

WASTE STREAM	9F45	Fuel Bottle
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SITE Sizewell A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:	< 0.1			
Total future arisings:	0.0			
Total waste volume:	< 0.1			

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

Comment on arising rates: -

Additional information on quantities: -

Uncertainty factors on volumes:

Stock (upper):	x 1.50	Arisings (upper):	x -
Stock (lower):	x 0.50	Arisings (lower):	x -

WASTE SOURCE

A leaking fuel element was removed from the reactor in November 2007 and placed inside a capped bottle to prevent excessive Cs-137/134 leaching into the ponds. The element was left in the bottle until June 2008 causing damage to the magnesium fuel can. Ion exchange resin cartridges were used to remove Cs-137/134 from the bottle prior to removing the element. The fuel element was intact when removed from the bottle and dispatched to Sellafield for reprocessing. High dose rates (>1Sv/hr) were observed on the bottle after the element was removed. The waste consists of the Fuel debris bottle, its cap containing ion exchange resin and an associated ion exchange resin column.

PHYSICAL CHARACTERISTICS

General description: Fuel Element Debris Bottle containing Fuel/Magnox residue, Fuel Element Debris Bottle cap containing ion exchange resin and spent ion exchange resin column.

Changes since waste generated: -

Bulk density (t/m³): = 1.2

Comment on density: Based on volume and mass assumptions made for waste constituents.

CHEMICAL COMPOSITION

General description and components (%wt): Fuel Element/Magnox can corrosion debris (1.62%), Ion Exchange Resin (0.58%), ABS (81.38%), Stainless Steel (16.09%), Polypropylene (0.03%), Polyethylene (0.04%), Retained Fluid (0.26%)

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 16.1	-	
Other ferrous metals.....	NE	-	
Iron.....		-	
Aluminium.....		-	
Beryllium.....		-	
Cobalt.....		-	
Copper.....		-	
Lead.....		-	
Magnox/Magnesium.....	NE	-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....		-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....		-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	= 0	-	
Paper, cotton.....	= 0	-	
Wood.....	= 0	-	
Halogenated plastics.....	= 0	-	
Total non-halogenated plastics.....	= 81.5	-	
Condensation polymers.....	= 81.5	ABS (81.38%), Polypropylene (0.03%), Polyethylene (0.04%)	
Others.....	= 0	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	= 0	-	
Halogenated rubber.....	= 0	-	
Non-halogenated rubber.....	= 0	-	
Hydrocarbons.....	-	-	
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.....	= 0.58	-	
Inorganic sludges and flocs.....	= 1.6	Fuel Element/Magnox can corrosion debris	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....		-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	0	Not applicable	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	~ 0.26	Retained Fluid (0.26%)	
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...	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...	-	-
Corrosive materials...	0	-
Pyrophoric materials...	0	-
Generating toxic gases...	0	-
Reacting with water...	0	-
Higher activity particles...	-	-
Soluble solids as bulk chemical compounds...	-	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
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 None	On-site	100.0

Comments on planned treatments:

-

Conditioning method:

-

Conditioning plants:

Plant Name	Location
SZA AVDS	Sizewell A

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
	500 l RS drum (0mm Pb)	100.0	0.03	0.49	1	-

Range in container waste loading: -

Other information on packaging and conditioning: -

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)	100.0		
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			
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			

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: Activity associated with leaking Fuel Element and associated clean-up/containment techniques. (i.e. resin media).

Uncertainty: -

Measurement of radioactivities: Inferred through gamma dose rate modelling and ratio to a reference radionuclide. Activity associated with this waste has been determined through dose-rate measurement and physical sampling.

Chemical form of radionuclides:

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

WASTE STREAM		9F45		Fuel Bottle					
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			8		Gd 153			8	
Be 10			8		Ho 163			8	
C 14			8		Ho 166m			8	
Na 22			8		Tm 170			8	
Al 26			8		Tm 171			8	
Cl 36			8		Lu 174			8	
Ar 39			8		Lu 176			8	
Ar 42			8		Hf 178n			8	8
K 40			8		Hf 182			8	
Ca 41			8		Pt 193			8	
Mn 53			8		Tl 204			8	
Mn 54			8		Pb 205			8	
Fe 55			8		Pb 210			8	
Co 60			8		Bi 208			8	
Ni 59			8		Bi 210m			8	
Ni 63			8		Po 210			8	
Zn 65			8		Ra 223			8	
Se 79			8		Ra 225			8	
Kr 81			8		Ra 226			8	
Kr 85	3.12E-01	C C	2		Ra 228			8	
Rb 87			8		Ac 227			8	
Sr 90	4.94E+00	C C	2		Th 227			8	
Zr 93			8		Th 228			8	
Nb 91			8		Th 229			8	
Nb 92			8		Th 230	1.83E-08	C C	2	
Nb 93m			8		Th 232			8	
Nb 94			8		Th 234			8	
Mo 93			8		Pa 231			8	
Tc 97			8		Pa 233	4.34E-07	C C	2	
Tc 99			8		U 232			8	
Ru 106	1.53E-04	C C	2		U 233			8	
Pd 107			8		U 234	2.23E-04	C C	2	
Ag 108m			8		U 235			8	
Ag 110m			8		U 236	2.85E-08	C C	2	
Cd 109			8		U 238			8	
Cd 113m			8		Np 237	4.41E-07	C C	2	
Sn 119m			8		Pu 236			8	
Sn 121m			8		Pu 238	1.07E-01	C C	2	
Sn 123			8		Pu 239	9.51E-02	C C	2	
Sn 126			8		Pu 240	1.07E-01	C C	2	
Sb 125	1.30E-02	C C	2		Pu 241	4.14E+00	C C	2	
Sb 126			8		Pu 242	5.98E-05	C C	2	
Te 125m	3.26E-03	C C	2		Am 241	1.85E-01	C C	2	
Te 127m			8		Am 242m	2.51E-03	C C	2	
I 129			8		Am 243	1.41E-04	C C	2	
Cs 134	7.75E-03	C C	2		Cm 242	2.07E-03	C C	2	
Cs 135			8		Cm 243	1.05E-04	C C	2	
Cs 137	1.91E+01	C C	2		Cm 244	1.68E-03	C C	2	
Ba 133			8		Cm 245			8	
La 137			8		Cm 246			8	
La 138			8		Cm 248			8	
Ce 144	9.05E-06	C C	2		Cf 249			8	
Pm 145			8		Cf 250			8	
Pm 147	2.13E-01	C C	2		Cf 251			8	
Sm 147			8		Cf 252			8	
Sm 151	4.50E-02	C C	2		Unsp a				
Eu 152	2.60E-03	C C	2		Unsp b/g				
Eu 154	6.10E-02	C C	2		Total a	4.98E-01	*	0	*
Eu 155	1.56E-02	C C	2		Total b/g	2.88E+01	*	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