

Appendix 5.6 Modelling Methodology

Model Inputs

Main Stack Emissions

A5.6.1 The emissions parameters and model inputs for the flues serving the proposed facility are set out in Table A5.6.1, Table A5.6.2 and Table A5.6.3.

Table A5.6.1: Emission Parameters for the Proposed REC (3 Flues Combined)

Stack Parameter	Value ^b
Exit Velocity (m/s)	21.1
Normalised ⁵ Volume Flow Rate (Nm ³ /s) ^a	31.6
Actual Volume Flow Rate (m ³ /s) ^a	40.3
Exhaust Temperature (°C)	140
Equivalent Stack Internal Diameter (m)	1.56
Stack Height Above Ground-Level (m)	52
Stack Location (O.S. x,y)	419903.8,292160.7

^a this is the combined efflux rate from the two flues within the stack.

^b rounded numbers are presented here but unrounded numbers were input into the model.

Table A5.6.2: Air Emission Limit Values

Pollutant	Emissions Averaging Period ^a	Emissions (mg/Nm ³)
Nitrogen oxides	½ hour average	400
	daily average	200
PM ₁₀	½ hour average	30
	daily average	10
SO ₂	½ hour average	200
	daily average	50
CO	½ hour average	100
	daily average	50
TOC	½ hour average	20

⁵ Throughout this report, 'normal' (N) is used to refer to conditions recorded in the absence of moisture, at 11% oxygen, and at 0 degrees Celsius. These are the reference conditions at which the relevant IED emissions limits are expressed.

Pollutant	Emissions Averaging Period ^a	Emissions (mg/Nm ³)
	daily average	10
HCl	½ hour average	60
	daily average	10
HF	½ hour average	4
	daily average	1
Cd and Tl	periodic over minimum ½ hour and maximum 8 hours	0.05
Hg	periodic over minimum ½ hour and maximum 8 hours	0.05
Group III metals ^b	periodic over minimum ½ hour and maximum 8 hours	0.5
NH ₃	½ hour average and daily average	10
Dioxins and furans	periodic over minimum 6 hours and maximum 8 hours	0.0000001

^a i.e. the averaging period over which emissions will be measured.

^b Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V.

Table A5.6.3: Modelled Emission Rates (3 Flues Combined)

Pollutant	Concentration Averaging Period ^a	Emissions (g/s) ^b
Nitrogen oxides	1-hour mean	12.642
	24-hour mean	4.741
	annual mean	4.741 ^c
PM ₁₀	24-hour mean	0.948
	annual mean	0.316
SO ₂	1-hour and 15-minute means	6.321
	annual mean	1.580
CO	rolling 8-hour mean	4.471
TOC	1-hour mean	0.632
	annual mean	0.316
HCl	1-hour mean	1.896
	annual mean	0.316
HF	1-hour mean	0.126
	24-hour and weekly means	0.032
Cd and Tl	annual mean	0.002

Pollutant	Concentration Averaging Period ^a	Emissions (g/s) ^b
Hg	1-hour mean	0.0016
	annual mean	
Group III metals	1-hour mean	0.016
	annual mean	
NH ₃	1-hour mean	0.316
	annual mean	
Dioxins and furans	annual mean	0.000000032

^a i.e. the averaging periods set in the air quality objectives and EALs over which concentrations have been predicted..

^b rounded numbers (to two significant figures) are presented here but unrounded numbers were input into the model.

^c This is based on a NO_x emission of 150 mg/Nm³. The technology to be used in the proposed REC has very low NO_x emissions, and is expected to emit significantly less NO_x than the IED limits (200 µg/Nm³) allow.

A5.6.2 For most of the group III metals shown in Table A5.6.3, when assessing against each of the EALs for each metal in turn, it has been assumed that the total group III metals emission rate is made up entirely of that metal. This is a worst-case approach. For some pollutants, in particular chromium VI, it is not possible to screen out the potential for significant impacts using this method. Therefore the more detailed approach set out by the Environment Agency in its Interim Guidance Note for Metals (Environment Agency, 2012) has been used. This includes three steps. The first step is what has initially been assumed in this assessment; that the total group III metals emission rate is made up entirely of each metal in turn. The second step assumes that each metal comprises 11% of the total group emissions. Step 3 of the Environment Agency guidance has only been used for chromium VI, for which the guidance includes some typical emission concentrations for energy from waste plant as set out below:

- mean 0.000035 mg/Nm³;
- minimum 0.000023 mg/Nm³; and
- maximum 0.00013 mg/Nm³.

A5.6.3 It is considered that, given the similarity of the proposed facility and its fuel source to those included in the Environment Agency guidance, it is appropriate to use the emission concentrations set out above for chromium VI. The amended mass emission rates for chromium VI from the proposed facility are:

- mean 0.0000011 g/s;
- minimum 0.000000073 g/s; and

- maximum 0.0000041 g/s.

A5.6.4 These amended emission rates have been used later in the assessment (See ES Chapter Section 5.4 – Assessment of Likely Significant Effects).

Background Concentrations

A5.6.5 The background pollutant concentrations across the study area have been defined using the national pollution maps published by Defra (2016b). These cover the whole country on a 1x1 km grid and are published for each year from 2011 until 2030. The background maps for 2014 have been calibrated against concurrent measurements from national monitoring sites. The calibration factor calculated has also been applied to future year backgrounds. This has resulted in slightly higher predicted concentrations for the future assessment year than that derived from the Defra maps (AQC, 2016b).

Model Post-processing

Point Source

A5.6.6 Details of the post-processing for the stack emissions are provided in the main air quality chapter.

Total Concentrations

A5.6.7 Total concentrations of nitrogen dioxide at receptors have been calculated by adding all of the source contributions together (i.e. measured/mapped background concentration + REC emissions contribution).