

# Annual Report 2022: Environmental Performance

Western Bio-Energy Ltd  
Longlands Lane,  
Margam  
Neath Port Talbot  
SA13 2NR

**Permit Reference: EPR/ZP393GL**

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## 1 Introduction

This report has been compiled by Western Bio-Energy Ltd (WBE) for the Biomass Plant located at Margam, Port Talbot. This report incorporates the annual reporting requirements detailed EPR permit ZP3939GL

- Table S5.1 Reporting of monitoring data
- Table S5.2: Annual production/treatment
- Table S5.3 Performance parameters

The site generates electricity from biomass, accepting and chipping predominantly round wood logs, but the fuel is augmented with virgin wood chips, baled brush bundles, bark peelings, wood shavings and sawdust. These virgin products are also supplemented with the addition of clean recycled wood biofuels.

The site is exempt from the requirements of Industrial Emissions Directive Chapter IV as listed in point (b) of point 31 of Article 3;

The electrical power generated is approximately 14MWe which is exported to the National Grid.

## 2 Summary

This report summarises the emissions data from the WBL plant for the whole of 2022.

A continuous monitoring system is in operation which monitors particulate matter, nitrogen dioxide, carbon monoxide,

ELV limits are set within the Permit as follows:-

- Particulates 10 mg/m<sup>3</sup>
- Carbon Monoxide (CO) 250 mg/m<sup>3</sup>
- Oxides of Nitrogen 250 mg/m<sup>3</sup>

Flue gases are independently monitored 6 monthly by ECL and was undertaken in May 2022 and Jan 2023 ( delayed with NRW consent due to the plant being offline). The results were submitted in the Q2 2022 and will be submitted in Q1 of 2023 submissions respectively.

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### 3 Emissions To Atmosphere

The main emissions to air are combustion gases because of the biomass combustion process, which comprises predominantly of nitrogen oxides, carbon monoxide and particulate matter. These emissions are constantly monitored within the CEMS system, as per the Environmental Permit requirements. Graphs relating to each of the emissions can be found in the following pages.

<b>NOx mg/m<sup>3</sup></b>												
Criteria	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Nox Daily mean of hourly ave (max result)	247.82	245.75	247.65	249.00	247.60	249.19	247.57	247.53	0	0	0	216.28
Nox Daily mean of hourly ave (ave result)	245	141.05	231.98	245.59	244.43	246.85	242.26	239.52	0	0	0	180.00
<b>Nox ELV</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>
<b>Nox 200% ELV</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>

<b>CO mg/m<sup>3</sup></b>												
Criteria	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
CO Daily mean of hourly ave (max result)	151.98	192.32	125.24	248.98	195.44	147.04	231.26	228.53	0	0	0	117.42
CO Daily mean of hourly ave (ave result)	103.77	61.47	86.61	118.43	93.92	79.63	125.06	154.99	0	0	0	63.67
<b>CO ELV</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>	<b>250</b>
<b>CO 200% ELV</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>

<b>Particulates mg/m<sup>3</sup></b>												
Criteria	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Particulate Daily mean of hourly ave (max result)	3.12	4.90	3.13	1.98	1.80	1.81	2.50	2.49	0	0	0	2.55
Particulate Daily mean of hourly ave (ave result)	1.15	1.66	1.97	1.08	0.80	0.14	0.42	1.62	0	0	0	1.30
<b>Particulate ELV</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>
<b>Particulate 200% ELV</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>

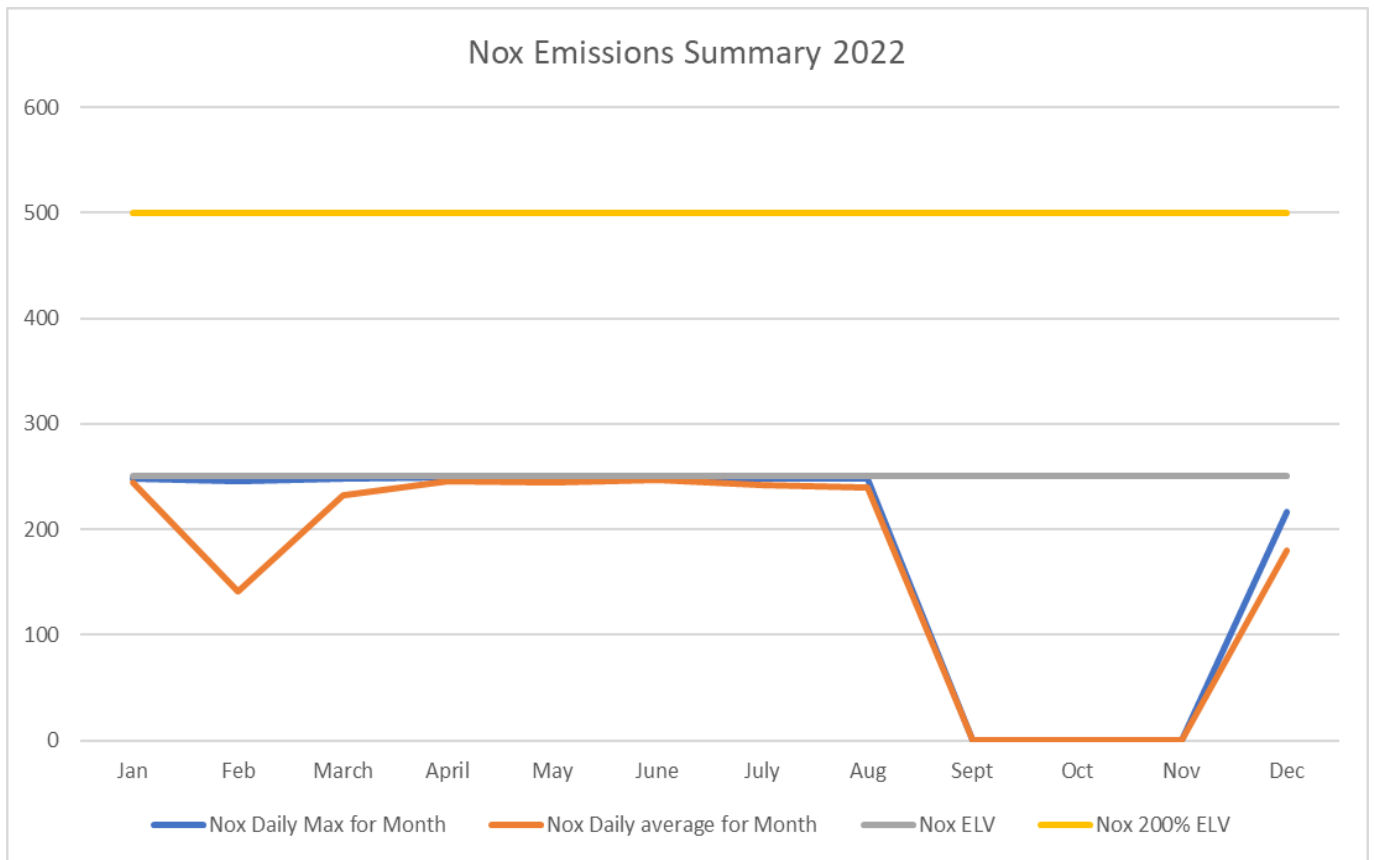
Note: Whilst there were some instances of hourly peaks above the ELV, the daily and monthly averages fell within limits for the daily averages as required in the permit.

### 3.1 Oxides of Nitrogen

Please refer to the graph showing the hourly readings on the following page which shows that the hourly average range of emissions for NOx for the year.

The continuous Emission Limit Values does exceed (ELV) of 250mg/Nm<sup>3</sup> on hourly averages, however 95% of validated hourly averages within a calendar year do not exceed 200% of ELV. The daily average has remained within the ELV 250mg/Nm<sup>3</sup> set within the permit and appear stable during the year

#### 3.1.1 Graph profile depicting hourly averages of NOx measured at Stack



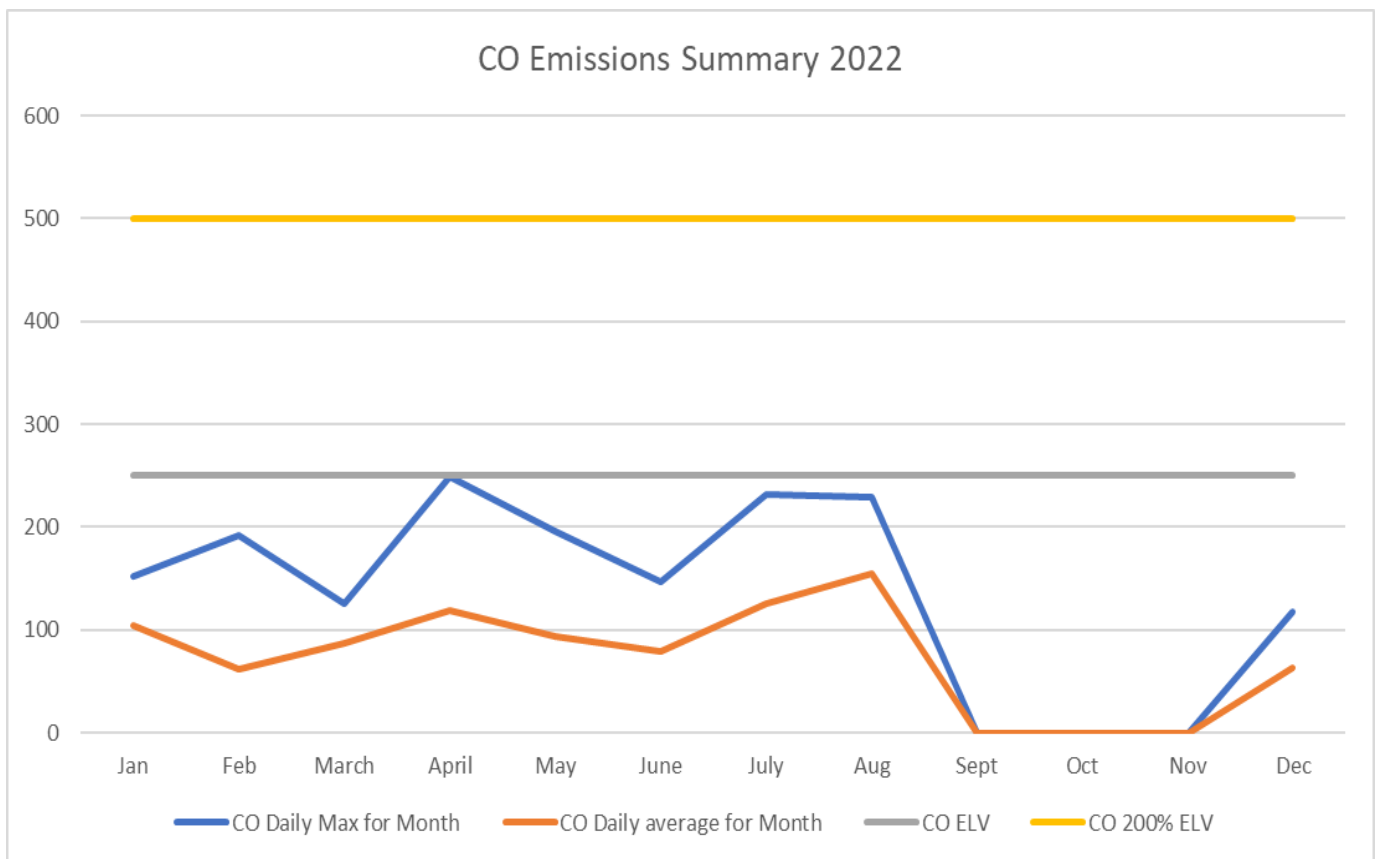
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### 3.2 Carbon Monoxide

Please refer to the graph showing the hourly readings on the following page which shows that the hourly average range of emissions for carbon Monoxide (CO) for the year.

The continuous Emission Limit Values does exceed (ELV) of 250mg/Nm<sup>3</sup> on hourly averages, however 95% of validated hourly averages within a calendar year do not exceed 200% of ELV. The daily average has remained within the ELV 250mg/Nm<sup>3</sup> set within the permit and appear stable during the year

#### 3.2.1 Graph profile depicting hourly averages of CO measured at Stack

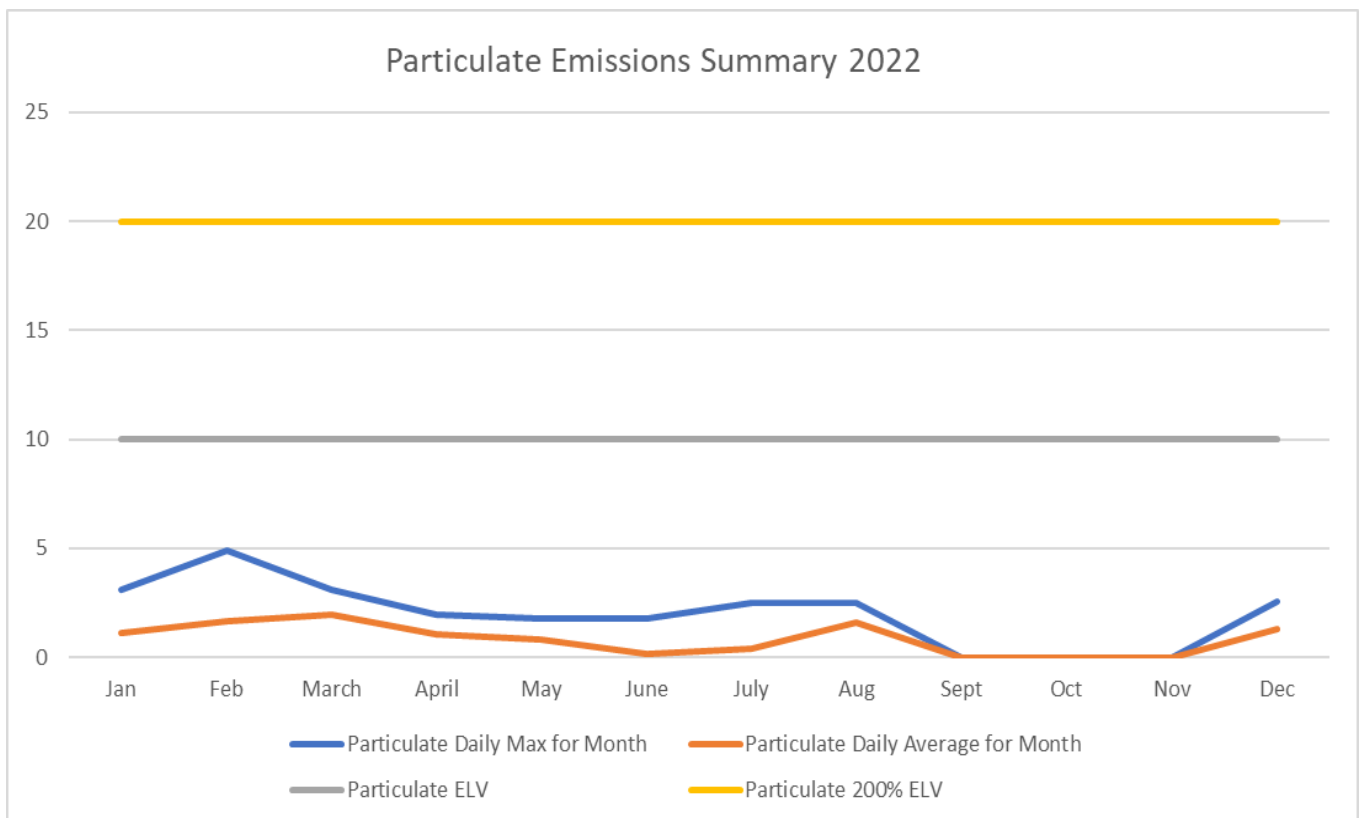


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### 3.3 Particulates

A mostly very consistent result indicates a good performance of the facilities bag filter house. The continuous Emission Limit Values does exceed (ELV) of 10mg/Nm<sup>3</sup> on hourly averages, however 95% of validated hourly averages within a calendar year do not exceed 200% of ELV. The daily average has remained within the ELV 10mg/Nm<sup>3</sup> set within the permit and appear stable during the year

#### 3.3.1 Graph profile depicting hourly averages of Particulate matter measured at Stack



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## 4 Ash Residues

Both bottom and fly ashes were monitored monthly during 2022 with the analysis being performed by Socotec for the normal suite of parameters. The Dioxins and Furans for both the bottom and fly ashes were sampled and analysed quarterly by Marchwood Scientific with the combined results shown below:

All the analyses are on an 'as received' basis. The heavy metal contents are analysed on a 'dry' basis, reported in mg/kg. Dioxins, Furans & PCB's are reported in ng/kg.

Note (\*) For both the Bottom and Fly ash analysis in Q2 (Jun 2022), the PCB's analysis was not available from the testing company hence the testing house was changed for Q3 onwards.

### 4.1 Table of Bottom Ash Residues

Bottom Ash	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Antimony	0.3	6.6	4.1	8.0	12.5	33.2	11.3	8.9	Off	Off	Off	2.0
Arsenic	3.9	30.6	33.3	81.1	42.0	1.2	76.9	40.9	Off	Off	Off	16.8
Cadmium	0.4	1.0	0.2	1.5	1.5	0.9	2.0	0.9	Off	Off	Off	0.8
Chromium	151.0	83.5	90.8	156.0	126.0	69.2	115.7	141.0	Off	Off	Off	44.1
Cobalt	9.0	5.9	7.7	8.5	8.8	5.2	10.5	9.0	Off	Off	Off	5.0
Copper	892.0	892.0	378.0	11300.0	15800.0	191.0	592.8	1330.0	Off	Off	Off	200.0
Lead	836.0	2910.0	428.0	357.0	1320.0	23.4	537.6	207.0	Off	Off	Off	58.3
Manganese	749.0	642.0	1050	974.0	1030.0	83.7	1399.0	922.0	Off	Off	Off	863.0
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Off	Off	Off	<0.1
Nickel	184.0	29.4	32.7	33.7	158.0	14.3	38.4	41.7	Off	Off	Off	13.2
Thallium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Off	Off	Off	<0.1
Tin	1.1	6.6	5.2	20.1	95.2	22.9	11.6	160.4	Off	Off	Off	2.5
Vanadium	3.2	17.2	25.0	23.1	27.9	3.1	35.3	20.6	Off	Off	Off	20.5
Zinc	1150.0	493.0	413.0	1890.0	6060.0	167.0	1143.0	559.0	Off	Off	Off	202.0
TOC's	1.9	1.6	1.1	1.1	0.7	0.5	1.1	5.3	Off	Off	Off	1.1
Dioxins			41.2			38.2			49.2			41.9
Furans			5.54			7.96			9.56			7.34
PCB's			5.90			N/A			0.410			111

## 4.2 Table of Fly Ash Residues

Fly Ash	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Antimony	36.6	55.2	38.7	139	35.8	2.6	268.9	41.3	Off	Off	Off	104.2
Arsenic	476.5	442.9	389.3	952.8	282.5	14.8	1176	1310	Off	Off	Off	1,134.8
Cadmium	37.4	13	18.1	32.2	10.6	0.8	40	51	Off	Off	Off	20.7
Chromium	124	123	90.8	137	104	42.6	401.3	266	Off	Off	Off	311.8
Cobalt	7.1	4.2	3.4	5.1	3.8	5.2	8.3	6.8	Off	Off	Off	7.4
Copper	915	526	356	779	420	238	1111	1130	Off	Off	Off	1,677.5
Lead	4930	2090	1740	3670	1670	58.6	3121	3410	Off	Off	Off	4,667.5
Manganese	1080	851	549	769	754	594	2005	1050	Off	Off	Off	1,351.9
Mercury	2.8	1.4	1.1	2.5	0.8	<0.1	2.2	2.3	Off	Off	Off	3.6
Nickel	22	11.8	11.9	13.5	11.6	19.2	26.8	23.1	Off	Off	Off	18.9
Thallium	0.5	<0.1	0.4	1.9	0.4	<0.1	19.9	1.9	Off	Off	Off	1.0
Vanadium	15	13.5	11.4	15.8	11.7	17.8	30.6	24.5	Off	Off	Off	22.1
Zinc	13000	3730	3970	9310	3.080	256	5935	937	Off	Off	Off	8,723.2
Dioxins			36500			16900			8610			42300
Furans			13500			11700			13800			13300
PCB's			4600			N/A			1.4			3800

## 5 Wastes Trade Effluents

Western Bio-Energy Plant has a Trade Effluent Discharge Consent for process waters and boiler blow and drain downs and wastewater from the demineralisation process.

The pH threshold in the consent is set between 6.0 and 10.0. There was one non-conformity during the year where the pH has been outside these limits and these have been traced to isolated occurrences.

Welsh water has been contacted and are not concerned about these readings being slightly above the high limit.

Other parameters within the consent include:-

- COD at pH 7 shall not exceed 500 mg/l
- Suspended solids shall not exceed 500 mg/l
- Mineral oil shall not exceed 100 mg/l

The results from the analyses on the table below demonstrate that the above parameters are within consent in 2022.

### 5.1 Table of results from Trade waste

Parameter	PH HL-10 LL-6	Suspended Solids HL-500mg/1	Oil & Grease HL-100mg/1	COD HL-500MG/!	BOD HL-250mg/1	Toxic Metals HL-2mg/1	Sulphate HL-1000mg/1
Jan	7.7	13	<10	17	4.7	1.59	35.9
Feb	7.8	52	<10	59	24	14.6	9.20
Mar	7.6	9	<10	38	8.1	5.07	35.9
Apr	8.7	20	<10	17	11	13.5	44.3
May	11.4	57	<10	66	8.5	8.1	472
Jun	8.6	56	<10	35	6.7	9	58.5
Jul	7.4	46	<10	31	6.7	5.14	23.7
Aug	Plant Offline						
Sep	Plant Offline						
Oct	Plant Offline						
Nov	8.4	58	<10	110	42	7.45	105
Dec	N/A	N/A	N/A	N/A	N/A	N/A	N/A

As the plant was offline during most of August to the end of November sampling was paused due no discharge from site. Sampling resumed in November but during December a sample couldn't be analysed as the sample house were unable to obtain a sufficient sample for analysis and being unable to reschedule during the remainder of the month.

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## 6 Fuels

The table below shows the fuel composition for 2022. The total tonnage of biomass combusted through the plant was 101,393te.

During 2022, 45 % of the energy was derived from recycled sources.

Wood Type	Tonnes	GJ's	Weighted Average Moisture Content	Net Calorific Value GJ/te	%age of Energy
OS Arboreal Cuttings	13,449	134,574	38.71%	18.41	12.77%
Log Whole logs	6,624	64,463	42.53%	18.41	5.93%
Log Chip	4,068	38,901	43.41%	18.42	3.69%
RCF Grade A woodchip	25,983	341,434	25.50%	18.45	32.40%
WTC Whole Tree Chip	48,135	467,552	41.42%	18.41	44.37%
Brash	2,682	5,333	24.60%	18.41	0.51%
Peelings	451	3,552	49.58%	18.43	0.34%
<b>TOTAL</b>	<b>101,393</b>	<b>1,053,809</b>	<b>37.96%</b>	<b>18.42</b>	<b>100.00%</b>

The quantity of Fuel oil used to ignite and maintain residual heat inside the boiler, during the year 2022 totalled 37,163 litres.

Periodic monitoring was performed in undertaken in May 2022 and Jan 2023 with results submitted in the Q2 2022 and to be submitted in Q1 of 2023 submissions respectively.

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## 6.1 Additional Information as Required

Annual production / treatment as req. table s5.2		Units
Total virgin biomass	61,960	te
Total waste biomass	39,432	te
Electrical export energy	77,752.7	MWh
Electrical energy used at site	521.39	MWh
<b>Performance Parameters as req. table performance s5.3</b>		<b>Units</b>
Supplementary fuel oil usage	37,163	litres
Water usage	36,331	M <sup>3</sup>
Bottom ash generated	4862.59	te
Flue gas residues generated	452.52	te
Average calorific value of biomass (wet) Net CV	10.4	MJ/kg
Number of start ups	31	No.
Bag filter bypass events & time	0 events during operation,	No. & time
Rejected fuel loads i.e. outside agreed spec.	30	No: of loads
Average plant availability ( <i>Jan to Dec including major outage</i> )	77.4	%

## 7 Conclusions

Whilst 2022 was largely a normal operational year, the plant was taken offline for an extended 3.5 month outage in order to restore the turbine to normal capacity and operation. This is the primary cause for the higher than normal electricity import and lower export performance along with the lower fuel and feedstock requirements.

It is also worth noting that there were no AEL permit breached requiring a Schedule 6 notification for either Nox, CO or particulates.

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