

WASTE STREAM**3T05****LLW Steam Generator Blowdown Ion Exchange Resin**

SITE Hinkley Point C
SITE OWNER NNB GenCo (HPC) Ltd
WASTE CUSTODIAN NNB GenCo (HPC) Ltd

WASTE TYPE LLW

Is the waste subject to
 Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	0 m ³
Future arisings -	1.4.2027 - 31.3.2028.....	~15.0 m ³
	1.4.2028 - 31.3.2029.....	~15.0 m ³
	1.4.2029 - 31.3.2030.....	~15.0 m ³
	1.4.2030 - 31.3.2031.....	~15.0 m ³
	1.4.2031 - 31.3.2032.....	~15.0 m ³
	1.4.2032 - 31.3.2033.....	~15.0 m ³
	1.4.2033 - 31.3.2034.....	~15.0 m ³
	1.4.2034 - 31.3.2035.....	~15.0 m ³
	1.4.2035 - 31.3.2036.....	~15.0 m ³
	1.4.2036 - 31.3.2037.....	~15.0 m ³
	1.4.2037 - 31.3.2038.....	~15.0 m ³
	1.4.2038 - 31.3.2039.....	~15.0 m ³
	1.4.2039 - 31.3.2040.....	~15.0 m ³
	1.4.2040 - 31.3.2041.....	~15.0 m ³
	1.4.2041 - 31.3.2042.....	~15.0 m ³
	1.4.2042 - 31.3.2043.....	~15.0 m ³
	1.4.2043 - 31.3.2044.....	~15.0 m ³
	1.4.2044 - 31.3.2045.....	~15.0 m ³
	1.4.2045 - 31.3.2046.....	~15.0 m ³
	1.4.2046 - 31.3.2047.....	~15.0 m ³
	1.4.2047 - 31.3.2048.....	~15.0 m ³
	1.4.2048 - 31.3.2049.....	~15.0 m ³
	1.4.2049 - 31.3.2050.....	~15.0 m ³
	1.4.2050 - 31.3.2051.....	~15.0 m ³
	1.4.2051 - 31.3.2052.....	~15.0 m ³
	1.4.2052 - 31.3.2053.....	~15.0 m ³
	1.4.2053 - 31.3.2054.....	~15.0 m ³
	1.4.2054 - 31.3.2055.....	~15.0 m ³
	1.4.2055 - 31.3.2056.....	~15.0 m ³
	1.4.2056 - 31.3.2057.....	~15.0 m ³
	1.4.2057 - 31.3.2058.....	~15.0 m ³
	1.4.2058 - 31.3.2059.....	~15.0 m ³
	1.4.2059 - 31.3.2060.....	~15.0 m ³
	1.4.2060 - 31.3.2061.....	~15.0 m ³
	1.4.2061 - 31.3.2062.....	~15.0 m ³
	1.4.2062 - 31.3.2063.....	~15.0 m ³
	1.4.2063 - 31.3.2064.....	~15.0 m ³
	1.4.2064 - 31.3.2065.....	~15.0 m ³
	1.4.2065 - 31.3.2066.....	~15.0 m ³
	1.4.2066 - 31.3.2067.....	~15.0 m ³
	1.4.2067 - 31.3.2068.....	~15.0 m ³
	1.4.2068 - 31.3.2069.....	~15.0 m ³
	1.4.2069 - 31.3.2070.....	~15.0 m ³
	1.4.2070 - 31.3.2071.....	~15.0 m ³
	1.4.2071 - 31.3.2072.....	~15.0 m ³
	1.4.2072 - 31.3.2073.....	~15.0 m ³
	1.4.2073 - 31.3.2074.....	~15.0 m ³
	1.4.2074 - 31.3.2075.....	~15.0 m ³

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1.4.2075 - 31.3.2076.....	~15.0 m ³
1.4.2076 - 31.3.2077.....	~15.0 m ³
1.4.2077 - 31.3.2078.....	~15.0 m ³
1.4.2078 - 31.3.2079.....	~15.0 m ³
1.4.2079 - 31.3.2080.....	~15.0 m ³
1.4.2080 - 31.3.2081.....	~15.0 m ³
1.4.2081 - 31.3.2082.....	~15.0 m ³
1.4.2082 - 31.3.2083.....	~15.0 m ³
1.4.2083 - 31.3.2084.....	~15.0 m ³
1.4.2084 - 31.3.2085.....	~15.0 m ³
1.4.2085 - 31.3.2086.....	~15.0 m ³
1.4.2086 - 31.3.2087.....	~15.0 m ³

Total future arisings: 900.0 m³

Total waste volume: 900.0 m³

Comment on volumes: All future arisings, no legacy waste for disposal No uncertainty data currently available.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.0
 Stock (lower): x Arisings (lower) x 1.0

WASTE SOURCE

Ion exchange beds are utilised in the APG [SGBS] to control the chemistry of the secondary circuit and to address potential leakages of activation and fission products from the primary coolant circuit. In recycling the APG [SGBS] blowdown water from the UK EPR secondary circuit, the blowdown water is purified by the use of two parallel filters for the removal of suspended solids and two parallel demineralisation lines which use ion exchange resins to perform the demineralisation.

PHYSICAL CHARACTERISTICS

General description: The resins that comprise this waste stream consist of balls or grains (diameter ranges between 0.3 – 1.2 mm) of organic resins with polystyrenic, phenolic, acrylic or formophenolic skeleton (cationic resins strongly acid, anionic resins strongly basic and mixed bed). Once the waste is generated, it will be sent off-site for most appropriate treatment / disposal.

Physical components (%vol): Ion exchange resin (100%wt).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Ion exchange resin (100%wt).

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): -

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

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Nickel..... NE
 Titanium..... NE
 Uranium..... NE
 Zinc..... NE
 Zircaloy/Zirconium..... NE
 Other metals..... NE

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....			
Paper, cotton.....			
Wood.....			
Halogenated plastics			
Total non-halogenated plastics.....			
Condensation polymers.....			
Others.....			
Organic ion exchange materials....	~100.0		
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..	NE		
Inorganic sludges and flocs.....	NE		
Soil.....	NE		
Brick/Stone/Rubble.....	NE		
Cementitious material.....	NE		
Sand.....	NE		
Glass/Ceramics.....	NE		
Graphite.....	NE		
Desiccants/Catalysts.....	NE		
Asbestos.....	NE		
Non/low friable.....	NE		
Moderately friable.....	NE		

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Highly friable.....	NE
Free aqueous liquids.....	NE
Free non-aqueous liquids.....	NE
Powder/Ash.....	NE

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.....	NE	
Low flash point liquids.....	NE	
Explosive materials.....	NE	
Phosphorus.....	NE	
Hydrides.....	NE	
Biological etc. materials.....	NE	
Biodegradable materials.....	NE	
Putrescible wastes.....	NE	
Non-putrescible wastes.....	NE	
Corrosive materials.....	NE	
Pyrophoric materials.....	NE	
Generating toxic gases.....	NE	
Reacting with water.....	NE	
Higher activity particles.....	NE	
Soluble solids as bulk chemical compounds.....	NE	

Hazardous substances / non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide.....	NE	
Benzene.....	NE	
Chlorinated solvents.....	NE	
Formaldehyde.....	NE	

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Organometallics.....	NE
Phenol.....	NE
Styrene.....	NE
Tri-butyl phosphate.....	NE
Other organophosphates.....	NE
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	NE
Boron.....	NE
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.....	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	NE
EEE Type 2.....	NE
EEE Type 3.....	NE
EEE Type 4.....	NE
EEE Type 5.....	NE

Complexing agents (%wt): No

(%wt) Type(s) and comment

EDTA.....	
DPTA.....	
NTA.....	
Polycarboxylic acids.....	
Other organic complexants.....	
Total complexing agents.....	

Potential for the waste to contain discrete items: No.

TREATMENT, PACKAGING AND DISPOSAL

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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		
Recycling / reuse		
Other / various	Off-site	100.0
None		

Comment on planned treatments:

Other / various is landfill disposal for cleared waste. Incineration is fallback for more active APG resin.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	100.0	
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		

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: Not yet determined

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 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			

Other information: -

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

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

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: Ion exchange beds are utilised in the APG [SGBS] to control the chemistry of the secondary circuit and to address potential leakages of activation and fission products from the primary coolant circuit. In recycling the APG [SGBS] blowdown water from the UK EPR secondary circuit, the blowdown water is purified by the use of two parallel filters for the removal of suspended solids and two parallel demineralisation lines which use ion exchange resins to perform the demineralisation.

Uncertainty: -

Definition of total alpha and total beta/gamma: In addition to the individual radionuclides which have been quantified the total beta gamma value accounts for relevant radionuclides which have been identified but not quantified individually.

Measurement of radioactivities: -

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3					Gd 153				
Be 10				6	Ho 163				
C 14			-5.81E-08	BB 2	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36				6	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41				6	Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55				6	Pb 210				
Co 60			-3.23E-06	BB 2	Bi 208				
Ni 59				6	Bi 210m				
Ni 63				6	Po 210				
Zn 65					Ra 223				
Se 79				6	Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90				6	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m				6	Th 232				
Nb 94				6	Th 234				
Mo 93				6	Pa 231				
Tc 97					Pa 233				
Tc 99				6	U 232				
Ru 106					U 233				
Pd 107				6	U 234				
Ag 108m				6	U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m				6	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			-3.44E-11	BB 2	Am 243				
Cs 134				6	Cm 242				
Cs 135				6	Cm 243				
Cs 137				6	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				6	Other a				
Eu 152					Other b/g				
Eu 154					Total a	0		0	
Eu 155					Total b/g	0		~5.90E-05	BB 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