

WASTE STREAM	2D45	Magnox Fuel End Crops
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SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:	= 27.7			
Total future arisings:	0.0			
Total waste volume:	27.7			

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

Comment on arising rates: End-cropping of Tokai Mura fuel in FHP has now been completed. No further arisings are expected. TMECs will be removed from the pond after 2035.

Additional information on quantities: Volume known precisely as it is a static stock, but some uncertainty present due to unknown carry of inventory from end cropping process.

Uncertainty factors on volumes: Stock (upper): x 1.05 Arisings (upper): x -
Stock (lower): x 0.95 Arisings (lower): x -

WASTE SOURCE End crops from Magnox fuel elements.

PHYSICAL CHARACTERISTICS

General description: End crops comprise a cylinder (~50 x 50mm) composed of uranium and Magnox and containing a small disc of sintered alumina and a small zirconium plug. There are no large items present.

Changes since waste generated: The waste has not undergone any change since it was generated.

Bulk density (t/m³): = 1.5

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Magnox (25%), uranium (60%), zirconium (8%) and alumina (7%).

Chemical state: Neutral

Sheet metal proportion / thickness: No sheet metal. Bulk metal in the form of cylinders 50mm x 50mm.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	= 0	-	
Iron.....	= 0	-	
Aluminium.....	= 0	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 25.0	-	
Nickel.....	= 0	-	
Titanium.....	= 0	-	
Uranium.....	= 60.0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 8.0	-	
Other metals.....	= 0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 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.....	= 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.....	= 0	-	
Sand.....	= 0	-	
Glass/Ceramics.....	= 7.0	-	
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	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	= 0	-
Chloride.....	= 0	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	= 0	-
Nitrate.....	= 0	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	= 0	-
Sulphide.....	= 0	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	= 25.0	-
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.....	= 25.0	-
Higher activity particles.....	= 0	-
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....		-
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)		
Incineration		
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		= 100.0
None		

Comments on planned treatments:

-

Conditioning method:

To be determined.

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
	Sellafield enhanced 3 m³ box	100.0	-	-	-	-

Range in container waste loading:

Other information on packaging and conditioning: -

Conditioned density (t/m³): NE
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			
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			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known	= 100.0		

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: Fission products and actinides.

Uncertainty: The activity is calculated and is estimated to be within a factor of 50%.

Measurement of radioactivities: -

Chemical form of radionuclides:

- H-3: Present in elemental and reacted forms.
- C-14: Present in elemental and reacted forms.
- Cl-36: Unknown.
- Se-79: Present in elemental and reacted forms.
- Tc-99: Present in elemental and reacted forms.
- I-129: Unknown.
- Ra: Ra isotopes will exist in the metallic and oxide fuel.
- Th: -
- U: Present in metallic and reacted forms (oxides and hydrides).
- Np: Present in metallic and reacted forms.
- Pu: Present in metallic and reacted forms.

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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	3.04E-01	A A 2			Gd 153				
Be 10					Ho 163				
C 14	1.05E-03	A A 2			Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	1.41E-03	B B 2			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41	2.47E-03	A A 2			Pt 193				
Mn 53					Ti 204				
Mn 54	1.97E-10	A A 2			Pb 205				
Fe 55	2.30E-03	A A 2			Pb 210	6.21E-09	A A 2		
Co 60	1.81E-01	A A 2			Bi 208				
Ni 59	1.06E-04	A A 2			Bi 210m				
Ni 63	1.14E-02	A A 2			Po 210	5.94E-09	A A 2		
Zn 65	6.25E-11	A A 2			Ra 223	1.20E-07	A A 2		
Se 79					Ra 225	5.41E-11	A A 2		
Kr 81					Ra 226	2.34E-08	A A 2		
Kr 85	4.74E+00	A A 2			Ra 228	9.88E-13	A A 2		
Rb 87					Ac 227	1.20E-07	A A 2		
Sr 90	1.34E+02	A A 2			Th 227	1.18E-07	A A 2		
Zr 93	7.75E-03	A A 2			Th 228	8.57E-13	A A 2		
Nb 91					Th 229	5.43E-11	A A 2		
Nb 92					Th 230	3.25E-06	A A 2		
Nb 93m	5.36E-03	A A 2			Th 232	1.39E-12	A A 2		
Nb 94	1.47E-09	A A 2			Th 234	1.13E-02	A A 2		
Mo 93					Pa 231	2.85E-07	A A 2		
Tc 97					Pa 233	3.76E-04	A A 2		
Tc 99	5.43E-02	A A 2			U 232				
Ru 106	2.90E-05	A A 2			U 233	4.23E-08	A A 2		
Pd 107					U 234	1.02E-02	A A 2		
Ag 108m					U 235	3.17E-04	A A 2		
Ag 110m	8.38E-11	A A 2			U 236	1.01E-03	A A 2		
Cd 109					U 238	1.13E-02	A A 2		
Cd 113m					Np 237	3.76E-04	A A 2		
Sn 119m					Pu 236				
Sn 121m	1.47E-03	A A 2			Pu 238	8.75E-01	A A 2		
Sn 123	8.05E-19	A A 2			Pu 239	3.68E+00	A A 2		
Sn 126					Pu 240	3.43E+00	A A 2		
Sb 125	1.50E-02	A A 2			Pu 241	6.46E+01	A A 2		
Sb 126					Pu 242	1.23E-03	A A 2		
Te 125m	3.75E-03	A A 2			Am 241	7.19E+00	A A 2		
Te 127m	2.47E-23	A A 2			Am 242m	1.02E-02	A A 2		
I 129	9.68E-05	A A 2			Am 243	2.10E-03	A A 2		
Cs 134	5.88E-03	A A 2			Cm 242	8.43E-03	A A 2		
Cs 135					Cm 243				
Cs 137	1.84E+02	A A 2			Cm 244	1.16E-02	A A 2		
Ba 133					Cm 245	5.19E-07	A A 2		
La 137					Cm 246				
La 138					Cm 248				
Ce 144	1.35E-06	A A 2			Cf 249				
Pm 145					Cf 250				
Pm 147	3.78E-01	A A 2			Cf 251				
Sm 147	1.26E-08	A A 2			Cf 252				
Sm 151	1.10E+00	A A 2			Unsp a	3.67E+00	A A 2		
Eu 152	2.15E-02	A A 2			Unsp b/g	5.37E+01	A A 2		
Eu 154	6.24E-01	A A 2			Total a	1.89E+01	*	0	*
Eu 155	2.42E-01	A A 2			Total b/g	4.44E+02	*	0	*

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