

| WASTE STREAM | 4C320 | Stage 3 Decommissioning: Secondary Wastes LLW |
|--------------|-------|-----------------------------------------------|
|--------------|-------|-----------------------------------------------|

**SITE** Torness

**SITE OWNER** EDF Energy Nuclear Generation Ltd (EDFE NGL)

**WASTE CUSTODIAN** EDF Energy Nuclear Generation Ltd (EDFE NGL)

**WASTE TYPE** LLW

#### WASTE VOLUMES

|                        | Reported (m <sup>3</sup> )   | OR | Conditioned (m <sup>3</sup> ) | Packaged (m <sup>3</sup> ) |
|------------------------|------------------------------|----|-------------------------------|----------------------------|
| Stocks:                | At 1.4.2025 = 0              |    |                               |                            |
| Future arisings:       | 1.4.2025 - 31.3.2118 = 0     |    |                               |                            |
|                        | 1.4.2118 - 31.3.2119 = 474.6 |    |                               |                            |
|                        | 1.4.2119 - 31.3.2120 = 525.0 |    |                               |                            |
|                        | 1.4.2120 - 31.3.2121 = 481.6 |    |                               |                            |
|                        | 1.4.2121 - 31.3.2122 = 147.5 |    |                               |                            |
|                        | 1.4.2122 - 31.3.2123 = 149.1 |    |                               |                            |
|                        | 1.4.2123 - 31.3.2124 = 240.9 |    |                               |                            |
| Total future arisings: | <b>2018.6</b>                |    |                               |                            |
| Total waste volume:    | <b>2018.6</b>                |    |                               |                            |

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

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

Additional information on quantities: Volumes based on Back to Bio Shield strategy. Work is ongoing looking at optimising the strategy which could lead to a change in volume and timings of arisings across Final Site Clearance wastes (300s) and Pre C&M wastes (100s), in future submissions.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.50  
Stock (lower): x - Arisings (lower): x 0.50

**WASTE SOURCE** Wastes arising from contamination control procedures during plant dismantling.

#### PHYSICAL CHARACTERISTICS

General description: A variety of combustible and non combustible materials. No large items are present in the waste.

Changes since waste generated: -

Bulk density (t/m<sup>3</sup>): ~ 1.0

Comment on density: The density is likely to lie between 0.5 and 1.5 t/m<sup>3</sup>.

#### CHEMICAL COMPOSITION

General description and components (%wt): The waste is expected to contain metallic items (~80% vol), plastic items (~4%vol), cloth items (<1% vol). Other organics include incinerator ash (~15%). Percentages of constituents are very uncertain.

Chemical state: -

Sheet metal proportion / thickness: Metal thicknesses will probably be typically 1-3 mm.

Metals and alloys (%wt):

|                           | (%wt)  | Type(s) / Grades(s) with proportions                | % of total C14 activity |
|---------------------------|--------|-----------------------------------------------------|-------------------------|
| Stainless steel.....      | ~ 5.0  | -                                                   |                         |
| Other ferrous metals..... | ~ 70.0 | -                                                   |                         |
| Iron.....                 | NE     | -                                                   |                         |
| Aluminium.....            | NE     | -                                                   |                         |
| Beryllium.....            | NE     | -                                                   |                         |
| Cobalt.....               | NE     | -                                                   |                         |
| Copper.....               | NE     | -                                                   |                         |
| Lead.....                 | NE     | -                                                   |                         |
| Magnox/Magnesium.....     | NE     | -                                                   |                         |
| Nickel.....               | NE     | -                                                   |                         |
| Titanium.....             | NE     | -                                                   |                         |
| Uranium.....              | NE     | -                                                   |                         |
| Zinc.....                 | NE     | -                                                   |                         |
| Zircaloy/Zirconium.....   | NE     | -                                                   |                         |
| Other metals.....         | ~ 5.0  | Miscellaneous metals with composition not assessed. |                         |

Organics (%wt):

|                                     | (%wt)  | Type(s) and comment | % of total C14 activity |
|-------------------------------------|--------|---------------------|-------------------------|
| Total cellulose.....                | < 1.0  | -                   |                         |
| Paper, cotton.....                  | < 1.0  | -                   |                         |
| Wood.....                           | NE     | -                   |                         |
| Halogenated plastics.....           | ~ 4.0  | -                   |                         |
| Total non-halogenated plastics..... | NE     | -                   |                         |
| Condensation polymers.....          | NE     | -                   |                         |
| Others.....                         | NE     | -                   |                         |
| Organic ion exchange materials..... | NE     | -                   |                         |
| Total rubber.....                   | NE     | -                   |                         |
| Halogenated rubber.....             | NE     | -                   |                         |
| Non-halogenated rubber.....         | NE     | -                   |                         |
| Hydrocarbons.....                   | NE     | -                   |                         |
| Oil or grease.....                  | -      | -                   |                         |
| Fuel.....                           | -      | -                   |                         |
| Asphalt/Tarmac (cont.coal tar)..... | -      | -                   |                         |
| Asphalt/Tarmac (no coal tar).....   | -      | -                   |                         |
| Bitumen.....                        | -      | -                   |                         |
| Others.....                         | -      | -                   |                         |
| Other organics.....                 | ~ 15.0 | -                   |                         |

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.....                             | = 0   | -                   |                         |
| Glass/Ceramics.....                   | = 0   | -                   |                         |
| Graphite.....                         | = 0   | -                   |                         |
| Desiccants/Catalysts.....             | = 0   | -                   |                         |
| Asbestos.....                         | = 0   | -                   |                         |
| Non/low friable.....                  | -     | -                   |                         |
| Moderately friable.....               | -     | -                   |                         |
| Highly friable.....                   | -     | -                   |                         |
| Free aqueous liquids.....             | = 0   | -                   |                         |
| Free non-aqueous liquids.....         | = 0   | -                   |                         |
| Powder/Ash.....                       | = 0   | -                   |                         |

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

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.....                        | = 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   | -                   |
| Higher activity particles.....                 | = 0   | Not expected.       |
| Soluble solids as bulk chemical compounds..... | = 0   | -                   |

Hazardous substances / non hazardous pollutants:

|                             | (%wt) | Type(s) and comment |
|-----------------------------|-------|---------------------|
| 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    | -                   |
| 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    | -                   |

Complexing agents (%wt):

| Not yet determined             |       |                                |
|--------------------------------|-------|--------------------------------|
|                                | (%wt) | Type(s) and comment            |
| EDTA.....                      | NE    | -                              |
| DPTA.....                      | NE    | -                              |
| NTA.....                       | NE    | -                              |
| Polycarboxylic acids.....      | NE    | -                              |
| Other organic complexants..... | NE    | Only trace quantities, if any. |
| Total complexing agents.....   | NE    | -                              |

Physical components:

|                                         | Number | Type(s) and comment |
|-----------------------------------------|--------|---------------------|
| Sources.....                            | = 0    | -                   |
| Electronic & Electrical Equipment (EEE) |        |                     |
| EEE Type 1.....                         | NE     | -                   |
| EEE Type 2.....                         | NE     | -                   |
| EEE Type 3.....                         | NE     | -                   |
| EEE Type 4.....                         | NE     | -                   |
| EEE Type 5.....                         | NE     | -                   |

## 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)                                      | Off-site           | ~ 15.0          |
| Incineration                                               | Off-site           | ~ 5.0           |
| Drying/dewatering/liquid separation                        |                    |                 |
| Tie down/fixatives/strippable coating/painting application |                    |                 |
| Decontamination                                            |                    |                 |
| Metal treatment                                            | Off-site           | ~ 64.0          |
| Recycling / reuse                                          |                    |                 |
| Thermal treatment, including vitrification                 |                    |                 |
| Encapsulation                                              |                    |                 |
| Polymer encapsulation                                      |                    |                 |
| Other physical treatment                                   |                    |                 |
| Other chemical treatment                                   |                    |                 |
| Containerisation                                           |                    |                 |
| Treatment not yet determined                               |                    |                 |
| None                                                       |                    | ~ 16.0          |

Comments on planned treatments:

Incinerator ash will be supercompacted. Approximately 80% of the metal waste is assumed to be recyclable with 95% suitable for re-use. Waste will be grouted into boxes if necessary. Supercompaction assumes x5 volume reduction. Incineration assumes 99% volume reduction.

Conditioning method:

-

Conditioning plants:

| Plant Name | Location |
|------------|----------|
|            |          |

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

**Waste Packaging:**

|                        |                                                    |                       |                    |              |                    |                                    |
|------------------------|----------------------------------------------------|-----------------------|--------------------|--------------|--------------------|------------------------------------|
| Likely container type: | Container                                          | Waste packaged (vol%) | Waste loading (m³) | Payload (m³) | Number of packages | Estimated start date for packaging |
|                        | 1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02) | 34.3                  | 22.7               | 18.3         | 31                 | -                                  |

Range in container waste loading:

Other information on packaging and conditioning: Stream volume includes incineration residues. Waste loading is representative of the raw waste following further planned treatments.

Conditioned density (t/m³): -  
Conditioned density comment: -

**Management Routes:**

| Disposal Route                                                                     | Stream volume % | Raw density t/m³ | Start date |
|------------------------------------------------------------------------------------|-----------------|------------------|------------|
| Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland) | ~ 34.0          | NE               |            |
| 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                                     | ~ 5.0<br>~ 61.0 | NE<br>NE         |            |
| 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                                                           |                 |                  |            |

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

Opportunities for alternative disposal routing: No

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

**RADIOACTIVITY**

Source: Contamination by activation products from the reactor structure.

Uncertainty: Only very approximate estimates have been made of the total specific activities.

Measurement of radioactivities: Activation/decay calculations based on operational waste streams and projected operating history. The activities quoted are for the time at which this waste will arise (i.e. ~85 years after end of generation). There may be some contamination by Cs137.

Chemical form of radionuclides: H-3: Diffused into materials.  
C-14: There may be some surface contamination as graphite.  
Cl-36: Not Determined.  
Se-79: Selenium content not expected to be significant.  
Tc-99: Not determined.  
I-129: Not determined.  
Ra: Radium content is insignificant.  
Th: Thorium content is insignificant.  
U: Not determined.  
Np: The neptunium content is insignificant.  
Pu: Not determined.

| WASTE STREAM |                            | 4C320             |                 | Stage 3 Decommissioning: Secondary Wastes LLW |           |                            |                   |                 |                   |
|--------------|----------------------------|-------------------|-----------------|-----------------------------------------------|-----------|----------------------------|-------------------|-----------------|-------------------|
| Nuclide      | Mean radioactivity, TBq/m³ |                   |                 |                                               | Nuclide   | Mean radioactivity, TBq/m³ |                   |                 |                   |
|              | Waste at<br>1.4.2025       | Bands and<br>Code | Future Arisings | Bands and<br>Code                             |           | Waste at<br>1.4.2025       | Bands and<br>Code | Future Arisings | Bands and<br>Code |
| H 3          |                            |                   | 3.25E-05        | C C 2                                         | Gd 153    |                            |                   |                 |                   |
| Be 10        |                            |                   | 3.40E-12        | C C 2                                         | Ho 163    |                            |                   |                 |                   |
| C 14         |                            |                   | 2.57E-05        | C C 2                                         | Ho 166m   |                            |                   | 3.70E-11        | C C 2             |
| Na 22        |                            |                   |                 | 4                                             | Tm 170    |                            |                   |                 |                   |
| Al 26        |                            |                   |                 | 4                                             | Tm 171    |                            |                   |                 |                   |
| Cl 36        |                            |                   | 3.92E-07        | C C 2                                         | Lu 174    |                            |                   |                 |                   |
| Ar 39        |                            |                   |                 |                                               | Lu 176    |                            |                   |                 |                   |
| Ar 42        |                            |                   |                 |                                               | Hf 178n   |                            |                   |                 |                   |
| K 40         |                            |                   |                 |                                               | Hf 182    |                            |                   |                 |                   |
| Ca 41        |                            |                   | 1.39E-07        | C C 2                                         | Pt 193    |                            |                   |                 |                   |
| Mn 53        |                            |                   |                 | 8                                             | Tl 204    |                            |                   |                 |                   |
| Mn 54        |                            |                   |                 |                                               | Pb 205    |                            |                   |                 | 8                 |
| Fe 55        |                            |                   | 2.02E-11        | C C 2                                         | Pb 210    |                            |                   |                 |                   |
| Co 60        |                            |                   | 5.63E-08        | C C 2                                         | Bi 208    |                            |                   |                 |                   |
| Ni 59        |                            |                   | 1.47E-06        | C C 2                                         | Bi 210m   |                            |                   |                 |                   |
| Ni 63        |                            |                   | 8.43E-05        | C C 2                                         | Po 210    |                            |                   |                 | 8                 |
| Zn 65        |                            |                   |                 | 8                                             | Ra 223    |                            |                   |                 |                   |
| Se 79        |                            |                   |                 | 8                                             | Ra 225    |                            |                   |                 |                   |
| Kr 81        |                            |                   |                 |                                               | Ra 226    |                            |                   |                 | 8                 |
| Kr 85        |                            |                   |                 |                                               | Ra 228    |                            |                   |                 |                   |
| Rb 87        |                            |                   |                 |                                               | Ac 227    |                            |                   |                 |                   |
| Sr 90        |                            |                   |                 | 8                                             | Th 227    |                            |                   |                 |                   |
| Zr 93        |                            |                   |                 | 8                                             | Th 228    |                            |                   |                 |                   |
| Nb 91        |                            |                   |                 |                                               | Th 229    |                            |                   |                 | 8                 |
| Nb 92        |                            |                   |                 |                                               | Th 230    |                            |                   |                 | 8                 |
| Nb 93m       |                            |                   | 1.27E-09        | C C 2                                         | Th 232    |                            |                   |                 | 8                 |
| Nb 94        |                            |                   | 9.27E-09        | C C 2                                         | Th 234    |                            |                   |                 |                   |
| Mo 93        |                            |                   | 2.28E-08        | C C 2                                         | Pa 231    |                            |                   |                 | 8                 |
| Tc 97        |                            |                   |                 |                                               | Pa 233    |                            |                   |                 |                   |
| Tc 99        |                            |                   | 4.64E-09        | C C 2                                         | U 232     |                            |                   |                 | 8                 |
| Ru 106       |                            |                   |                 | 8                                             | U 233     |                            |                   |                 | 8                 |
| Pd 107       |                            |                   |                 | 8                                             | U 234     |                            |                   |                 | 8                 |
| Ag 108m      |                            |                   | 3.12E-08        | C C 2                                         | U 235     |                            |                   |                 | 8                 |
| Ag 110m      |                            |                   |                 |                                               | U 236     |                            |                   |                 | 8                 |
| Cd 109       |                            |                   |                 |                                               | U 238     |                            |                   |                 | 8                 |
| Cd 113m      |                            |                   |                 |                                               | Np 237    |                            |                   |                 |                   |
| Sn 119m      |                            |                   |                 |                                               | Pu 236    |                            |                   |                 |                   |
| Sn 121m      |                            |                   | 1.83E-10        | C C 2                                         | Pu 238    |                            |                   |                 | 8                 |
| Sn 123       |                            |                   |                 |                                               | Pu 239    |                            |                   |                 | 8                 |
| Sn 126       |                            |                   |                 |                                               | Pu 240    |                            |                   |                 | 8                 |
| Sb 125       |                            |                   |                 |                                               | Pu 241    |                            |                   |                 | 8                 |
| Sb 126       |                            |                   |                 | 8                                             | Pu 242    |                            |                   |                 | 8                 |
| Te 125m      |                            |                   |                 |                                               | Am 241    |                            |                   |                 | 8                 |
| Te 127m      |                            |                   |                 |                                               | Am 242m   |                            |                   |                 | 8                 |
| I 129        |                            |                   |                 | 8                                             | Am 243    |                            |                   |                 | 8                 |
| Cs 134       |                            |                   |                 | 5                                             | Cm 242    |                            |                   |                 | 8                 |
| Cs 135       |                            |                   |                 | 8                                             | Cm 243    |                            |                   |                 | 8                 |
| Cs 137       |                            |                   |                 | 6                                             | Cm 244    |                            |                   |                 | 8                 |
| Ba 133       |                            |                   | 7.80E-10        | C C 2                                         | Cm 245    |                            |                   |                 | 8                 |
| La 137       |                            |                   |                 |                                               | Cm 246    |                            |                   |                 | 8                 |
| La 138       |                            |                   |                 |                                               | Cm 248    |                            |                   |                 |                   |
| Ce 144       |                            |                   |                 | 8                                             | Cf 249    |                            |                   |                 |                   |
| Pm 145       |                            |                   | 4.15E-10        | C C 2                                         | Cf 250    |                            |                   |                 |                   |
| Pm 147       |                            |                   |                 | 8                                             | Cf 251    |                            |                   |                 |                   |
| Sm 147       |                            |                   |                 |                                               | Cf 252    |                            |                   |                 |                   |
| Sm 151       |                            |                   | 1.22E-07        | C C 2                                         | Unsp a    |                            |                   |                 | 8                 |
| Eu 152       |                            |                   | 8.41E-07        | C C 2                                         | Unsp b/g  |                            |                   |                 | 5                 |
| Eu 154       |                            |                   | 8.76E-09        | C C 2                                         | Total a   | 0                          | *                 | 1.16E-18        | *                 |
| Eu 155       |                            |                   | 3.22E-12        | C C 2                                         | Total b/g | 0                          | *                 | 1.46E-04        | *                 |

#### 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