WASTE STREAM 9F14 Desiccant and Catalyst from Gas Conditioning Plant

SITE	Sizewell A
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Magnox Limited
WASTE TYPE	ILW
Is the waste subject to Scottish Policy:	No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	4.9 m^3
Total future arisings:		0 m^3
Total waste volume:		4.9 m^3

Comment on volumes: -

Uncertainty factors on volumes:				
	Stock (upper):	x 1.1	Arisings (upper)	x
	Stock (lower):	x 0.9	Arisings (lower)	x

WASTE SOURCE Reactor gas driers (humidriers) - desiccant removal. Also some catalyst from the recombination units in the Gas Conditioning Plant.

PHYSICAL CHARACTERISTICS

General description:	Desiccant pellets stored in the Reactor Gas Driers and Gas Conditioning Plant. There are no large items. Waste is expected to be placed in neoprene liners on retrieval from the plant
Physical components (%vol):	Desiccant pellets (82%), catalyst pellets (12%), neoprene drum liners (6%). 4m3 Desiccant, 0.6m3 catalyst, 0.3m3 neoprene liners
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m^3):	0.8
Comment on density:	Density of desiccant measured as 0.84 g/cc. Density of catalyst measured as 0.8 g/cc.

CHEMICAL COMPOSITION

General description and components (%wt):	Desiccant: molecular sieve (sodium aluminium silicate), catalyst (platinum on alumina) and neoprene drum liners.
Chemical state:	Neutral
Chemical form of radionuclides:	H-3: Tritium is expected to be present as water. Some may also be present in other inorganic or organic compounds. C-14: The carbon 14 content is insignificant. Cl-36: The chemical form of chlorine 36 has not been determined. Se-79: The selenium content is insignificant. Tc-99: The technetium content is insignificant. Ra: The radium isotope content is insignificant. Th: The thorium isotope content is insignificant. U: The uranium isotope content is insignificant. Np: The neptunium content is insignificant. Pu: The plutonium isotope content is insignificant.
Metals and alloys (%wt):	No bulk or sheet metal items present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	0		
Beryllium.....	0		
Cobalt.....			
Copper.....	0		

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Lead	0	
Magnox/Magnesium	0	
Nickel		
Titanium		
Uranium		
Zinc	0	
Zircaloy/Zirconium	0	
Other metals	NE	Platinium associated with the catalyst.

Organics (%wt): The only organic material is a neoprene drum liner.

	(%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	6.0		
Halogenated rubber	6.0	neoprene drum liner	
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	0		
Soil	0		
Brick/Stone/Rubble	0		
Cementitious material	0		
Sand			
Glass/Ceramics	0		
Graphite	0		
Desiccants/Catalysts	94.0	Desiccant pellets (82%), catalyst pellets (12%)	100.0

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Asbestos	0
Non/low friable	
Moderately friable	
Highly friable	
Free aqueous liquids	0
Free non-aqueous liquids	0
Powder/Ash	TR

Inorganic anions (%wt): Silicate is present, other inorganic anions are not fully assessed.

	(%wt)	Type(s) and comment
Fluoride	NE	
Chloride	NE	
Iodide	NE	
Cyanide	0	
Carbonate	NE	
Nitrate	NE	
Nitrite	NE	
Phosphate	NE	
Sulphate	NE	
Sulphide	NE	

Materials of interest for waste acceptance criteria: Powder may be present in trace quantities.

	(%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: none expected

	(%wt)	Type(s) and comment
Acrylamide		

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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.....

Electronic Electrical Equipment (EEE)

EEE Type 1.....

EEE Type 2.....

EEE Type 3.....

EEE Type 4.....

EEE Type 5.....

Complexing agents (%wt): No

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids…….

Other organic complexants.....

Total complexing agents..... 0

Potential for the waste to contain discrete items: No. In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

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TREATMENT, PACKAGING AND DISPOSAL

Waste that is currently ILW: The waste is planned to be washed and incinerated with an alternative option of decay storage being investigated

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recyling / reuse Other / various None	Off-site	100.0

Comment on planned treatments: Intention is to wash prior to incineration to reduce tritium burden, residual ash to be disposed of as VLLW.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0	0.80

Classification codes for waste expected to be consigned to a landfill facility: -

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

Waste Packaging for Disposal: (Not applicable to this waste stream)

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Container	Stream volume %	Waste loading m³	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO			
1/2 Height IP-2 Disposal/Re-usable ISO			
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: -

Waste Planned for Disposal at the LLW Repository: (Not applicable to this waste stream)

Container voidage: -

-

Waste consigned for disposal to LLWR in year of generation: No. Waste still to be retrieved from plant

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

RADIOACTIVITY

Source: The waste is exhausted desiccant and catalyst from the reactor gas drier system. The main source of activity is from tritium.

Uncertainty: Activity estimates are considered to be accurate to a factor of 10.

Definition of total alpha and total beta/gamma: Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities: Activities have been measured.

Other information: Mn 54 and Fe 55 may be present in trace quantities. Specific activity is a function of operating history.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	7.28E-02	C C 1			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	3.54E-05	C C 1			Ho 166m		8		
Na 22					Tm 170		8		
Al 26					Tm 171		8		
Cl 36	1.57E-04	C C 1			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		6			Pb 205		8		
Fe 55	2.00E-07	C C 1			Pb 210		8		
Co 60	1.05E-07	C C 1			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	3.25E-08	C C 1			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	8.65E-06	C C 1			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234		8		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234		8		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238		8		
Sn 123		8			Pu 239		8		
Sn 126		8			Pu 240		8		
Sb 125		8			Pu 241	3.47E-09	C C 1		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241		8		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	2.04E-07	C C 1			Cm 242		8		
Cs 135		8			Cm 243		8		
Cs 137	2.42E-08	C C 1			Cm 244		8		
Ba 133		8			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	3.23E-07	C C 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	6.03E-09	C C 1			Other b/g				
Eu 154	3.18E-06	C C 1			**Total a**	**0**		**0**	
Eu 155	9.44E-07	C C 1			**Total b/g**	**7.30E-02**	**C C 1**	**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 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