WASTE STREAM	3M24	Dry Carbonaceous Debris

SITE Heysham 2

SITE OWNER EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE CUSTODIAN EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE TYPE ILW

WASTE VOLUMES

		Reported (m^3)
Stocks:	At 1.4.2025	= 0
Future arisings:	1.4.2025 - 31.3.2034	= 0
	1.4.2034 - 31.3.2035	= 0.2
	1.4.2035 - 31.3.2036	= 0.2
	1.4.2036 - 31.3.2037	= 0.2
	1.4.2037 - 31.3.2038	= 0.2
	1.4.2038 - 31.3.2039	= 0.2
Total future arisings:		**1.0**
Total waste volume:		**1.0**

OR

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

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

Comment on arising rates: Waste will arise as plant is dismantled. A future arising of 1m3 is conservatively assumed during Care and Maintenance Preperaions. Further quantities of this material will also arise during reactor dismantling circa 85 years after EoG, however this is bounded by the Final SIte Clearance waste streams (300s)

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.75
Stock (lower): x - Arisings (lower): x 0.25

WASTE SOURCE From the point at which the AGRs came into operation in the 1970s and 1980s carbonaceous debris has been accumulating in the primary coolant circuit of all the AGRs.

PHYSICAL CHARACTERISTICS

General description: Fine powder, granular and flaked material. The inventory also includes some clustering of the smaller particulates into larger dense lumps from the presence of an oily substance.

Changes since waste generated: -

Bulk density (t/m^3): ~ 0.65

Comment on density: Density is provided in the Cavendish Nuclear, 2013, Technical Report for EDF Carbonaceous Debris Inventory Derivation Methodology (Reference P0031-11470-001 - Issue Number 02), see S3.2.1.

CHEMICAL COMPOSITION

General description and components (%wt): Not yet determined

Chemical state: Neutral

Sheet metal proportion / thickness: Not yet determined

Metals and alloys (%wt):

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

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics		-	
Paper, cotton		-	
Wood		-	
Halogenated plastics		-	
Total non-halogenated plastics		-	
Condensation polymers		-	
Others		-	
Organic ion exchange materials		-	
Total rubber		-	
Halogenated rubber		-	
Non-halogenated rubber		-	
Hydrocarbons		-	
Oil or grease		-	
Fuel		-	
Asphalt/Tarmac (cont.coal tar)		-	
Asphalt/Tarmac (no coal tar)		-	
Bitumen		-	
Others		-	
Other organics		-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials		-	
Inorganic sludges and flocs		-	
Soil		-	
Brick/Stone/Rubble		-	
Cementitious material		-	
Sand		-	
Glass/Ceramics		-	
Graphite		-	
Desiccants/Catalysts		-	
Asbestos		-	
Non/low friable		-	
Moderately friable		-	
Highly friable		-	
Free aqueous liquids		-	
Free non-aqueous liquids		-	
Powder/Ash		-	

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals		-
Low flash point liquids		-
Explosive materials		-
Phosphorus		-
Hydrides		-
Biological etc. materials		-
Biodegradable materials		-
Putrescible wastes		-
Non-putrescible wastes		-
Corrosive materials		-
Pyrophoric materials		-
Generating toxic gases		-
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		-
Boron (in Boral)		-
Boron (non-Boral)		-
Cadmium		-
Caesium		-
Selenium		-
Chromium		-
Molybdenum		-
Thallium		-
Tin		-
Vanadium		-
Mercury compounds		-
Others		-

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	= 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		
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	On-site	= 100.0
None		

Comments on planned treatments: An Operational Waste Procesing Facility (OWPF) will be designed or where a suitable alternative is available, this will be utilised to condition and package the ILW arising during C&M Preperations.

Conditioning method: Not yet determined

Conditioning plants:

Plant Name	Location
Heysham 2 Operational Waste Processing Facility (OWPF)	Heysham 2

Likely conditioning matrix: -

Further information on the conditioning matrix: To be determined

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
Not yet determined	100.0	-	-	-	-

Range in container waste loading: To be determined

Other information on packaging and conditioning: -

Conditioned density (t/m^3): NE
Conditioned density comment: -

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 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: Not yet determined

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Irradiated dust and spalled oxide, originating from the reactor core and boilers that is deposited in the reactor gas pipework external to the reactor.

Uncertainty: Specific activities calculated using Cavendish Nuclear, 2013, Technical Report for EDF Carbonaceous Debris Inventory Derivation Methodology (Reference P0031-11470-001 - Issue Number 02). Using radionuclide inventory and operational mass and volume per station (Tables 3 and 5).

Measurement of radioactivities: Specific activities calculated using Cavendish Nuclear, 2013, Technical Report for EDF Carbonaceous Debris Inventory Derivation Methodology (Reference P0031-11470-001 - Issue Number 02). Using radionuclide inventory and operational mass and volume per station (Tables 3 and 5). Other b/g includes: S-35, Ca-45, Sc-46, Cr-51, Fe-59, Co-57, Co-58, Se-75, Sb-124 and W-181.

Chemical form of radionuclides:

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

WASTE STREAM **3M24** **Dry Carbonaceous Debris**

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			1.28E-01	C C 2	Gd 153				
Be 10					Ho 163				
C 14			1.12E-02	C C 2	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36			3.16E-06	C C 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54			1.47E-02	C C 2	Pb 205				
Fe 55			1.14E+00	C C 2	Pb 210				
Co 60			5.14E-02	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63			7.03E-02	C C 2	Po 210				
Zn 65			2.27E-03	C C 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90			3.91E-05	C C 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m			8.79E-04	C C 2	U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238			4.78E-08	C C 2
Sn 123					Pu 239			4.26E-05	C C 2
Sn 126					Pu 240			2.45E-05	C C 2
Sb 125					Pu 241			7.88E-06	C C 2
Sb 126					Pu 242				
Te 125m					Am 241			1.10E-07	C C 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134			7.55E-05	C C 2	Cm 242			5.18E-07	C C 2
Cs 135					Cm 243			3.07E-07	C C 2
Cs 137			1.56E-04	C C 2	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147			9.12E-06	C C 2	Cf 251				
Sm 147					Cf 252				
Sm 151			1.92E-06	C C 2	Unsp a				
Eu 152			2.37E-04	C C 2	Unsp b/g			5.17E-02	C C 2
Eu 154			4.13E-05	C C 2	**Total a**	**0**	*	**6.81E-05**	*
Eu 155					**Total b/g**	**0**	*	**1.47E+00**	*

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