

**WASTE STREAM****4C24****Gas Bypass Area Waste - LLW****SITE** Torness**SITE OWNER** EDFE NGL**WASTE CUSTODIAN** EDFE NGL**WASTE TYPE** LLW**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	2.3 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2030.....	55.0 m <sup>3</sup>
	1.4.2030 - 31.3.2032.....	10.0 m <sup>3</sup>
Total future arisings:		65.0 m <sup>3</sup>
Total waste volume:		67.3 m <sup>3</sup>

Comment on volumes: Waste volumes will be variable depending on station operating conditions.

Uncertainty factors on volumes:

Stock (upper):	x 1.25	Arisings (upper)	x 1.5
Stock (lower):	x 0.75	Arisings (lower)	x 0.5

**WASTE SOURCE** Waste originating in the reactor gas bypass plants.**PHYSICAL CHARACTERISTICS**

General description: Primarily metal plant items items such as debris pot waste and gas filters and mixed waste items such as paper, polythene, clothing wood etc.. Other items may also be present.

Physical components (%vol): Breakdown not fully assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~0.2

Comment on density: -

**CHEMICAL COMPOSITION**

General description and components (%wt): The waste is generated in the Reactor Gas Bypass area and may include general waste items such as paper, polythene clothing, wood etc. and some non-compactable items such as metal, redundant plant items, cabling etc.

Chemical state: Neutral

Chemical form of radionuclides:

H-3: Not Determined  
 C-14: Not Determined  
 Cl-36: Not Determined  
 Se-79: Not Determined  
 Tc-99: Not Determined  
 I-129: Not Determined  
 Ra: Not Determined  
 Th: Not Determined  
 U: Not Determined  
 Np: Not Determined  
 Pu: Not Determined

Metals and alloys (%wt): -

Stainless steel.....	1.0	
Other ferrous metals.....	4.0	Mild Steel
Iron.....	0	
Aluminium.....	0	
Beryllium.....	0	
Cobalt.....	0	
Copper.....	0	
Lead.....	0	
Magnox/Magnesium.....	0	
Nickel.....	0	

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	Titanium.....	0	
	Uranium.....	NE	
	Zinc.....	0	
	Zircaloy/Zirconium.....	0	
	Other metals.....	0	
Organics (%wt):	There may be traces of oil. Note that items may be wrapped in plastic.		
	Total cellulose.....	~5.0	
	Paper, cotton.....	NE	
	Wood.....	~5.0	
	Halogenated plastics .....	NE	
	Total non-halogenated plastics.....	35.0	
	Condensation polymers.....	NE	
	Others.....	NE	
	Organic ion exchange materials....	0	
	Total rubber.....	3.0	
	Halogenated rubber .....	NE	
	Non-halogenated rubber.....	NE	
	Hydrocarbons.....	NE	Small quantities may be present
	Oil or grease .....		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...	0	
	Asphalt/Tarmac (no coal tar)....	0	
	Bitumen.....	0	
	Others.....		
	Other organics.....	TR	
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.....	NE	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	None of the listed inorganic anions are expected to be present at greater than 1%.		

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Fluoride.....	0
Chloride.....	<1.0
Iodide.....	<1.0
Cyanide.....	0
Carbonate.....	<1.0
Nitrate.....	<1.0
Nitrite.....	NE
Phosphate.....	1.0
Sulphate.....	<1.0
Sulphide.....	<1.0

Materials of interest for waste acceptance criteria:

The possible presence of materials likely to represent a fire or other non-radiological hazard has not been fully assessed.

Combustible metals.....	0
Low flash point liquids.....	0
Explosive materials.....	0
Phosphorus.....	0
Hydrides.....	NE
Biological etc. materials.....	NE
Biodegradable materials.....	52.0
Putrescible wastes.....	0
Non-putrescible wastes.....	52.0
Corrosive materials.....	NE
Pyrophoric materials.....	0
Generating toxic gases.....	NE
Reacting with water.....	0
Active particles.....	NE
Soluble solids as bulk chemical compounds.....	0

Not expected

Hazardous substances / non hazardous pollutants:

-	
Acrylamide.....	NE
Benzene.....	NE
Chlorinated solvents.....	NE
Formaldehyde.....	NE
Organometallics.....	NE
Phenol.....	0
Styrene.....	NE
Tri-butyl phosphate.....	0
Other organophosphates.....	NE
Vinyl chloride.....	NE
Arsenic.....	0
Barium.....	NE
Boron.....	0

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Cadmium.....	0
Caesium.....	NE
Selenium.....	0
Chromium.....	0
Molybdenum.....	0
Thallium.....	NE
Tin.....	0
Vanadium.....	0
Mercury compounds.....	0
Others.....	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	NE
EEE Type 2.....	NE
EEE Type 3.....	NE
EEE Type 4.....	NE
EEE Type 5.....	NE
Complexing agents (%wt):	Not yet determined
EDTA.....	NE
DPTA.....	NE
NTA.....	NE
Polycarboxylic acids.....	NE
Other organic complexants.....	NE
Total complexing agents.....	NE

May be present in trace quantities.

**TREATMENT, PACKAGING AND DISPOSAL**

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)	Off-site	4.0
Incineration	Off-site	90.0
Solidification		
Decontamination		
Metal treatment	Off-site	2.0
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		4.0

Comment on planned treatments:

-

**WASTE STREAM****4C24****Gas Bypass Area Waste - LLW****Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	8.0
Expected to be consigned to a Landfill Facility	
Expected to be consigned to an On-Site Disposal Facility	
Expected to be consigned to an Incineration Facility	90.0
Expected to be consigned to a Metal Treatment Facility	2.0
Expected to be consigned as Out of Scope	
Expected to be recycled / reused	
Disposal route not known	

**Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):**

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be consigned to an On-Site Disposal Facility			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be consigned as Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

**Waste Packaging for Disposal:**

Container	Stream volume %	Waste loading m <sup>3</sup>	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO			
1/2 Height IP-2 Disposal/Re-usable ISO	8.0	~13.55	< 1
2m box (no shielding)			
4m box (no shielding)			
Other			

## Other information:

Waste loading is representative of the raw waste following further planned treatments. The waste will be reduced to 50% of its original waste volume after further planned treatments.

**Waste Planned for Disposal at the LLW Repository:**

Container voidage: -

Waste Characterisation Form (WCH):

The waste meets the LLWR's Waste Acceptance Criteria (WAC).  
The waste has a current WCH.  
Inventory information is consistent with the current WCH.

Waste consigned for disposal to LLWR in year of generation:

Yes. Waste will usually be disposed of in the year of arising, however this will be dependent upon rate of arising of LLW throughout the year for LLWR disposal.

Potential for the waste to contain discrete items:

Yes

**Non-Containerised Waste for In-Vault Grouting:** (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

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Other information:

-

**RADIOACTIVITY**

Source:

Surface contamination from exposure to reactor circuit gas coolant and tritiated effluent.

Uncertainty:

-

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:

-

Other information:

-

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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	3.26E-05	CC 2	3.26E-05	CC 2	Gd 153				
Be 10					Ho 163				
C 14	8.08E-07	CC 2	8.08E-07	CC 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	3.92E-07	CC 2	3.92E-07	CC 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	9.39E-07	CC 2	9.39E-07	CC 2	Pb 205				
Fe 55	1.86E-05	CC 2	1.86E-05	CC 2	Pb 210				
Co 60	1.47E-06	CC 2	1.47E-06	CC 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	1.36E-06	CC 2	1.36E-06	CC 2	Po 210				
Zn 65	3.83E-07	CC 2	3.83E-07	CC 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	3.33E-08	CC 2	3.33E-08	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	1.04E-07	CC 2	1.04E-07	CC 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	6.11E-07	CC 2	6.11E-07	CC 2	U 233				
Pd 107					U 234				
Ag 108m	8.13E-08	CC 2	8.13E-08	CC 2	U 235				
Ag 110m	1.84E-07	CC 2	1.84E-07	CC 2	U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125	2.37E-07	CC 2	2.37E-07	CC 2	Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	9.67E-08	CC 2	9.67E-08	CC 2	Cm 242				
Cs 135					Cm 243				
Cs 137	1.9E-07	CC 2	1.9E-07	CC 2	Cm 244				
Ba 133	1.03E-07	CC 2	1.03E-07	CC 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	5.28E-07	CC 2	5.28E-07	CC 2	Cf 249				
Pm 145					Cf 250				
Pm 147	1.6E-08	CC 2	1.6E-08	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152	2.62E-07	CC 2	2.62E-07	CC 2	Other b/g				
Eu 154	2.52E-07	CC 2	2.52E-07	CC 2	<b>Total a</b>	<b>NE</b>	<b>6</b>	<b>NE</b>	<b>6</b>
Eu 155	1.75E-07	CC 2	1.75E-07	CC 2	<b>Total b/g</b>	<b>5.94E-05</b>	<b>7</b>	<b>5.94E-05</b>	<b>7</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