

<b>WASTE STREAM</b>	<b>3K115</b>	<b>Care and Maintenance Preparations: Wet Fuel Route LLW</b>
---------------------	--------------	--

**SITE** Hartlepool

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** LLW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	0 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2026.....	0 m <sup>3</sup>
	1.4.2027 - 31.3.2028.....	0.4 m <sup>3</sup>
	1.4.2028 - 31.3.2029.....	70.9 m <sup>3</sup>
	1.4.2029 - 31.3.2030.....	829.9 m <sup>3</sup>
	1.4.2030 - 31.3.2031.....	18.7 m <sup>3</sup>
	1.4.2031 - 31.3.2032.....	7.4 m <sup>3</sup>
Total future arisings:		927.3 m <sup>3</sup>
Total waste volume:		927.3 m <sup>3</sup>

Comment on volumes: Waste volumes will be variable depending on station operating conditions. Volumes based on Back to Bio Shield strategy. Work is ongoing looking at optimising the strategy which could lead to a change in volume and timings of arisings across Pre C&M wastes (100s) and Final Site Clearance wastes (300s), in future submissions.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.25  
 Stock (lower): x Arisings (lower) x 0.75

**WASTE SOURCE** General solid decommissioning LLW arisings from the Wet Fuel Route. Waste arising from plant dismantling and associated contamination control procedures.

**PHYSICAL CHARACTERISTICS**

General description: A variety of mixed decommissioning materials, including metals, organics and other mixed materials.

Physical components (%wt): Metals (93%), Rubble (1%), Organics (5%), Sludge (1%),

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~1.32

Comment on density: Density based on raw volume and weight.

**CHEMICAL COMPOSITION**

General description and components (%wt): Mild Steel (91%), Stainless Steel (~1%), Mixed cables (1%), Rubble (1%), Organics (5%), Sludge (1%),

Chemical state: Neutral

Chemical form of radionuclides: H-3: To be Determined  
 C-14: To be Determined  
 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

Metals and alloys (%wt): Not estimated

<b>WASTE STREAM</b>	<b>3K115</b>	<b>Care and Maintenance Preparations: Wet Fuel Route LLW</b>
---------------------	--------------	--

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~0.02		
Other ferrous metals.....	NE	Mild steel	
Iron.....	NE		
Aluminium.....	NE		
Beryllium.....	NE		
Cobalt.....	NE		
Copper.....	NE		
Lead.....	NE		
Magnox/Magnesium.....	NE		
Nickel.....	NE		
Titanium.....	NE		
Uranium.....	NE		
Zinc.....	NE		
Zircaloy/Zirconium.....	NE		
Other metals.....	~0.04	Mixed cables	
Organics (%wt):	Total organic content estimated ~5.99%.		
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	~2.7		
Paper, cotton.....	~2.6		
Wood.....	~0.07		
Halogenated plastics .....	~1.3		
Total non-halogenated plastics.....	~1.3		
Condensation polymers.....	~0.67		
Others.....	~0.67		
Organic ion exchange materials....	~0		
Total rubber.....	~0.67		
Halogenated rubber .....	~0.33		
Non-halogenated rubber.....	~0.33		
Hydrocarbons.....	NE		
Oil or grease .....	NE		
Fuel.....	NE		
Asphalt/Tarmac (cont.coal tar)...	NE		
Asphalt/Tarmac (no coal tar)....	NE		
Bitumen.....	NE		
Others.....	NE		
Other organics.....	NE		
Other materials (%wt):	Estimated ~1% other materials.		

**WASTE STREAM**

**3K115**

**Care and Maintenance Preparations: Wet Fuel Route LLW**

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	NE		
Inorganic sludges and flocs.....	~0.33		
Soil.....	NE		
Brick/Stone/Rubble.....	~0.67		
Cementitious material.....	NE		
Sand.....	NE		
Glass/Ceramics.....	NE		
Graphite.....	NE		
Desiccants/Catalysts.....	NE		
Asbestos.....	NE		
Non/low friable.....	0		
Moderately friable.....	0		
Highly friable.....	0		
Free aqueous liquids.....	NE		
Free non-aqueous liquids.....	NE		
Powder/Ash.....	NE		

Inorganic anions (%wt):      Not estimated.

	(%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:      No hazardous materials 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	

<b>WASTE STREAM</b>	<b>3K115</b>	<b>Care and Maintenance Preparations: Wet Fuel Route LLW</b>
---------------------	--------------	--

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:      Listed substances are not expected in significant quantity.

	(%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.....	NE	
EEE Type 2.....	NE	
EEE Type 3.....	NE	
EEE Type 4.....	NE	
EEE Type 5.....	NE	

**WASTE STREAM      3K115      Care and Maintenance Preparations: Wet Fuel Route LLW**

Complexing agents (%wt):      Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	NE	
DPTA.....	NE	
NTA.....	NE	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	
Total complexing agents.....	NE	

Potential for the waste to contain discrete items:      Yes.

**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	~1.5
Incineration	Off-site	~9.0
Solidification		
Decontamination		
Metal treatment	Off-Site	~87.6
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None	Off-site	~2.0

Comment 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. The percentages are based on the history of consignments across the fleet of EDF Energy Nuclear Generation stations.

**Disposal Routes:**

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	~3.4	
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	~9.0	
Expected to be consigned to a Metal Treatment Facility	~87.6	
Expected to be consigned as Out of Scope		
Expected to be recycled / reused		
Disposal route not known		

Classification codes for waste expected to be consigned to a landfill facility:      -

**Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):**

**WASTE STREAM****3K115****Care and Maintenance Preparations: Wet Fuel Route LLW**

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

**Opportunities for alternative disposal routing:** -

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

**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	~3.4	~15.46	3
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: 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.

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

Container voidage: -

Waste Characterisation Form (WCH): It is not yet determined if the waste meets LLWR's Waste Acceptance Criteria (WAC).

Waste consigned for disposal to LLWR in year of generation: Not yet determined.

**Non-Containerised Waste for In-Vault Grouting:**

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

**RADIOACTIVITY**

Source: Activation and/or contamination of mixed materials from facility area.

Uncertainty: Approximate estimates have been made of the total specific activities.

**WASTE STREAM****3K115****Care and Maintenance Preparations: Wet Fuel Route LLW**

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 beta/gamma emitting radionuclides plus 'other beta/gamma' not listed on the datasheet.

Measurement of radioactivities:

Calculations based on operational wastestreams. More detailed characterisation work will be undertaken as the arising of the waste gets closer.

Other information:

-

**WASTE STREAM 3K115 Care and Maintenance Preparations: Wet Fuel Route LLW**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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			1.12E-07	CC 2	Gd 153				
Be 10					Ho 163				
C 14			3.28E-08	CC 2	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36			8.27E-09	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			3.03E-06	CC 2	Pb 205				
Fe 55			3.46E-06	CC 2	Pb 210				
Co 60			1.16E-06	CC 2	Bi 208				
Ni 59					Bi 210m				
Ni 63			2.14E-06	CC 2	Po 210				
Zn 65			1.73E-08	CC 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90			2.96E-07	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94			4.93E-09	CC 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106			8.63E-07	CC 2	U 233				
Pd 107					U 234				
Ag 108m			6.93E-09	CC 2	U 235				
Ag 110m			6.67E-09	CC 2	U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238		8E-09	CC 2	
Sn 123					Pu 239		4.53E-09	CC 2	
Sn 126					Pu 240		1.09E-08	CC 2	
Sb 125			2.57E-08	CC 2	Pu 241		6.09E-07	CC 2	
Sb 126					Pu 242				
Te 125m					Am 241		3.67E-08	CC 2	
Te 127m					Am 242m				
I 129					Am 243				
Cs 134			3.18E-07	CC 2	Cm 242		1.93E-08	CC 2	
Cs 135					Cm 243				
Cs 137			1.58E-05	CC 2	Cm 244		1.6E-09	CC 2	
Ba 133			3.43E-08	CC 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144			2.99E-07	CC 2	Cf 249				
Pm 145					Cf 250				
Pm 147			1.03E-07	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152			2.28E-08	CC 2	Other b/g		1.20E-07	CC 2	
Eu 154			1.13E-08	CC 2	<b>Total a</b>	<b>0</b>	<b>8.11E-08</b>	<b>CC 2</b>	
Eu 155			1.32E-08	CC 2	<b>Total b/g</b>	<b>0</b>	<b>2.85E-05</b>	<b>CC 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