

**WASTE STREAM****3S07****Station Maintenance and Operations LLW****SITE** Sizewell B**SITE OWNER** EDFE NGL**WASTE CUSTODIAN** EDFE NGL**WASTE TYPE** LLW**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	134.7 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2035.....	480.0 m <sup>3</sup>
	1.4.2035 - 31.3.2044.....	540.0 m <sup>3</sup>
	1.4.2044 - 31.3.2051.....	14.8 m <sup>3</sup>
Total future arisings:		1034.8 m <sup>3</sup>
Total waste volume:		1169.5 m <sup>3</sup>

Comment on volumes: Waste volumes will be variable depending on station operating conditions. Waste volume now includes redundant reactor pressure vessel (RPV) head (previously included in 3S05).

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 1.5  
Stock (lower): x 0.75 Arisings (lower) x 0.5

**WASTE SOURCE** Hard and soft trash arising from power station operation and maintenance. Reactor pressure vessel head.

**PHYSICAL CHARACTERISTICS**

General description: A range of slightly contaminated materials. The rates of arising for different materials will vary through the cycle. Individual drums will not be representative of the stream averages. Reactor pressure vessel head will be reprocessed.

Physical components (%wt): Plastics; Paper; Incinerator ash; Metallic Items; Clothing; Rubber; Filters; Redundant Equipment; Glass; Wood. There are also drums containing the waste. The plastics, paper, clothing and rubber are expected to be subjected to low force in-drum compaction.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~1

Comment on density: Density refers to the density of the material as contained in 200 litre drums.

**CHEMICAL COMPOSITION**

General description and components (%wt): Metal (2%wt), soil/rubble (1%wt), soft organics (10%wt), plastic/rubber (76%wt), wood (1%wt), ash/ceramics/charcoal (10%wt).

Chemical state: Neutral

Chemical form of radionuclides: H-3: In any residual moisture. Unlikely to be a significant fraction of the waste.  
C-14: Trace (value unknown but not thought to be significant).  
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 (value unknown but not thought to be significant), probably as oxide.  
Np: Not expected to be present in any measurable quantity.  
Pu: Trace (value unknown but not thought to be significant), probably as oxide.

Metals and alloys (%wt): The RPV head is a significant steel component approximately 5m in diameter and 3m high and weighs approximately 80Te. Other metal is steel from dismantled and compacted Steam Blowdown System filters. These consist of a bottom disc (~20cm dia x 3cm thick) and top rim (~20cm dia x 1cm thick).

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	Stainless steel.....	~9.0
	Other ferrous metals.....	~18.0
	Iron.....	NE
	Aluminium.....	P
	Beryllium.....	NE
	Cobalt.....	NE
	Copper.....	P
	Lead.....	P
	Magnox/Magnesium.....	NE
	Nickel.....	NE
	Titanium.....	NE
	Uranium.....	NE
	Zinc.....	P
	Zircaloy/Zirconium.....	NE
	Other metals.....	NE
Organics (%wt):	Cellulosic includes paper and cotton. Other organics include charcoal granules PVC sheeting, plastic hoses etc.	
	Total cellulosics.....	~1.0
	Paper, cotton.....	~0
	Wood.....	~1.0
	Halogenated plastics .....	~0
	Total non-halogenated plastics.....	~57.0
	Condensation polymers.....	0
	Others.....	~57.0
	Organic ion exchange materials....	0
	Total rubber.....	~9.0
	Halogenated rubber .....	~9.0
	Non-halogenated rubber.....	NE
	Hydrocarbons.....	NE
	Oil or grease .....	NE
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	~5.0
Other materials (%wt):	-	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs.....	0
	Soil.....	1.0
	Brick/Stone/Rubble.....	~0
	Cementitious material.....	0
	Sand.....	NE

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	Glass/Ceramics.....	~0
	Graphite.....	0
	Desiccants/Catalysts.....	0
	Asbestos.....	NE
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	0
	Free non-aqueous liquids.....	0
	Powder/Ash.....	0
Inorganic anions (%wt):	Not estimated but only trace quantities, if any, will be present.	
	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:	Some of the materials would burn under appropriate conditions. The waste might include very small quantities of asbestos occasionally.	
	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.....	NE
	Corrosive materials.....	0
	Pyrophoric materials.....	0
	Generating toxic gases.....	0
	Reacting with water.....	0
	Active particles.....	0
	Soluble solids as bulk chemical compounds.....	0
Hazardous substances / non hazardous pollutants:	The waste might include very small quantities of asbestos occasionally if specialised small items cannot be manufactured asbestos free.	
	Acrylamide.....	NE
	Benzene.....	NE

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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.....	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):	Not yet determined
EDTA.....	NE
DPTA.....	NE
NTA.....	NE
Polycarboxylic acids.....	NE
Other organic complexants.....	NE
Total complexing agents.....	0

Not expected.

**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)	Off-site	~5.0
Incineration	Off-site	~45.0
Solidification	Off-Site	<5.0
Decontamination		
Metal treatment	Off-Site	~40.0
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		~5.0

Comment on planned treatments:

In line with the waste hierarchy, wastes will be treated preferentially by incineration, metal decontamination/melting, supercompaction, optimal packaging in HHISOs or immobilisation by encapsulation where necessary, prior to ultimate disposal at the LLW Repository. These treatments will be carried out off-site under contract with companies such as LLWR Ltd, Studsvik, Tradebe and Inutec. The percentages are based on the history of consignments across the fleet of EDF Energy Nuclear Generation stations. RPV Head will be transposed off-site for metal recycling.

**Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	15.0
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	45.0
Expected to be consigned to a Metal Treatment Facility	40.0
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 <sup>3</sup>	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	15.0	~10.56	17
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information:

Waste loading is representative of the raw waste following further planned treatments. The waste will be reduced to 50% of its original waste volume after further planned treatments.

**Waste Planned for Disposal at the LLW Repository:**

Container voidage:	-
Waste Characterisation Form (WCH):	The waste meets the LLWR's Waste Acceptance Criteria (WAC). The waste does not have a current WCH.  Waste stream characterisation document is still currently valid.
Waste consigned for disposal to LLWR in year of generation:	Yes. Waste will normally be disposed of during year of arising, but this is dependent on rate of arising throughout the year.
Potential for the waste to contain discrete items:	Yes

**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 main sources of activity in the waste will be activation products. Activity on the pressure vessel head is primarily associated with an oxide layer on the primary coolant side of the head although some activation has taken place.
Uncertainty:	The values quoted are indicative of the activities that may be expected.
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:	Activity values are based on fingerprint of waste stream. The reactor pressure vessel head will be characterised separately prior to disposal.
Other information:	-

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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-07	CC 2	2E-07	CC 2	Gd 153				
Be 10		8		8	Ho 163				
C 14	2E-07	CC 2	2E-07	CC 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36		8		8	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41		8		8	Pt 193				
Mn 53					Tl 204				
Mn 54	3.2E-06	CC 2	3.2E-06	CC 2	Pb 205				
Fe 55	6.4E-05	CC 2	6.4E-05	CC 2	Pb 210		8		8
Co 60	2.8E-05	CC 2	2.8E-05	CC 2	Bi 208				
Ni 59		8		8	Bi 210m				
Ni 63	1.6E-05	CC 2	1.6E-05	CC 2	Po 210		8		8
Zn 65	4E-07	CC 2	4E-07	CC 2	Ra 223				
Se 79		8		8	Ra 225				
Kr 81					Ra 226		8		8
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	<2E-07	C 3	<2E-07	C 3	Th 227				
Zr 93		8		8	Th 228				
Nb 91					Th 229		8		8
Nb 92					Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234				
Mo 93		8		8	Pa 231		8		8
Tc 97					Pa 233				
Tc 99		8		8	U 232				
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	<4E-08	C 3	<4E-08	C 3
Ag 108m	4E-07	CC 2	4E-07	CC 2	U 235	<4E-08	C 3	<4E-08	C 3
Ag 110m	4E-07	CC 2	4E-07	CC 2	U 236	<4E-08	C 3	<4E-08	C 3
Cd 109					U 238	<4E-08	C 3	<4E-08	C 3
Cd 113m					Np 237		8		8
Sn 119m					Pu 236				
Sn 121m		8		8	Pu 238	<4E-08	C 3	<4E-08	C 3
Sn 123					Pu 239	<4E-08	C 3	<4E-08	C 3
Sn 126		8		8	Pu 240	<4E-08	C 3	<4E-08	C 3
Sb 125	2E-06	CC 2	2E-06	CC 2	Pu 241	<4E-06	C 3	<4E-06	C 3
Sb 126					Pu 242		8		8
Te 125m					Am 241	<4E-08	C 3	<4E-08	C 3
Te 127m					Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	<2E-07	C 3	<2E-07	C 3	Cm 242	<4E-08	C 3	<4E-08	C 3
Cs 135		8		8	Cm 243	<4E-08	C 3	<4E-08	C 3
Cs 137	8E-07	CC 2	8E-07	CC 2	Cm 244	<4E-08	C 3	<4E-08	C 3
Ba 133					Cm 245		8		8
La 137					Cm 246		8		8
La 138					Cm 248				
Ce 144	<2E-07	C 3	<2E-07	C 3	Cf 249				
Pm 145					Cf 250				
Pm 147	<8E-07	C 3	<8E-07	C 3	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a		6		6
Eu 152		8		8	Other b/g	1.68E-05	CC 2	1.68E-05	CC 2
Eu 154		8		8	<b>Total a</b>	<b>&lt;4.4E-07</b>	<b>C 3</b>	<b>&lt;4.4E-07</b>	<b>C 3</b>
Eu 155		8		8	<b>Total b/g</b>	<b>1.38E-04</b>	<b>CC 2</b>	<b>1.38E-04</b>	<b>CC 2</b>

**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