

WASTE STREAM	4C01	Catalyst
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SITE Torness

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m ³
Future arisings -	1.4.2019 - 31.3.2030.....	0 m ³
	1.4.2030 - 31.3.2032.....	0 m ³
	1.4.2032 - 31.3.2033.....	6.0 m ³
	1.4.2033 - 31.3.2034.....	3.4 m ³
Total future arisings:		9.4 m ³
Total waste volume:		9.4 m ³

Comment on volumes: Waste volumes will be variable depending on station operating conditions.

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

WASTE SOURCE Catalyst used for recombination of carbon dioxide reactor coolant.

PHYSICAL CHARACTERISTICS

General description: Exhausted catalyst 0.3 wt% platinum on 2/5mm diameter alumina catalyst cylinders. There are no large items that require special handling.

Physical components (%wt): Catalyst (100%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: Waste density is an estimate.

CHEMICAL COMPOSITION

General description and components (%wt): The catalyst is granular alumina-platinum. Alumina platinum catalyst (100% wt).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Incorporated into material
C-14: May be present as Graphite contamination
Cl-36: Not expected to be present in significant quantities
Se-79: Not expected to be present in significant quantities
Tc-99: Not expected to be present in significant quantities
I-129: Not expected to be present in significant quantities
Ra: Not expected to be present in significant quantities
Th: Not expected to be present in significant quantities
U: Not expected to be present in significant quantities
Np: Not expected to be present in significant quantities
Pu: Not expected to be present in significant quantities

Metals and alloys (%wt): Not expected to be present.

Stainless steel.....	0
Other ferrous metals.....	0
Iron.....	0
Aluminium.....	0
Beryllium.....	0
Cobalt.....	0
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0

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Nickel..... 0
 Titanium..... 0
 Uranium..... 0
 Zinc..... 0
 Zircaloy/Zirconium..... 0
 Other metals..... ~0.30

The waste contains platinum in small amounts.

Organics (%wt):

There are no organic materials present. This waste is not expected to contain any halogenated plastics and rubbers.

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
 Fuel.....
 Asphalt/Tarmac (cont.coal tar)...
 Asphalt/Tarmac (no coal tar)....
 Bitumen.....
 Others.....
 Other organics..... 0

Other materials (%wt):

Approximately 100wt% alumina base granule.
 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..... 99.7
 Asbestos..... 0
 Non/low friable.....
 Moderately friable.....
 Highly friable.....
 Free aqueous liquids..... 0
 Free non-aqueous liquids..... 0

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Powder/Ash..... 0

Inorganic anions (%wt): The waste contains no inorganic anions.

Fluoride..... 0

Chloride..... 0

Iodide..... 0

Cyanide..... 0

Carbonate..... 0

Nitrate..... 0

Nitrite..... 0

Phosphate..... 0

Sulphate..... 0

Sulphide..... 0

Materials of interest for waste acceptance criteria: There are no hazardous materials present.

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

Active particles..... 0

Soluble solids as bulk chemical compounds..... 0

Not expected

Hazardous substances / non hazardous pollutants: This waste is not expected to contain any listed substances.

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

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Barium.....	NE
Boron.....	NE
Cadmium.....	NE
Caesium.....	NE
Selenium.....	NE
Chromium.....	NE
Molybdenum.....	NE
Thallium.....	NE
Tin.....	NE
Vanadium.....	NE
Mercury compounds.....	NE
Others.....	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	0
EEE Type 2.....	0
EEE Type 3.....	0
EEE Type 4.....	0
EEE Type 5.....	0
Complexing agents (%wt):	No
EDTA.....	NE
DPTA.....	NE
NTA.....	NE
Polycarboxylic acids.....	NE
Other organic complexants.....	NE
Total complexing agents.....	NE

The waste contains no complexing agents.

LAW TREATMENT, PACKAGING AND DISPOSAL

Waste that is currently ILW: This waste is ILW at the time of arising. The waste is stored temporarily to allow decay of short lived radionuclides, following this, the waste is sent for decontamination to LLW. No date specified.

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

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

Comment on planned treatments:

Current waste treatment is to decontaminated to LLW and then encapsulated. However, trials are ongoing to consider a change in strategy to wash and incinerate.

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Disposal Routes:	Disposal Route	Stream volume %
		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

Upcoming (2019/20-2021/22) waste routing (if expected to change from above)

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
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			

Waste Packaging for Disposal:

Container	Stream volume %	Waste loading m ³	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	100.0	~9.08	2

Other information: Waste loading is based on 9.1 tonnes per half-height ISO. This gives a conditioning factor of approximately 1.62.

Waste Consigned to the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): The waste does not meet the LLWR's Waste Acceptance Criteria (WAC).

Does not meet WAC until catalyst is decontaminated.

Waste consigned for disposal to LLWR in year of generation: No. Waste is ILW when generated and needs decontaminating to LLW .

Potential for the waste to contain discrete items: No

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

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume: -

Inaccessible voidage: -

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Other information: -

RADIOACTIVITY

Source: Principally activation products Co-60, H-3, S-35.

Uncertainty: Activity data not yet assessed.

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: Not yet determined

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3			2E-01	C C 2	Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22				4	Tm 170				
Al 26				4	Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54			4E-07	D D 2	Pb 205				
Fe 55			2E-06	D D 2	Pb 210				
Co 60			3E-07	D D 2	Bi 208				
Ni 59					Bi 210m				
Ni 63			3E-07	D D 2	Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					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					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
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					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					Other a				
Eu 152					Other b/g		5E-01	D D 2	
Eu 154					Total a		<1E-09	8	
Eu 155					Total b/g		7E-01	C C 2	

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