

WASTE STREAM	3L11	Dry Fuel Route LLW
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SITE Heysham 1

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	= 11.6		
Future arisings:	1.4.2025 - 31.3.2026	= 14.0		
	1.4.2026 - 31.3.2027	= 14.0		
	1.4.2027 - 31.3.2028	= 14.0		
	1.4.2028 - 31.3.2029	= 14.0		
	1.4.2029 - 31.3.2030	= 14.0		
Total future arisings:		70.0		
Total waste volume:		81.6		

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

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

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 General solid LLW arisings from the Heysham 1 Reactor Building dry fuel route processing areas. This area includes: Pile Cap, PUMF Cell and Workshop, Control Rod and Active Maintenance Facility, Nose Unit Maintenance Facility.

PHYSICAL CHARACTERISTICS

General description: The wastes generated in these areas are mixed wastes ranging from metal items, spent filters, redundant plant items, cabling, general soft trash waste, heavy duty plastic, and rubber waste.

Changes since waste generated: Where appropriate waste will be supercompacted prior to disposal.

Bulk density (t/m³): ~ 0.43

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

CHEMICAL COMPOSITION

General description and components (%wt): Metal (38%) Concrete / rubble (1%), biodegradeable (non-putrescibles) (24%), Plastics halogenated (14%), plastics non-halogenated (14%), rubber (3%), wood (1%), Powders / ash (1%), other organic (1%), Others (glass, ceramics, lagging) (3%)

Chemical state: Neutral

Sheet metal proportion / thickness: Metal thicknesses will be variable.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 2.0	Pipework, small valves	
Other ferrous metals.....	~ 34.0	Mild steel-Pipework, small valves	
Iron.....	NE	-	
Aluminium.....	~ 1.0	Pipework, small valves	
Beryllium.....	NE	-	
Cobalt.....	NE	-	
Copper.....	~ 1.0	Copper metal alloy	
Lead.....	~ 1.0	Lead wool	
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.....	~ 25.0	-	
Paper, cotton.....	~ 24.0	-	
Wood.....	~ 1.0	-	
Halogenated plastics.....	14.0	-	
Total non-halogenated plastics.....	~ 14.0	-	
Condensation polymers.....	NE	-	
Others.....	NE	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	~ 3.0	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	NE	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	~ 1.0	-	

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.....	= 0	-	
Cementitious material.....	~ 1.0	Concrete/rubble	
Sand.....	= 0	-	
Glass/Ceramics.....	= 1.0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	= 1.0	Lagging (could be asbestos or MMMF)	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	~ 1.0	-	

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.....	= 46.0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	= 0	Not expected
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.....	= 0	-
Styrene.....	NE	-
Tri-butyl phosphate.....	= 0	-
Other organophosphates.....	NE	-
Vinyl chloride.....	= 0	-
Arsenic.....	= 0	-
Barium.....	NE	-
Boron.....	= 0	-
Boron (in Boral).....	NE	-
Boron (non-Boral).....	NE	-
Cadmium.....	= 0	-
Caesium.....	NE	-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	= 0	-
Thallium.....	NE	-
Tin.....	= 0	-
Vanadium.....	= 0	-
Mercury compounds.....	= 0	-
Others.....	NE	-

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	Present in trace quantities.
Total complexing agents.....	TR	-

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	~~ 20.0
Incineration	Off-site	~~ 60.0
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	~~ 10.0
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)	27.0	36.8	18.3	1	-

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.. The residual LLW from metal decontamination is assumed to be captured within the data provided by LLWR in wastestream 6H02 - LLW (Minor Users).

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)	~~ 30.0		
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	~~ 60.0		
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			
Expected to be consigned to a Metal Treatment Facility	~~ 10.0		
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: The main assumptions used in the fingerprint determination are that the swabs taken from the sub-areas are truly representative of those areas, and that the waste mapping information is accurate.
It is also assumed that the wastes consigned within this waste-stream are all created in similar processes. Any wastes which are produced within these areas, but via unusual processes, will be compared against the waste fingerprint for this area, and will be considered a separate waste stream if the nuclide ratios do not match.

The differences between the fingerprints obtained from previous sampling campaigns show that there have been no significant changes to the radionuclide ratios, so there is a high degree of confidence in these assumptions.

Measurement of radioactivities: Multiple swabs (10-30 per area) were taken from all available contaminated surfaces including floors and workbenches, and from contaminated plant and equipment. The swabs from each area were then shredded and blended to produce a bulk sample for each area. It is reasonable to assume that the radionuclide content of the swabs is representative of the radionuclide content of the active waste produced in the areas.

Chemical form of radionuclides:	H-3: Diffused into materials
	C-14: Contamination by activated graphite, some from activation of metal components
	Cl-36: Not assessed
	Se-79: Not expected to be significant
	Tc-99: Not expected to be significant
	I-129: Not assessed
	Ra: Not expected to be significant
	Th: Not expected to be significant
	U: Not assessed
	Np: Not expected to be significant
	Pu: Not assessed

WASTE STREAM 3L11 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	3.28E-05	C C 1	3.28E-05	C C 1	Gd 153				
Be 10					Ho 163				
C 14	2.59E-05	C C 1	2.59E-05	C C 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	1.64E-06	C C 1	1.64E-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	4.03E-05	C C 1	4.03E-05	C C 1	Pb 205				
Fe 55	2.11E-03	C C 1	2.11E-03	C C 1	Pb 210				
Co 60	1.26E-04	C C 1	1.26E-04	C C 1	Bi 208				
Ni 59					Bi 210m				
Ni 63	1.84E-04	C C 1	1.84E-04	C C 1	Po 210				
Zn 65	5.32E-06	C C 1	5.32E-06	C C 1	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	2.12E-07	C C 1	2.12E-07	C C 1	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	7.37E-08	C C 1	7.37E-08	C C 1	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	3.97E-07	C C 1	3.97E-07	C C 1	U 233				
Pd 107					U 234	1.47E-11	C C 1	1.47E-11	C C 1
Ag 108m	9.71E-08	C C 1	9.71E-08	C C 1	U 235	2.34E-13	C C 1	2.34E-13	C C 1
Ag 110m	5.66E-07	C C 1	5.66E-07	C C 1	U 236	3.76E-12	C C 1	3.76E-12	C C 1
Cd 109					U 238	4.34E-12	C C 1	4.34E-12	C C 1
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.72E-09	C C 1	3.72E-09	C C 1
Sn 123					Pu 239	2.62E-09	C C 1	2.62E-09	C C 1
Sn 126					Pu 240	6.21E-09	C C 1	6.21E-09	C C 1
Sb 125	1.16E-07	C C 1	1.16E-07	C C 1	Pu 241	8.77E-07	C C 1	8.77E-07	C C 1
Sb 126					Pu 242				
Te 125m					Am 241	1.56E-08	C C 1	1.56E-08	C C 1
Te 127m					Am 242m				
I 129	1.17E-13	C C 1	1.17E-13	C C 1	Am 243				
Cs 134	3.94E-07	C C 1	3.94E-07	C C 1	Cm 242	9.66E-09	C C 1	9.66E-09	C C 1
Cs 135					Cm 243	1.38E-10	C C 1	1.38E-10	C C 1
Cs 137	4.33E-07	C C 1	4.33E-07	C C 1	Cm 244	9.24E-09	C C 1	9.24E-09	C C 1
Ba 133	5.14E-08	C C 1	5.14E-08	C C 1	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	2.40E-07	C C 1	2.40E-07	C C 1	Cf 249				
Pm 145					Cf 250				
Pm 147	1.90E-07	C C 1	1.90E-07	C C 1	Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152	1.57E-07	C C 1	1.57E-07	C C 1	Unsp b/g	2.11E-04	C C 1	2.11E-04	C C 1
Eu 154	1.26E-07	C C 1	1.26E-07	C C 1	Total a	4.72E-08	*	4.72E-08	*
Eu 155	7.03E-08	C C 1	7.03E-08	C C 1	Total b/g	2.74E-03	*	2.74E-03	*

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