

WASTE STREAM	3K23	Miscellaneous Activated Components - Debris Vault 3
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SITE Hartlepool

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			
Future arisings:	= 0.5			
Total future arisings:	0.0			
Total waste volume:	0.5			

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

Comment on arising rates: Stock volume maintained at 0.5 m3 following station assessment. Future arisings unpredictable depending on operational failures.

Additional information on quantities: -

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

WASTE SOURCE Irradiated reactor control rods, control rod chains and graphite specimen assemblies.

PHYSICAL CHARACTERISTICS

General description: Redundant or defective control rods and control rod chains and graphite specimen assemblies. The possibility of large items which may need special handling is not assessed.

Changes since waste generated: -

Bulk density (t/m³): > 1.0

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Irradiated components principally steel (>50% wt) removed from the reactor. Other materials not assessed.

Chemical state: Neutral

Sheet metal proportion / thickness: Majority of the waste is stainless steel cylinders, of varying thickness

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	P	321, 316 and boronated stainless steel.	
Other ferrous metals.....	P	-	
Iron.....	NE	-	
Aluminium.....	NE	-	
Beryllium.....	NE	-	
Cobalt.....	NE	-	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	NE	-	
Nickel.....	NE	-	
Titanium.....	NE	-	
Uranium.....	NE	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
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.....	= 0	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....	= 0	-	
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.....	NE	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	NE	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
Sulphide.....	NE	-

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	-
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.....	P	as Boronated Stainless Steel
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):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	-
Total complexing agents.....	NE	-

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	On-site	= 100.0
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		

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
Hartlepool Waste Management Centre (WMC)	Hartlepool

Likely conditioning matrix:

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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 components removed from the reactor. 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"

Chemical form of radionuclides: H-3: Diffused into components
 C-14: Activated graphite contamination, activation of carbon within components
 Cl-36: Not Assessed
 Se-79: Not Assessed
 Tc-99: Not Assessed
 I-129: Not Assessed
 Ra: Not Assessed
 Th: Not Assessed
 U: Not Assessed
 Np: Not Assessed
 Pu: Not Assessed

WASTE STREAM		3K23		Miscellaneous Activated Components - Debris Vault 3					
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		Gd 153				
Be 10			8		Ho 163				
C 14	5.00E-02	C C	2		Ho 166m				
Na 22			4		Tm 170				
Al 26			4		Tm 171				
Cl 36			6		Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41			8		Pt 193				
Mn 53					Tl 204				
Mn 54	7.04E-03	C C	2		Pb 205				
Fe 55	2.31E+01	C C	2		Pb 210		8		
Co 60	3.37E+01	C C	2		Bi 208				
Ni 59	2.00E-01	C C	2		Bi 210m				
Ni 63	9.79E+00	C C	2		Po 210		8		
Zn 65	1.79E-09	C C	2		Ra 223				
Se 79			8		Ra 225				
Kr 81					Ra 226		8		
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90			8		Th 227				
Zr 93			8		Th 228				
Nb 91					Th 229		8		
Nb 92					Th 230		8		
Nb 93m	3.25E-05	C C	2		Th 232		8		
Nb 94	1.00E-03	C C	2		Th 234				
Mo 93	5.00E-04	C C	2		Pa 231		8		
Tc 97					Pa 233				
Tc 99			8		U 232				
Ru 106			8		U 233		8		
Pd 107			8		U 234		8		
Ag 108m	3.98E-03	C C	2		U 235		8		
Ag 110m					U 236		8		
Cd 109					U 238		8		
Cd 113m					Np 237		8		
Sn 119m					Pu 236				
Sn 121m			8		Pu 238		8		
Sn 123					Pu 239		8		
Sn 126			8		Pu 240		8		
Sb 125					Pu 241		8		
Sb 126					Pu 242		8		
Te 125m					Am 241		8		
Te 127m					Am 242m		8		
I 129			8		Am 243		8		
Cs 134			6		Cm 242		8		
Cs 135			8		Cm 243		8		
Cs 137			6		Cm 244		8		
Ba 133					Cm 245		8		
La 137					Cm 246		8		
La 138					Cm 248				
Ce 144			8		Cf 249				
Pm 145					Cf 250				
Pm 147			8		Cf 251				
Sm 147					Cf 252				
Sm 151			8		Unsp a		8		
Eu 152			8		Unsp b/g	4.37E-08	C C	2	
Eu 154			8		Total a	0	*		0 *
Eu 155			8		Total b/g	6.69E+01	*		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 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