

WASTE STREAM	4C16	Dry Fuel Route LLW
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SITE Torness

SITE OWNER EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE CUSTODIAN EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 10.8		
Future arisings:	1.4.2025 - 31.3.2026	= 68.2		
	1.4.2026 - 31.3.2027	= 68.2		
	1.4.2027 - 31.3.2028	= 68.2		
	1.4.2028 - 31.3.2029	= 68.2		
	1.4.2029 - 31.3.2030	= 68.2		
	1.4.2030 - 31.3.2031	= 68.2		
Total future arisings:		409.2		
Total waste volume:		420.0		

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

Comment on arising rates: Future arisings are aligned to volume quoted in WCH. This will be variable and dependent on operating and decommissioning activities.

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 Waste generated from the dry fuel route areas. This includes the following areas: Gas Circulators, Pile Cap Area, Irradiated Fuel Disposal Facility, Fuel Plug Unit area, High Active Debris Vault, and SDM area.

PHYSICAL CHARACTERISTICS

General description: The wastes generated in these areas can be metal, redundant plant items both small and large, cabling. They can be shreddable/compactable including general bagged waste, paper, polythene, clothing, wood, rubber, lagging, vacuum bags etc. Some small amounts of contaminated asbestos may be generated during plant maintenance activities

Changes since waste generated: Items that are considered suitable will be shredded and compacted into the standard 180 – litre drum. Waste compaction on site is carried out for volume minimisation.

Bulk density (t/m³): ~ 0.21

Comment on density: Density based on raw volume and weight at arising as provided in WCH.

CHEMICAL COMPOSITION

General description and components (%wt): Metal (~63%), Plastic/Rubber (~15%), Wood (~8%), Biodegradable- non putrescibles (~12%) and Other (~2%).

Chemical state: Neutral

Sheet metal proportion / thickness: This waste stream is variable and may contain some bulk items which will be volume reduced by cutting, proportion of bulk items unknown.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 9.0	Solid - miscellaneous plant items, typically from maintenance and overhaul of gas circulators or replacement of effluent pipework in reactor building, support structure, redundant fuel handling equipment. Also Solid - miscellaneous plant items and scrap generated during plant modifications and maintenance. Hand tools, nuts, bolts, valves, pipework, stainless steel sintered metal cylindrical HEPA filters etc.	
Other ferrous metals.....	~ 54.0	Mild steel-Solid - miscellaneous plant items and scrap generated during plant modifications and maintenance. Locations will be primarily from Decontam workshop areas. E.g. support structure, pipework, redundant fuel handling equipment, mild steel rectangular HEPA filters.	
Iron.....	= 0	-	
Aluminium.....	= 0	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	~ 0	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	NE	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 20.0	-	
Paper, cotton.....	~ 12.0	Biodegradable-non putrescibles	
Wood.....	~ 8.0	-	
Halogenated plastics.....	NE	-	
Total non-halogenated plastics.....	~ 12.0	General shredded plastic wastes e.g. plastic bags, sheeting, PPE	
Condensation polymers.....	NE	-	
Others.....	NE	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	~ 3.0	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	~ 3.0	-	
Hydrocarbons.....	~ 0	A small amount may be present	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	Epoxy polyester paint-Coating adhered to mild steel rectangular HEPA filters.	
Other organics.....	~ 0	-	

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.....	= 1.8	-	
Cementitious material.....	= 0	-	
Sand.....	= 0	-	
Glass/Ceramics.....	NE	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	~ 0.20	Man Made Mineral Fibres	
Non/low friable.....	~ 0.10	CAF joints - WHITE Chrysotile asbestos, with a small quantity of BROWN Amosite asbestos	
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.....	= 0	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	= 0	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	= 0	-
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.....	= 12.0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	= 0	-
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	NE	-
Benzene.....	= 0	-
Chlorinated solvents.....	NE	-
Formaldehyde.....	NE	-
Organometallics.....	NE	-
Phenol.....	NE	-
Styrene.....	NE	-
Tri-butyl phosphate.....	= 0	-
Other organophosphates.....	NE	-
Vinyl chloride.....	= 0	-
Arsenic.....	= 0	-
Barium.....	NE	-
Boron.....	= 0	-
Boron (in Boral).....	= 0	-
Boron (non-Boral).....	= 0	-
Cadmium.....	= 0	-
Caesium.....	= 0	-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	= 0	-
Thallium.....	NE	-
Tin.....	= 0	-
Vanadium.....	= 0	-
Mercury compounds.....	= 0	-
Others.....	NE	-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	-
Total complexing agents.....	= 0	-

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)	Off-site	~ 10.0
Incineration	Off-site	~ 40.0
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	~ 40.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None	Off-site	~ 10.0

Comments on planned treatments:

In line with the waste hierarchy, wastes will be treated preferentially by incineration, metal decontamination/melting, supercompaction, optimal packaging in HHISOs or immobilisation by encapsulation where necessary, prior to ultimate disposal at the LLW Repository. These treatments will be carried out off-site under contract with companies such as LLWR Ltd, Cyclife, Tradebe Inutec.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	20.0	30.4	18.3	3	-

Range in container waste loading:

Other information on packaging and conditioning:

Waste loading is representative of the raw waste following further planned treatments. Supercompaction assumed to reduce volume to 20% of original. Solidification assumed to increase volume to 300% of original. No treatment results in the same volume.

Conditioned density (t/m³):

-

Conditioned density comment:

-

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)			
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	~ 20.0		
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	~ 40.0		
Expected to be consigned to a Metal Treatment Facility	~ 40.0		
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:	Contamination will be main source of activity with possibly some activation of certain reactor or fuel route components.
Uncertainty:	Activity expected to be within a factor of 10.
Measurement of radioactivities:	Results for the analysis of area bulk samples were calculated as ratios to Co-60 and Cs-137. These ratios are referred to as individual area fingerprints. For these fingerprints 'less than' values were quoted where a result falls below the Minimum Detectable Activity (MDA). Waste mapping data was provided by Torness in the form of volume of bags/drums (m3) and associated dose rates ($\mu\text{Sv/h}$) from plant areas. The waste mapping data covers the period between June 2011 and February 2015. This allowed NNL to calculate activity based percentage contributions to the waste stream for each area sampled.
Chemical form of radionuclides:	H-3: Contamination from tritiated water C-14: Graphite Cl-36: To be determined Se-79: To be determined Tc-99: To be determined I-129: To be determined Ra: To be determined Th: To be determined U: To be determined Np: To be determined Pu: To be determined

WASTE STREAM 4C16 Dry Fuel Route LLW									
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	2.03E-05	C C 1	2.03E-05	C C 1	Gd 153				
Be 10					Ho 163				
C 14	2.67E-06	C C 1	2.67E-06	C C 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	4.26E-06	C C 1	4.26E-06	C C 1	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Ti 204				
Mn 54	1.34E-05	C C 1	1.34E-05	C C 1	Pb 205				
Fe 55	3.55E-04	C C 1	3.55E-04	C C 1	Pb 210				
Co 60	5.87E-05	C C 1	5.87E-05	C C 1	Bi 208				
Ni 59					Bi 210m				
Ni 63	3.85E-05	C C 1	3.85E-05	C C 1	Po 210				
Zn 65	8.74E-07	C C 1	8.74E-07	C C 1	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	1.84E-07	C C 1	1.84E-07	C C 1	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	3.70E-08	C C 1	3.70E-08	C C 1	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	4.63E-07	C C 1	4.63E-07	C C 1	U 233				
Pd 107					U 234	8.80E-13	C C 1	8.80E-13	C C 1
Ag 108m	3.57E-08	C C 1	3.57E-08	C C 1	U 235	1.40E-14	C C 1	1.40E-14	C C 1
Ag 110m	2.09E-07	C C 1	2.09E-07	C C 1	U 236	2.25E-13	C C 1	2.25E-13	C C 1
Cd 109					U 238	2.60E-13	C C 1	2.60E-13	C C 1
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	4.99E-10	C C 1	4.99E-10	C C 1
Sn 123					Pu 239	1.47E-10	C C 1	1.47E-10	C C 1
Sn 126					Pu 240	3.81E-10	C C 1	3.81E-10	C C 1
Sb 125	3.31E-08	C C 1	3.31E-08	C C 1	Pu 241	1.33E-07	C C 1	1.33E-07	C C 1
Sb 126					Pu 242				
Te 125m					Am 241	9.97E-10	C C 1	9.97E-10	C C 1
Te 127m					Am 242m				
I 129	2.69E-13	C C 1	2.69E-13	C C 1	Am 243				
Cs 134	8.50E-08	C C 1	8.50E-08	C C 1	Cm 242	6.16E-10	C C 1	6.16E-10	C C 1
Cs 135					Cm 243	3.54E-12	C C 1	3.54E-12	C C 1
Cs 137	8.80E-07	C C 1	8.80E-07	C C 1	Cm 244	2.35E-10	C C 1	2.35E-10	C C 1
Ba 133	1.51E-08	C C 1	1.51E-08	C C 1	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	1.76E-07	C C 1	1.76E-07	C C 1	Cf 249				
Pm 145					Cf 250				
Pm 147	8.91E-08	C C 1	8.91E-08	C C 1	Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152	4.72E-08	C C 1	4.72E-08	C C 1	Unsp b/g	1.94E-05	C C 1	1.94E-05	C C 1
Eu 154	7.27E-08	C C 1	7.27E-08	C C 1	Total a	2.88E-09	*	2.88E-09	*
Eu 155	3.77E-08	C C 1	3.77E-08	C C 1	Total b/g	5.15E-04	*	5.15E-04	*

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