fuel can oxide and graphite dust, and abraded drier desiccant. Principally iron oxide with some graphite. Other materials not assessed.

Chemical state: Neutral

Sheet metal proportion / thickness: Not expected to be present.

Metals and alloys (%wt):

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

Organics (%wt):

	(%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.....	= 0	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	NE	-	

Other materials (%wt):

	(%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.....	= 0	-	
Glass/Ceramics.....	-	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....	NE	-	
Asbestos.....	= 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	TR	-
Chloride.....	TR	-
Iodide.....	TR	-
Cyanide.....	NE	-
Carbonate.....	TR	-
Nitrate.....	TR	-
Nitrite.....	NE	-
Phosphate.....	TR	-
Sulphate.....	TR	-
Sulphide.....	TR	-

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.....	= 0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	= 0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	P	May be present
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	NE	-
Benzene.....	NE	-
Chlorinated solvents.....	NE	-
Formaldehyde.....	NE	-
Organometallics.....	NE	-
Phenol.....	NE	-
Styrene.....	NE	-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....	NE	-
Vinyl chloride.....	NE	-
Arsenic.....	NE	-
Barium.....	NE	-
Boron.....	NE	-
Boron (in Boral).....	NE	-
Boron (non-Boral).....	NE	-
Cadmium.....	NE	-
Caesium.....	NE	-
Selenium.....	NE	-
Chromium.....	NE	-
Molybdenum.....	NE	-
Thallium.....	NE	-
Tin.....	NE	-
Vanadium.....	NE	-
Mercury compounds.....	NE	-
Others.....	NE	-

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	May be present in trace quantities.
Total complexing agents.....	TR	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)		
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None	On-site	= 100.0

Comments on planned treatments:

-

Conditioning method: "The waste will be conditioned to satisfy the disposal requirements which are effective at the time of retrieval/conditioning. It is currently assumed that the waste will be placed in 'baskets' in the waste packages and will be encapsulated."

Conditioning plants:

Plant Name	Location
Heysham 1 Waste Management Centre	Heysham 1

Likely conditioning matrix:

-

Further information on the conditioning matrix: Conditioning matrix will be BFS/OPC. Mix ratios are yet to be established

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	4 m box (100 mm concrete shielding)	100.0	12.2	14.3	1	-

Range in container waste loading:

Other information on packaging and conditioning: Waste will be retained on site pending Final Site Clearance, to let nuclides such as Co-60 undergo considerable radioactive decay. Baskets of different Final Site Clearance ILW wastes may be in the same waste package.

Conditioned density (t/m³): ~ 3.0
 Conditioned density comment: The density of the encapsulated waste is expected to be approximately 3 t/m³.

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	= 100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Irradiated dust and spalled oxide collected in appropriate tanks. Activated material removed from the reactor core is likely to be of high specific activity.

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

Measurement of radioactivities: Estimates are based upon theoretical assessments. Other beta/gamma nuclides of arisings and stocks (in TBq/m³) include Cr51 (7E+2, 1E-11); Co58 (2E+2, 1E-4); Nb95 (6E-1, 4E-12) and Ru103 (4E-4, 3E-14). Other beta/gamma nuclides also include Fe59.

Chemical form of radionuclides: H-3: Not expected to be significant
 C-14: Graphite
 Cl-36: Not expected to be significant
 Se-79: Not expected to be significant
 Tc-99: Not expected to be significant
 I-129: Not expected to be significant
 Ra: Not expected to be significant
 Th: Not expected to be significant
 U: Not expected to be significant
 Np: Not expected to be significant
 Pu: Not expected to be significant

WASTE STREAM		3L21		Miscellaneous Activated Components - Spalled Oxide and Dust						
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³				
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	
H 3			6		6	Gd 153				
Be 10			8		8	Ho 163				
C 14	1.00E-01	C C 2		1.00E-01	C C 2	Ho 166m				
Na 22			4		4	Tm 170				
Al 26			4		4	Tm 171				
Cl 36			6		6	Lu 174				
Ar 39						Lu 176				
Ar 42						Hf 178n				
K 40						Hf 182				
Ca 41		8			8	Pt 193				
Mn 53						Tl 204				
Mn 54	3.00E-02	C C 2		2.00E+01	C C 2	Pb 205				
Fe 55	4.00E+01	C C 2		5.00E+02	C C 2	Pb 210	8			8
Co 60	5.00E+01	C C 2		2.00E+02	C C 2	Bi 208				
Ni 59	3.00E-01	C C 2		3.00E-01	C C 2	Bi 210m				
Ni 63	2.00E+01	C C 2		2.00E+01	C C 2	Po 210	8			8
Zn 65	9.00E-09	C C 2		5.00E-05	C C 2	Ra 223				
Se 79		8			8	Ra 225				
Kr 81						Ra 226	8			8
Kr 85						Ra 228				
Rb 87						Ac 227				
Sr 90		8			8	Th 227				
Zr 93		8			8	Th 228				
Nb 91						Th 229	8			8
Nb 92						Th 230	8			8
Nb 93m	6.00E-05	C C 2		1.00E-04	C C 2	Th 232	8			8
Nb 94	2.00E-03	C C 2		2.00E-03	C C 2	Th 234				
Mo 93	1.00E-03	C C 2		1.00E-03	C C 2	Pa 231	8			8
Tc 97						Pa 233				
Tc 99		8			8	U 232				
Ru 106		8			8	U 233	8			8
Pd 107		8			8	U 234	8			8
Ag 108m	8.00E-03	C C 2		8.00E-03	C C 2	U 235	8			8
Ag 110m						U 236	8			8
Cd 109						U 238	8			8
Cd 113m						Np 237	8			8
Sn 119m						Pu 236				
Sn 121m		8			8	Pu 238	8			8
Sn 123						Pu 239	8			8
Sn 126		8			8	Pu 240	8			8
Sb 125						Pu 241	8			8
Sb 126						Pu 242	8			8
Te 125m						Am 241	8			8
Te 127m						Am 242m	8			8
I 129		8			8	Am 243	8			8
Cs 134		6			6	Cm 242	8			8
Cs 135		8			8	Cm 243	8			8
Cs 137		6			6	Cm 244	8			8
Ba 133						Cm 245	8			8
La 137						Cm 246	8			8
La 138						Cm 248				
Ce 144		8			8	Cf 249				
Pm 145						Cf 250				
Pm 147		8			8	Cf 251				
Sm 147						Cf 252				
Sm 151		8			8	Unsp a	8			8
Eu 152		8			8	Unsp b/g	1.00E-04 C C 2	9.00E+02 C C 2		2
Eu 154		8			8	Total a	0 *	0		*
Eu 155		8			8	Total b/g	1.10E+02 *	1.64E+03		*

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 the 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
* Total calculated from the 114 declared radionuclides