

<b>WASTE STREAM</b>	<b>3L23</b>	<b>Miscellaneous Activated Components - Tie Bar Ends &amp; Nuts</b>
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**SITE** Heysham 1

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** ILW; SPD3

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	0.3 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2024.....	0.3 m <sup>3</sup>
	1.4.2024 - 31.3.2026.....	0.4 m <sup>3</sup>
Total future arisings:		0.7 m <sup>3</sup>
Total waste volume:		1.0 m <sup>3</sup>

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 volumes: Stock (upper): x 1.25 Arisings (upper) x 1.75  
 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/m<sup>3</sup>): ~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):

Stainless steel.....	P
Other ferrous metals.....	0
Iron.....	NE
Aluminium.....	
Beryllium.....	0
Cobalt.....	0
Copper.....	
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	P

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

	Titanium.....	NE
	Uranium.....	0
	Zinc.....	0
	Zircaloy/Zirconium.....	0
	Other metals.....	0
Organics (%wt):	Other organics to be further assessed.	
	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.....	0
	Oil or grease .....	
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	NE
Other materials (%wt):	-	
	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
	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.	

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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.

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
Active particles.....	P
Soluble solids as bulk chemical compounds.....	0

Hazardous substances / non hazardous pollutants:

-

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

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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

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

Expect only trace quantities, if any.

**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 (m<sup>3</sup>/y incoming waste):

-

Target start date for packaging this stream:

-

Throughput for this stream (m<sup>3</sup>/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 <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
4m box (100mm concrete shielding)	100.0	~12.2	~14.3	< 1

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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/m<sup>3</sup>): ~2.5

Conditioned density comment: The density of the encapsulated waste is expected to be approximately 2.5 t/m<sup>3</sup>.

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

Treatment	Stream volume (%)	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.

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/m<sup>3</sup>) 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).

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**3L23**

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	9E-07	DD 2	2E-06	DD 2	Gd 153				
Be 10	1E-09	DD 2	1E-09	DD 2	Ho 163				
C 14	3E-06	DD 2	3E-06	DD 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	7E-05	DD 2	7E-05	DD 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41	7E-04	DD 2	7E-04	DD 2	Pt 193				
Mn 53					Tl 204				
Mn 54	3E+00	DD 2	1E+02	DD 2	Pb 205				
Fe 55	7E+02	DD 2	6E+03	DD 2	Pb 210	8		8	
Co 60	8E+02	DD 2	3E+03	DD 2	Bi 208				
Ni 59	8E+00	DD 2	8E+00	DD 2	Bi 210m				
Ni 63	9E+02	DD 2	1E+03	DD 2	Po 210	8		8	
Zn 65	1E-04	DD 2	5E-03	DD 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	DD 2	5E-06	DD 2	Th 228				
Nb 91					Th 229	8		8	
Nb 92					Th 230	8		8	
Nb 93m	4E-03	DD 2	5E-03	DD 2	Th 232	8		8	
Nb 94	2E-02	DD 2	2E-02	DD 2	Th 234				
Mo 93	6E-02	DD 2	6E-02	DD 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	DD 2	9E-03	DD 2	U 235	8		8	
Ag 110m	6E-02	DD 2	3E+00	DD 2	U 236	8		8	
Cd 109	5E-03	DD 2	1E-01	DD 2	U 238	8		8	
Cd 113m	5E-07	DD 2	8E-07	DD 2	U 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 DD 2	2E+04 DD 2		
Eu 154		8		8	<b>Total a</b>	<b>NE 8</b>	<b>NE 8</b>	<b>8</b>	
Eu 155		8		8	<b>Total b/g</b>	<b>2.43E+03 DD 2</b>	<b>3.01E+04 DD 2</b>	<b>DD 2</b>	

**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