

WASTE STREAM	8A05	Empty Uranium Hexafluoride Containers
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SITE Capenhurst

SITE OWNER Urenco

WASTE CUSTODIAN Urenco Nuclear Stewardship

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0		
Future arisings:	1.4.2028 - 31.3.2053	= 1776.0		
Total future arisings:		1776.0		
Total waste volume:		1776.0		

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

Comment on arising rates: Current forecast for operation of LCF plant is 25 years from 2028.

Additional information on quantities: The waste volume is calculated from data given on design drawings of the containers and is the volume of the whole cylinders prior to any size reduction or treatment. Numbers of containers for future arisings is taken from current stored UF6 material and raw volumes are calculated from the size of the cylinders. At present the forecast date is 2028-2053 and arisings will be assumed to be linear.

Uncertainty factors on volumes:

Stock (upper):	x -	Arisings (upper):	x 2.00
Stock (lower):	x -	Arisings (lower):	x 0.50

WASTE SOURCE Future arisings will be from containers currently used to store hex which will be emptied during deconversion process.

PHYSICAL CHARACTERISTICS

General description: The waste consists of steel containers internally contaminated with traces of depleted, natural and enriched uranium as UF6/UF4/UO2F2. No items require special handling.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.71

Comment on density: The density is assumed from calculated data.

CHEMICAL COMPOSITION

General description and components (%wt): Steel (>99%), UF6/UF4/UO2F2 (<1%).

Chemical state: Acid

Sheet metal proportion / thickness: Metal cylinders. Approximate dimensions 1m x 0.3m diameter, thickness 6mm. Future arisings will be made up of other sizes of cylinders but composition etc. will be the same.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	> 99.9	mild steel 100%	100.0
Iron.....	0	-	
Aluminium.....		-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....		-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....		-	
Titanium.....		-	
Uranium.....	< 0.10	Present as UF6/UF4/UO2F2 proportions unknown.	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 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.....	0	-	
Fuel.....	0	-	
Asphalt/Tarmac (cont.coal tar).....	0	-	
Asphalt/Tarmac (no coal tar).....	0	-	
Bitumen.....	0	-	
Others.....	0	-	
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.....	-	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	0	-	
Asbestos.....	= 0	-	
Non/low friable.....	0	-	
Moderately friable.....	0	-	
Highly friable.....	0	-	
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.....	< 0.10	-
Chloride.....	< 0.01	-
Iodide.....	< 0.01	-
Cyanide.....	NE	-
Carbonate.....	< 0.01	-
Nitrate.....	< 0.01	-
Nitrite.....	NE	-
Phosphate.....	< 0.01	-
Sulphate.....	< 0.01	-
Sulphide.....	< 0.01	-

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.....	0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	< 1.0	<1%
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.....	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.....	< 1.0	-

Complexing agents (%wt):

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

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	On-site	= 100.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment	On-site	= 100.0
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments:

After on site washing the cylinders will be sent for metals recycling - could be further decontamination or melting. For stocks recently disposed of, melting was the chosen option (so 100% given). No final decisions have been made on the future arisings as yet.

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
	-	-	-	-	-	-

Range in container waste loading:

Other information on packaging and conditioning: Final disposal route will depend on the success of the metals recycling process.

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			
Expected to be consigned to a Landfill Facility	= 1.0	~ 1.0	
Expected to be disposed On-Site	= 99.0	~ 7.8	
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: Contamination by uranium and daughters, with the possibility of Tc-99 in some of the containers.

Uncertainty: The specific activity data was measured for cylinders now disposed of. The future arisings have not yet been sampled so the existing data is assumed to apply. The accuracy is good for the measured data.

Measurement of radioactivities: Samples of 10% of the previous stocks of containers (now disposed of) have been analysed and this data has been used to calculate the specific activity for the existing containers and future arisings.

Chemical form of radionuclides:

H-3: -
C-14: Unknown.
Cl-36: -
Se-79: -
Tc-99: Present as TcO₂.
I-129: Unknown.
Ra: Unknown.
Th: Present as ThO₂, ThO₂F₂, ThF₄.
U: Present as UF₆/UF₄/UO₂F₂.
Np: Present as NpO₂/NpO₂F₂.
Pu: -

WASTE STREAM 8A05 Empty Uranium Hexafluoride Containers									
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					Gd 153				
Be 10					Ho 163				
C 14			~ 7.45E-10	C C 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Ti 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226			~ 8.94E-09	C C 1
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228			~ 1.27E-08	C C 1
Nb 91					Th 229				
Nb 92					Th 230			~ 1.15E-07	C C 1
Nb 93m					Th 232			~ 1.49E-09	C C 1
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99			~ 4.45E-07	C C 1	U 232			~ 3.65E-08	C C 1
Ru 106					U 233			~ 2.10E-07	C C 1
Pd 107					U 234			~ 1.21E-05	C C 1
Ag 108m					U 235			~ 5.14E-07	C C 1
Ag 110m					U 236			~ 1.65E-07	C C 1
Cd 109					U 238			~ 3.92E-06	C C 1
Cd 113m					Np 237			~ 2.16E-08	C C 1
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129			~ 4.26E-07	C C 1	Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	0	*	1.71E-05	*
Eu 155					Total b/g	0	*	8.72E-07	*

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