

WASTE STREAM	3S06	Spent Resins (LLW)
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SITE Sizewell B

SITE OWNER EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE CUSTODIAN EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025 = 20.4			
Future arisings:	1.4.2025 - 31.3.2026 = 2.1			
	1.4.2026 - 31.3.2027 = 2.1			
	1.4.2027 - 31.3.2028 = 2.1			
	1.4.2028 - 31.3.2035 = 14.7			
	1.4.2035 - 31.3.2043 = 42.0			
Total future arisings:	63.0			
Total waste volume:	83.4			

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

Comment on arising rates: Unconditioned arisings are approximately 2.1m³/yr during operation and ~4.2m³/yr for 8 years after EoG. Plus 8.4m³ assumed to arise from primary circuit decontamination.

Additional information on quantities: Station operation is assumed to end in 2035.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper): x 1.50
Stock (lower): x 0.75 Arisings (lower): x 0.50

WASTE SOURCE This is process waste associated with clean-up of liquid radwaste and the refuelling pool.

PHYSICAL CHARACTERISTICS

General description: Sizewell B Power Station LLW resin comprises of a mixture of components of Purolite NRW-3240 and Amberlite IRM9882 ion exchange (IEX) resins. Purolite NRW-3240 is a nuclear grade mixed bed gel-type IEX resin. Activity levels are expected to vary considerably depending upon the ratio of resins from the various sources. The ion exchange resin is accumulated under water in tanks. It is easily pumped and has good settling characteristics.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.36

Comment on density: Density from WCH for Raw Waste.

CHEMICAL COMPOSITION

General description and components (%wt): Composition appropriate to proprietary resins, which will be organic polystyrene resins (100%).

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

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

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.....	= 100.0	-	
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.....	TR	-	

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.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	= 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	P	-	
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.....	= 0	-
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:

	(%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.....	= 2.5	WCH quotes 143 kg in raw weight of 5.78 tonne.
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.....	= 0.22	Lithium - WCH quotes 13 kg in raw weight of 5.78 tonne.

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	Complexing agents may be present in trace quantities.
Total complexing agents.....	TR	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
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	On-site	= 100.0
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		

Comments on planned treatments:

Conditioning method: Prior to disposal the 400L drums of conditioned resin will be encapsulated into half height ISO containers at LLWR. Filters from 3S08 will be co disposed in the spaces between drums.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

Further information on the conditioning matrix:

The formulation of cement used for LLW encapsulation is the same as that proposed for both ILW and LLW encapsulation during plant design. Known as Bthin, it consists of 20 wt % LLW resin (drained equivalent) in 9:1 BFS/ OPC, water:cement (w/c) = 0.37 and water : solid sodium hydroxide (w/NaOH(s))=7.13.

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	100.0	5.0	18.3	17	-

Range in container waste loading: Waste loading is based on approximately 20 x 400L drums loaded into each half-height ISO container. Each drum with approx 0.239m³ of resin. Filters from 3S08 will be co disposed in the spaces between drums.

Other information on packaging and conditioning:

The resins will be conditioned into uncompactable 400L drums. The approximate overall % composition by weight and volume of the waste is:
Metal (Mild steel drum & sacrificial paddle) 12% weight 1% volume
Concrete 77% weight 59% volume
Resin 11% weight 40% volume
These will then be loaded into half height ISO containers.

Conditioned density (t/m³):
Conditioned density comment:

= 2.1
Based on WCH data.

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: Spent ion exchange resin. Contamination by fission products, actinides and activation products.

Uncertainty: The activity values quoted are indicative of the activities that may be expected and are obtained from the waste stream characterisation document. There is a higher level of uncertainty for activity in future arisings.

Measurement of radioactivities: Activity estimates are based on fingerprint of waste stream and on dose rate measurements of drummed waste.

Chemical form
of radionuclides:

H-3: In interstitial water.
C-14: Trace quantities may exist adsorbed onto the resin beads see WCH for more detail.
Cl-36: Not expected to be present in any measurable quantity.
Se-79: Not expected to be present in any measurable quantity.
Tc-99: Not expected to be present in any measurable quantity.
I-129: Not expected to be present in any measurable quantity.
Ra: Not expected to be present in any measurable quantity.
Th: Not expected to be present in any measurable quantity.
U: Trace quantities may exist adsorbed onto the resin beads, probably as salts. Detailed analysis still awaited.

Np: Not expected to be present in any measurable quantity.
Pu: Trace quantities may exist adsorbed onto the resin beads, probably as salts. Detailed analysis still awaited.

WASTE STREAM		3S06		Spent Resins (LLW)						
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		8	Gd 153		8		8
Be 10			8		8	Ho 163		8		8
C 14	1.55E-04	C C 2		1.55E-04	C C 2	Ho 166m		8		8
Na 22			8		8	Tm 170		8		8
Al 26			8		8	Tm 171		8		8
Cl 36			8		8	Lu 174		8		8
Ar 39			8		8	Lu 176		8		8
Ar 42			8		8	Hf 178n		8		8
K 40			8		8	Hf 182		8		8
Ca 41			8		8	Pt 193		8		8
Mn 53			8		8	Tl 204		8		8
Mn 54	2.75E-06	C C 2		2.75E-06	C C 2	Pb 205		8		8
Fe 55	4.06E-05	C C 2		4.06E-05	C C 2	Pb 210		8		8
Co 60	5.02E-04	C C 2		5.02E-04	C C 2	Bi 208		8		8
Ni 59			8		8	Bi 210m		8		8
Ni 63	9.56E-04	C C 2		9.56E-04	C C 2	Po 210		8		8
Zn 65	4.00E-08	C C 2		4.00E-08	C C 2	Ra 223		8		8
Se 79			8		8	Ra 225		8		8
Kr 81			8		8	Ra 226		8		8
Kr 85			8		8	Ra 228		8		8
Rb 87			8		8	Ac 227		8		8
Sr 90	2.94E-06	C C 2		2.94E-06	C C 2	Th 227		8		8
Zr 93			8		8	Th 228		8		8
Nb 91			8		8	Th 229		8		8
Nb 92			8		8	Th 230		8		8
Nb 93m			8		8	Th 232		8		8
Nb 94			8		8	Th 234		8		8
Mo 93			8		8	Pa 231		8		8
Tc 97			8		8	Pa 233		8		8
Tc 99			8		8	U 232		8		8
Ru 106	1.88E-07	C C 2		1.88E-07	C C 2	U 233		8		8
Pd 107			8		8	U 234		8		8
Ag 108m	5.63E-07	C C 2		5.63E-07	C C 2	U 235		8		8
Ag 110m	1.25E-08	C C 2		1.25E-08	C C 2	U 236		8		8
Cd 109			8		8	U 238		8		8
Cd 113m			8		8	Np 237		8		8
Sn 119m			8		8	Pu 236		8		8
Sn 121m			8		8	Pu 238	9.63E-08	C C 2	9.63E-08	C C 2
Sn 123			8		8	Pu 239	5.94E-08	C C 2	5.94E-08	C C 2
Sn 126			8		8	Pu 240	5.94E-08	C C 2	5.94E-08	C C 2
Sb 125	3.75E-05	C C 2		3.75E-05	C C 2	Pu 241	3.56E-06	C C 2	3.56E-06	C C 2
Sb 126			8		8	Pu 242		8		8
Te 125m			8		8	Am 241	1.25E-07	C C 2	1.25E-07	C C 2
Te 127m			8		8	Am 242m		8		8
I 129	1.30E-04	C C 2		1.30E-04	C C 2	Am 243		8		8
Cs 134	7.75E-06	C C 2		7.75E-06	C C 2	Cm 242	6.25E-08	C C 2	6.25E-08	C C 2
Cs 135			8		8	Cm 243	1.25E-07	C C 2	1.25E-07	C C 2
Cs 137	7.62E-04	C C 2		7.62E-04	C C 2	Cm 244	6.25E-08	C C 2	6.25E-08	C C 2
Ba 133			8		8	Cm 245		8		8
La 137			8		8	Cm 246		8		8
La 138			8		8	Cm 248		8		8
Ce 144	3.75E-08	C C 2		3.75E-08	C C 2	Cf 249		8		8
Pm 145			8		8	Cf 250		8		8
Pm 147			8		8	Cf 251		8		8
Sm 147			8		8	Cf 252		8		8
Sm 151			8		8	Unsp a				
Eu 152			8		8	Unsp b/g				
Eu 154			8		8	Total a	5.90E-07	*	5.90E-07	*
Eu 155			8		8	Total b/g	2.60E-03	*	2.60E-03	*

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