

WASTE STREAM**3L23****Miscellaneous Activated Components - Tie Bar Ends & Nuts****SITE** Heysham 1**SITE OWNER** EDFE NGL**WASTE CUSTODIAN** EDFE NGL**WASTE TYPE** ILW; SPD3

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

Reported

Stocks: At 1.4.2022..... 0.3 m³Future arisings - 1.4.2022 - 31.3.2023..... 0.1 m³1.4.2023 - 31.3.2024..... 0.1 m³1.4.2024 - 31.3.2025..... 0.2 m³1.4.2025 - 31.3.2026..... 0.2 m³Total future arisings: 0.5 m³Total waste volume: 0.8 m³

Comment on volumes: Volume reduced from 2013 following reassessment of waste stocks. Future arisings will be variable depending on station operating conditions.

Uncertainty factors on Stock (upper): x 1.25 Arisings (upper) x 1.75

volumes: Stock (lower): x 0.75 Arisings (lower) x 0.25

WASTE SOURCE Metallic components resulting from the dismantling of fuel element stringers.**PHYSICAL CHARACTERISTICS**

General description: Tie bar ends and nuts. Some other components may be present. No large items are expected.

Physical components (%vol): ~100% Tie bar ends and nuts

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~0.5

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Mainly stainless steel. Some nimonic alloy will also be present. Percentage breakdown not estimated.

Chemical state: Neutral

Chemical form of radionuclides: H-3: diffused into materials
C-14: graphite
Cl-36: Incorporated into steels
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

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	P		
Other ferrous metals.....	0		
Iron.....	NE		
Aluminium.....			
Beryllium.....	0		

WASTE STREAM

3L23

Miscellaneous Activated Components - Tie Bar Ends & Nuts

Cobalt.....	0
Copper.....	
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	P
Titanium.....	NE
Uranium.....	0
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	0

Organics (%wt): Other organics to be further assessed.

	(%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.....	0		

WASTE STREAM	3L23	Miscellaneous Activated Components - Tie Bar Ends & Nuts
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Desiccants/Catalysts.....	0
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): Not estimated but not expected to be present at greater than 1%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: None expected.

	(%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	

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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	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	0	
EEE Type 2.....	0	
EEE Type 3.....	0	
EEE Type 4.....	0	
EEE Type 5.....	0	

Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	NE	
DPTA.....	NE	
NTA.....	NE	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	Expect only trace quantities, if any.
Total complexing agents.....	NE	

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Potential for the waste to contain discrete items: Yes.

PACKAGING AND CONDITIONING

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.

Plant Name: None.

Location: Heysham 1 power station

Plant startup date: ~2104

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: All of the waste is expected to be retrieved and conditioned when a conditioning campaign is undertaken. The total plant process rate is not estimated.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	4m box (100mm concrete shielding)	100.0	~12.2	~14.3	< 1

Likely container type comment: -

Range in container waste volume: -

Other information on containers: Stainless steel.

Likely conditioning matrix: BFS/OPC

Other information: -

Conditioned density (t/m³): ~2.5

Conditioned density comment: The density of the encapsulated waste is expected to be approximately 2.5 t/m³.

Other information on 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.

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Activation of nuclides within the steel will be the main sources of activity.

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

WASTE STREAM**3L23****Miscellaneous Activated Components - Tie Bar Ends & Nuts**

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:

Theoretical assessments.

Other information:

Estimates have been based on theoretical assessments. "Other beta/gamma nuclides (in TBq/m³) in arisings and stocks include: - S35 (6E-1, 8E-3); Ca45 (1E+0, 3E-2); Cr51 (2E+4, 1E+1); Co58 (1E+3, 9E+0), Zr95 (6E-1, 5E-3); Nb95 (1E+1, 2E-2); Sc46 (1E-1, 1E-3) and Fe59 (2E+2, 7E-1).

WASTE STREAM

3L23

Miscellaneous Activated Components - Tie Bar Ends & Nuts

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	9E-07	CC 2	2E-06	CC 2	Gd 153				
Be 10	1E-09	CC 2	1E-09	CC 2	Ho 163				
C 14	3E-06	CC 2	3E-06	CC 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	7E-05	CC 2	7E-05	CC 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41	7E-04	CC 2	7E-04	CC 2	Pt 193				
Mn 53					Tl 204				
Mn 54	3E+00	CC 2	1E+02	CC 2	Pb 205				
Fe 55	7E+02	CC 2	6E+03	CC 2	Pb 210	8			8
Co 60	8E+02	CC 2	3E+03	CC 2	Bi 208				
Ni 59	8E+00	CC 2	8E+00	CC 2	Bi 210m				
Ni 63	9E+02	CC 2	1E+03	CC 2	Po 210	8			8
Zn 65	1E-04	CC 2	5E-03	CC 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	5E-06	CC 2	5E-06	CC 2	Th 228				
Nb 91					Th 229	8			8
Nb 92					Th 230	8			8
Nb 93m	4E-03	CC 2	5E-03	CC 2	Th 232	8			8
Nb 94	2E-02	CC 2	2E-02	CC 2	Th 234				
Mo 93	6E-02	CC 2	6E-02	CC 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	9E-03	CC 2	9E-03	CC 2	U 235	8			8
Ag 110m	6E-02	CC 2	3E+00	CC 2	U 236	8			8
Cd 109	5E-03	CC 2	1E-01	CC 2	U 238	8			8
Cd 113m	5E-07	CC 2	8E-07	CC 2	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		8		8	Cm 242	8			8
Cs 135		8		8	Cm 243	8			8
Cs 137		8		8	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	Other a	8			8
Eu 152		8		8	Other b/g	2E+01	CC 2	2E+04	CC 2
Eu 154		8		8	Total a	NE	8	NE	8
Eu 155		8		8	Total b/g	2.43E+03	CC 2	3.01E+04	CC 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