WASTE STREAM	9F43	FED Nimonic/Zirconium

SITE Sizewell A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m^3)
At 1.4.2025	< 0.1
Stocks:	
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**< 0.1**

OR

Conditioned (m^3)	Packaged (m^3)

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 1.10	Arisings (upper):	x -
Stock (lower):	x 0.90	Arisings (lower):	x -

WASTE SOURCE Nimonic springs and zirconium alloy components were originally incorporated into Magnox fuel element top end fittings. These components are accumlated as waste when the fuel elements are desplittered.

PHYSICAL CHARACTERISTICS

General description: The waste consists of Nimonic springs (5g) and zirconium alloy (4g) components of the Fuel Element Top End Fittings. The inventory data is based on equal numbers of Nimonic and zirconium alloy components; however there may be fewer zirconium alloy components present. The components are expected to be intact and there may also be a small amount of Magnox attached to these components.

Changes since waste generated: -

Bulk density (t/m³): = 2.2

Comment on density: The density is calculated from the mass of the components, and an estimate of the envelope volume of individual components.

CHEMICAL COMPOSITION

General description and components (%wt): Nimonic 55.6%, zirconium alloy 44.4%. There may be a small amount of Magnox material attached to these components.

Chemical state: Neutral

Sheet metal proportion / thickness: No bulk or sheet metallic items present

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	= 0	-	
Other ferrous metals……	= 0	-	
Iron……		-	
Aluminium……	= 0	-	
Beryllium……	0	-	
Cobalt……		-	
Copper……	= 0	-	
Lead……	= 0	-	
Magnox/Magnesium……	TR	There may be a small amount of Magnox material attached to these components.	
Nickel……	= 55.6	Present as Nimonic alloy.	
Titanium……		-	
Uranium……		-	
Zinc……	= 0	-	
Zircaloy/Zirconium……	= 44.4	-	
Other metals……	= 0	No "other" metals present.	

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	= 0	-	
Condensation polymers	= 0	-	
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	-	
Inorganic sludges and flocs		-	
Soil	= 0	-	
Brick/Stone/Rubble	= 0	-	
Cementitious material	= 0	-	
Sand		-	
Glass/Ceramics	= 0	-	
Graphite	TR	-	
Desiccants/Catalysts		-	
Asbestos	= 0	-	
Non/low friable		-	
Moderately friable		-	
Highly friable		-	
Free aqueous liquids		-	
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		-
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		-
Higher activity particles		-
Soluble solids as bulk chemical compounds		-

Hazardous substances / non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide		-
Benzene		-
Chlorinated solvents		-
Formaldehyde		-
Organometallics		-
Phenol		-
Styrene		-
Tri-butyl phosphate		-
Other organophosphates		-
Vinyl chloride		-
Arsenic		-
Barium		-
Boron	0	-
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		-
DPTA		-
NTA		-
Polycarboxylic acids		-
Other organic complexants		-
Total complexing agents	NE	-

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 (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
500 l RS drum (120mm Pb)	100.0	0.02	0.17	1	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m^3): ~ 2.2

Conditioned density comment: The conditioned density has not been assessed. The quoted value is an estimate.

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	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	100.0		
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: The Nimonic springs and zirconium alloy components of the Fuel Element Top End Fittings will contain activation products and also fission product contamination.

Uncertainty: The values quoted are derived from the activation calculations for Nimonic and Zirconium material using the Station operation history, and are indicative of the activity expected. The volume of the waste material is an estimate.

Measurement of radioactivities: The Nimonic springs and zirconium alloy Fuel Element Top End Fitting components are expected to be of high specific activity. Induced activity has been calculated.

Chemical form of radionuclides:

H-3: Tritium will probably be present as surface contamination, possibly as water or perhaps as other inorganic or organic compounds.
C-14: Carbon 14 is likely to be present in the form of graphite contamination.
Cl-36: Chlorine 36 may be present in surface contamination.
Se-79: The selenium content is insignificant.
Tc-99: The chemical form of technetium has not been determined.
I-129: -
Ra: The radium isotope content is insignificant.
Th: The thorium isotope content is insignificant.
U: Chemical form of uranium isotopes may be uranium oxides if present.
Np: The chemical form of neptunium has not been determined.
Pu: Chemical form of plutonium isotopes may be plutonium oxides if present.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	4.94E-03	C C 2			Gd 153		8		
Be 10	8.51E-09	C C 2			Ho 163	1.28E-07	C C 2		
C 14	2.75E-01	C C 2			Ho 166m	2.44E-06	C C 2		
Na 22		8			Tm 170		8		
Al 26	3.25E-08	C C 2			Tm 171	2.88E-09	C C 2		
Cl 36	1.94E-04	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n	8.42E-09	C C 2		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53	1.29E-08	C C 2			Tl 204	1.34E-05	C C 2		
Mn 54		8			Pb 205	1.20E-09	C C 2		
Fe 55	1.85E-02	C C 2			Pb 210		8		
Co 60	1.86E+01	C C 2			Bi 208		8		
Ni 59	1.44E+01	C C 2			Bi 210m		8		
Ni 63	1.31E+03	C C 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85	1.77E-09	C C 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	1.83E-04	C C 2			Th 227		8		
Zr 93	8.23E-05	C C 2			Th 228	3.29E-07	C C 2		
Nb 91	1.06E-08	C C 2			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	1.08E-04	C C 2			Th 232		8		
Nb 94	8.07E-06	C C 2			Th 234	1.82E-07	C C 2		
Mo 93	1.07E-06	C C 2			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	4.50E-07	C C 2			U 232	3.63E-07	C C 2		
Ru 106		8			U 233	8.25E-07	C C 2		
Pd 107		8			U 234	7.22E-07	C C 2		
Ag 108m		8			U 235	3.50E-09	C C 2		
Ag 110m		8			U 236	1.42E-08	C C 2		
Cd 109		8			U 238	1.82E-07	C C 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m	8.35E-06	C C 2			Pu 238	5.26E-06	C C 2		
Sn 123		8			Pu 239	4.98E-06	C C 2		
Sn 126		8			Pu 240	5.85E-06	C C 2		
Sb 125	1.12E-07	C C 2			Pu 241	1.44E-04	C C 2		
Sb 126		8			Pu 242	6.14E-08	C C 2		
Te 125m	2.82E-08	C C 2			Am 241	2.94E-05	C C 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	1.09E-08	C C 2			Cm 242		8		
Cs 135		8			Cm 243	2.48E-08	C C 2		
Cs 137	2.48E-04	C C 2			Cm 244	2.79E-07	C C 2		
Ba 133	1.62E-05	C C 2			Cm 245		8		
La 137	1.62E-08	C C 2			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	9.42E-07	C C 2			Cf 250		8		
Pm 147	2.84E-07	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	7.17E-05	C C 2			Unsp a				
Eu 152		8			Unsp b/g				
Eu 154		8			**Total a**	**4.83E-05**	*	**0**	*
Eu 155		8			**Total b/g**	**1.34E+03**	*	**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