Eskom

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21 February 2020

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Ref: (12/4/12L-W4/A3)

Dear Mrs Thivhafuni

MATIMBA POWER STATION'S MONTHLY EMISSIONS REPORT FOR THE MONTH OF JANUARY 2020

This serves as the monthly report required in terms of Section 7.7.1 in Matimba Power Station's Atmospheric Emission License 12/4/12L-W4/A3.

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Raw Materials and Products

Table 1: Quantity of Raw Materials and Products used/produced for the month.

Raw Materials and Products used	Raw Material Type	Unit	Maximum Permitted Consumption Rate (Quantity)	Consumption Rate
	Coal	Tons/month	1 500 000	1 099 471
	Fuel Oil	Tons/month	1 200	212.427
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate**
	Energy	GWh	4 212.6	2 347.372

Abatement Technology

Table 2: Abatement Equipment Control Technology utilise.

Associated Unit	Technology Type	Actual Utilisation (%)
Unit 1	Electrostatic Precipitator	99.962
Unit 2	Electrostatic Precipitator	99.905
Unit 3	Electrostatic Precipitator	99.949
Unit 4	Electrostatic Precipitator	99.891
Unit 5	Electrostatic Precipitator	99.943
Unit 6	Electrostatic Precipitator	99.899

Associated Unit	Technology Type	Actual Utilisation (%)
Unit 1	SO_3 Plant	96
Unit 2	SO_3 Plant	97
Unit 3	SO_3 Plant	98
Unit 4	SO_3 Plant	94
Unit 5	SO_3 Plant	98
Unit 6	SO_3 Plant	99

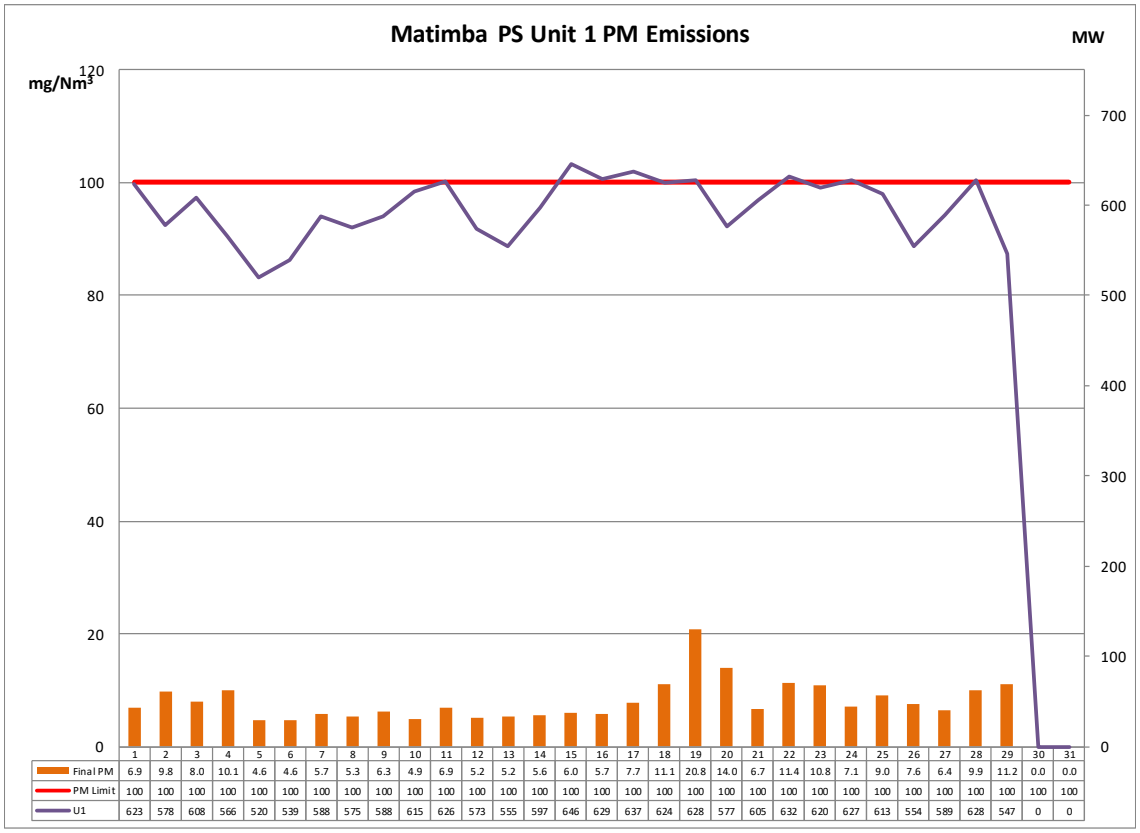
Energy Source Characteristics

Table 3: Energy Source Material Characteristics.

	Characteristic	Stipulated Range (Unit)	Monthly Average Content
Coal burned	**Sulphur Content**	0.8-1.6%	1.24
	Ash Content	30-40%	30.15

Emissions Reporting

Unit 1 particulate emissions

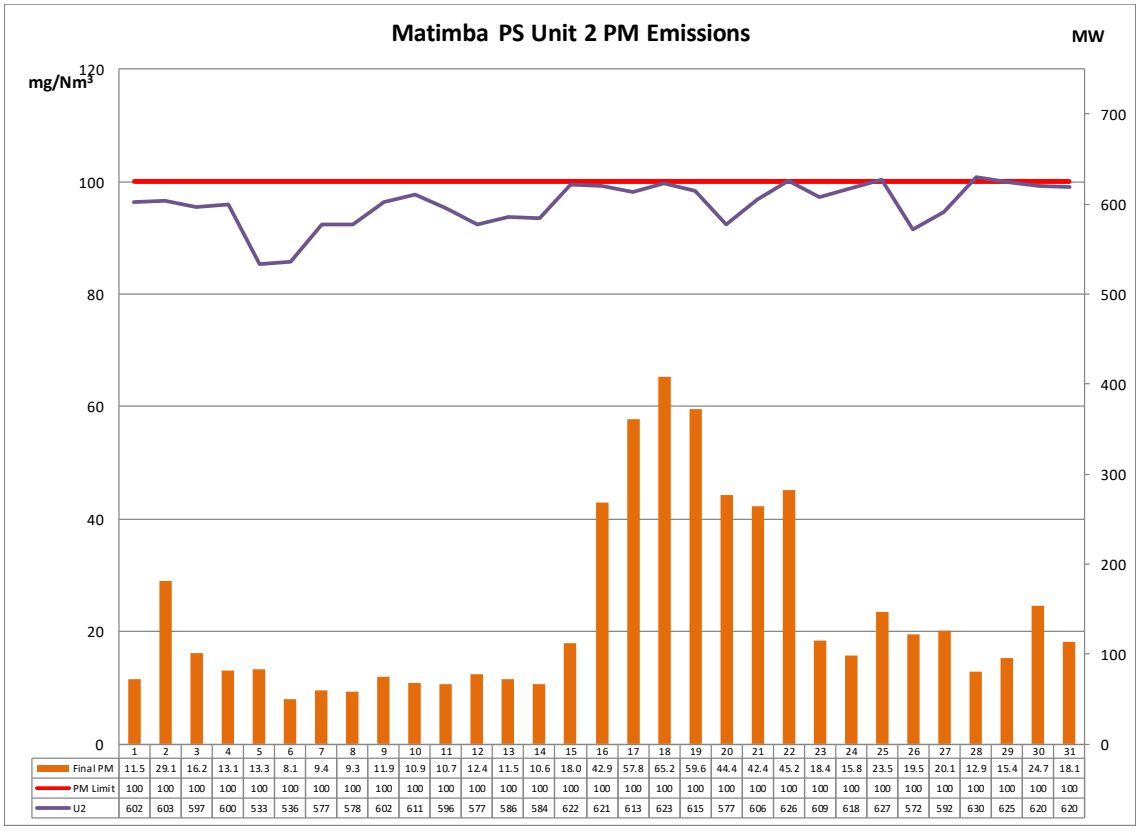


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final PM	6.9	9.8	8.0	10.1	4.6	4.6	5.7	5.3	6.3	4.9	6.9	5.2	5.2	5.6	6.0	5.7	7.7	11.1	20.8	14.0	6.7	11.4	10.8	7.1	9.0	7.6	6.4	9.9	11.2	0.0	0.0
PM Limit	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
U1	623	578	608	566	520	539	588	575	588	615	626	573	555	597	646	629	637	624	628	577	605	632	620	627	613	554	589	628	547	0	0

Graph 1: Particulate matter daily average emissions against emission limit for unit 1 for the month of January 2020

Interpretation:
All daily averages below particulate emission limit of 100 mg/Nm^3.

Unit 2 particulate emissions

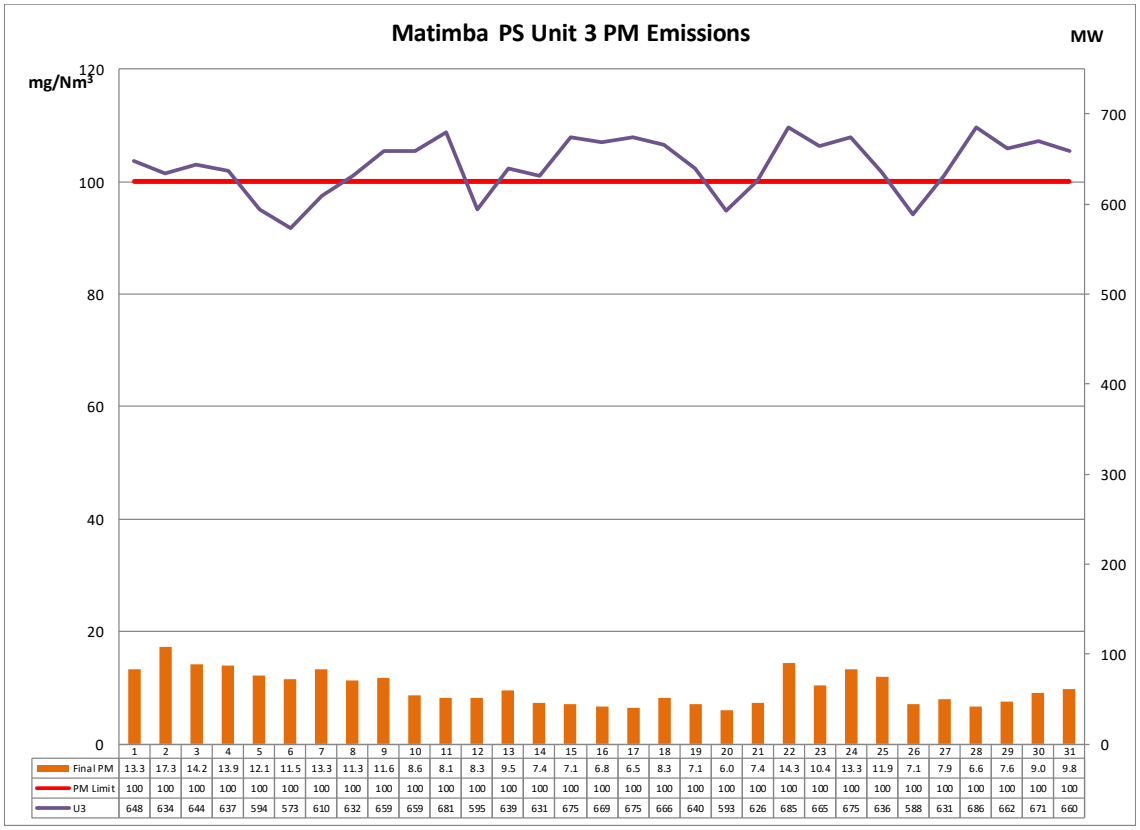


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final PM	11.5	29.1	16.2	13.1	13.3	8.1	9.4	9.3	11.9	10.9	10.7	12.4	11.5	10.6	18.0	42.9	57.8	65.2	59.6	44.4	42.4	45.2	18.4	15.8	23.5	19.5	20.1	12.9	15.4	24.7	18.1
PM Limit	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
U2	602	603	597	600	533	536	577	578	602	611	596	577	586	584	622	621	613	623	615	577	606	626	609	618	627	572	592	630	625	620	620

Graph 2: Particulate matter daily average emissions against emission limit for unit 2 for the month of January 2020

Interpretation:
All daily averages below particulate emission limit of 100 mg/Nm^3.

Unit 3 particulate emissions

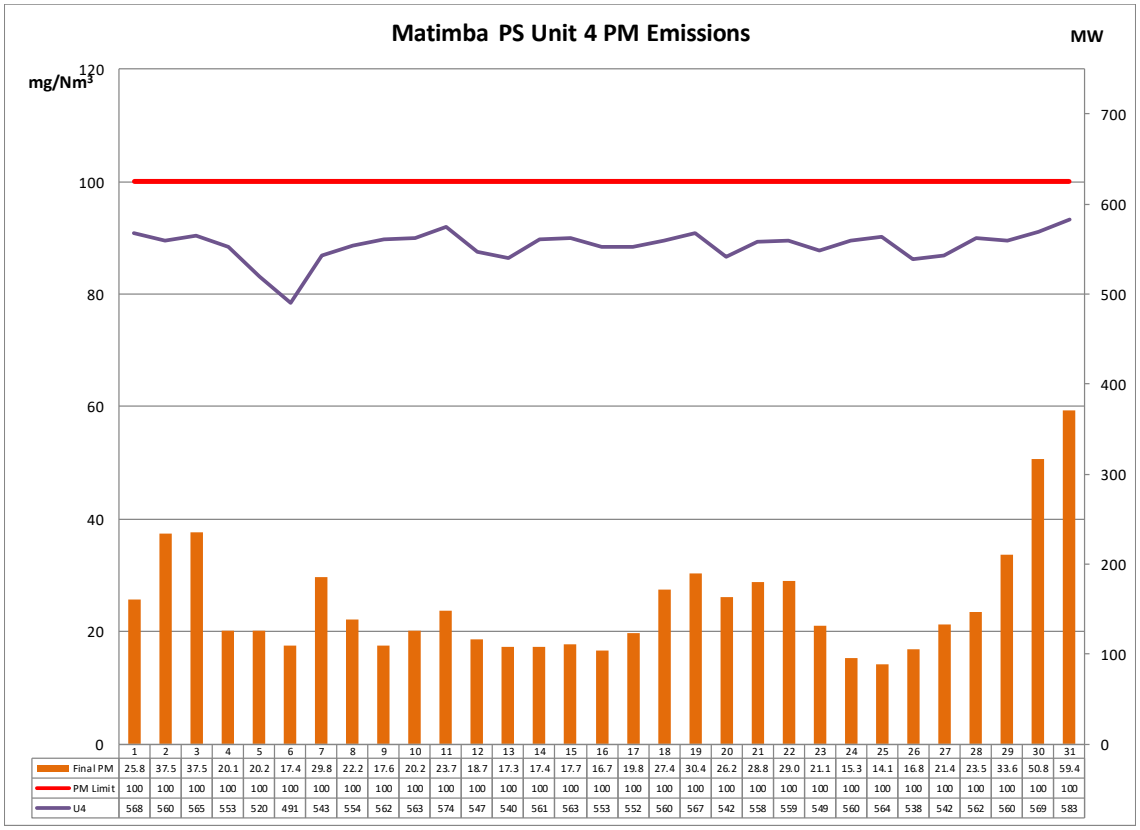


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final PM	13.3	17.3	14.2	13.9	12.1	11.5	13.3	11.3	11.6	8.6	8.1	8.3	9.5	7.4	7.1	6.8	6.5	8.3	7.1	6.0	7.4	14.3	10.4	13.3	11.9	7.1	7.9	6.6	7.6	9.0	9.8
PM Limit	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
U3	648	634	644	637	594	573	610	632	659	659	681	595	639	631	675	669	675	666	640	593	626	685	665	675	636	588	631	686	662	671	660

Graph 3: Particulate matter daily average emissions against emission limit for unit 3 for the month of January 2020

Interpretation:
All daily averages below particulate emission limit of 100 mg/Nm^3.

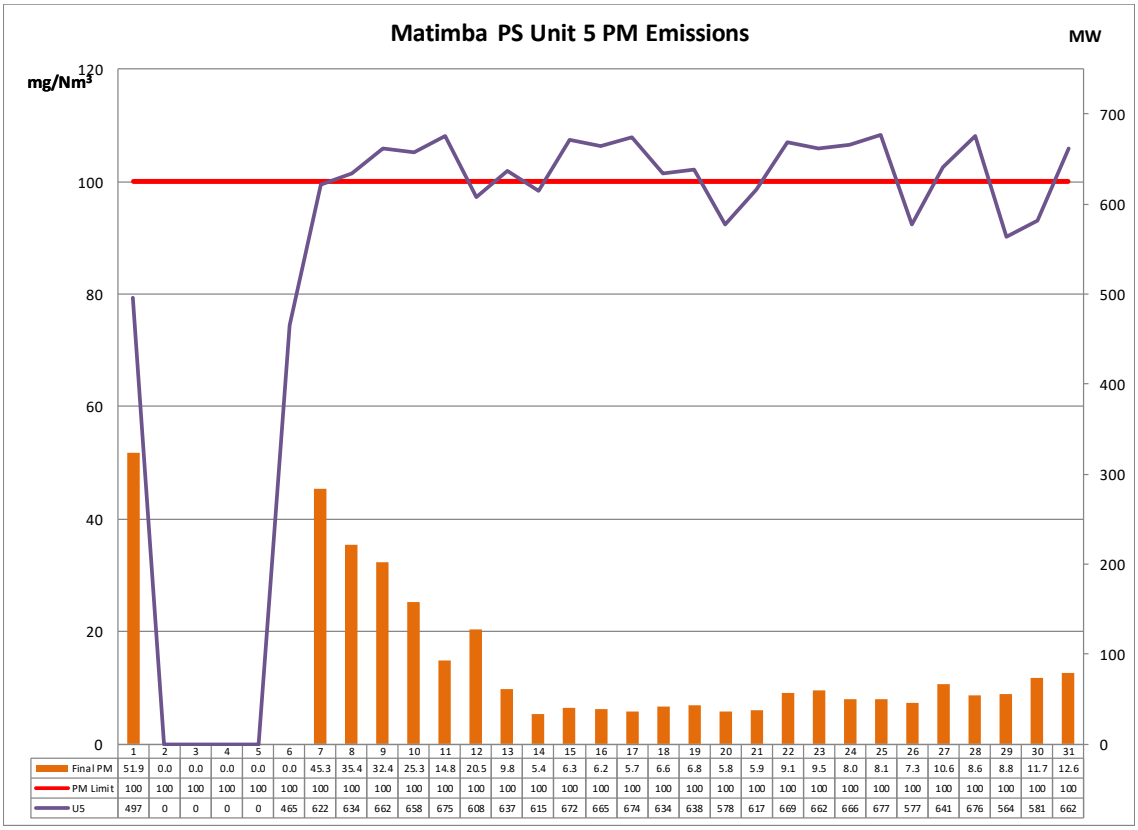
Unit 4 particulate emissions



Graph 4: Particulate matter daily average emissions against emission limit for unit 4 for the month of January 2020

Interpretation:
All daily averages below particulate emission limit of 100 mg/Nm^3.

Unit 5 particulate emissions

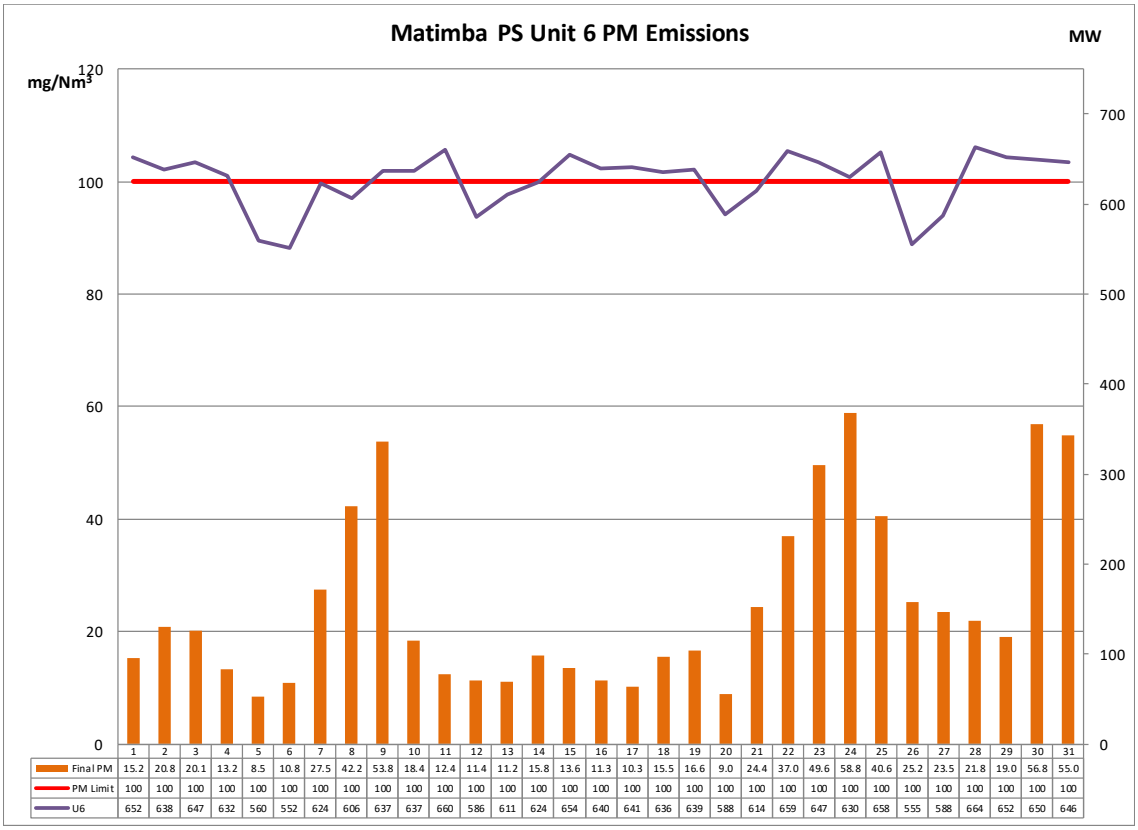


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final PM	51.9	0.0	0.0	0.0	0.0	0.0	45.3	35.4	32.4	25.3	14.8	20.5	9.8	5.4	6.3	6.2	5.7	6.6	6.8	5.8	5.9	9.1	9.5	8.0	8.1	7.3	10.6	8.6	8.8	11.7	12.6
PM Limit	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
U5	497	0	0	0	0	465	622	634	662	658	675	608	637	615	672	665	674	634	638	578	617	669	662	666	677	577	641	676	564	581	662

Graph 5: Particulate matter daily average emissions against emission limit for unit 5 for the month of January 2020

Interpretation:
All daily averages below particulate emission limit of 100 mg/Nm^3.

Unit 6 particulate emissions

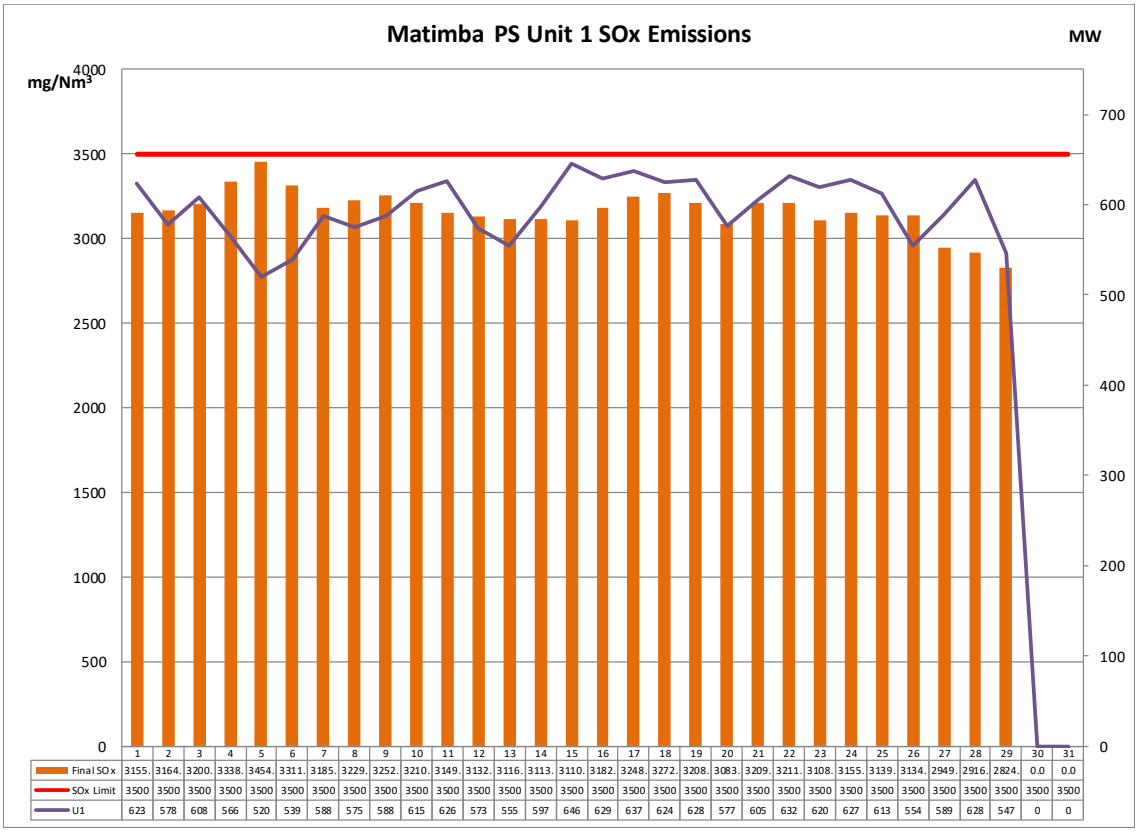


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final PM	15.2	20.8	20.1	13.2	8.5	10.8	27.5	42.2	53.8	18.4	12.4	11.4	11.2	15.8	13.6	11.3	10.3	15.5	16.6	9.0	24.4	37.0	49.6	58.8	40.6	25.2	23.5	21.8	19.0	56.8	55.0
PM Limit	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
U6	652	638	647	632	560	552	624	606	637	637	660	586	611	624	654	640	641	636	639	588	614	659	647	630	658	555	588	664	652	650	646

Graph 6: Particulate matter daily average emissions against emission limit for unit 6 for the month of January 2020

Interpretation:
All daily averages below particulate emission limit of 100 mg/Nm^3.

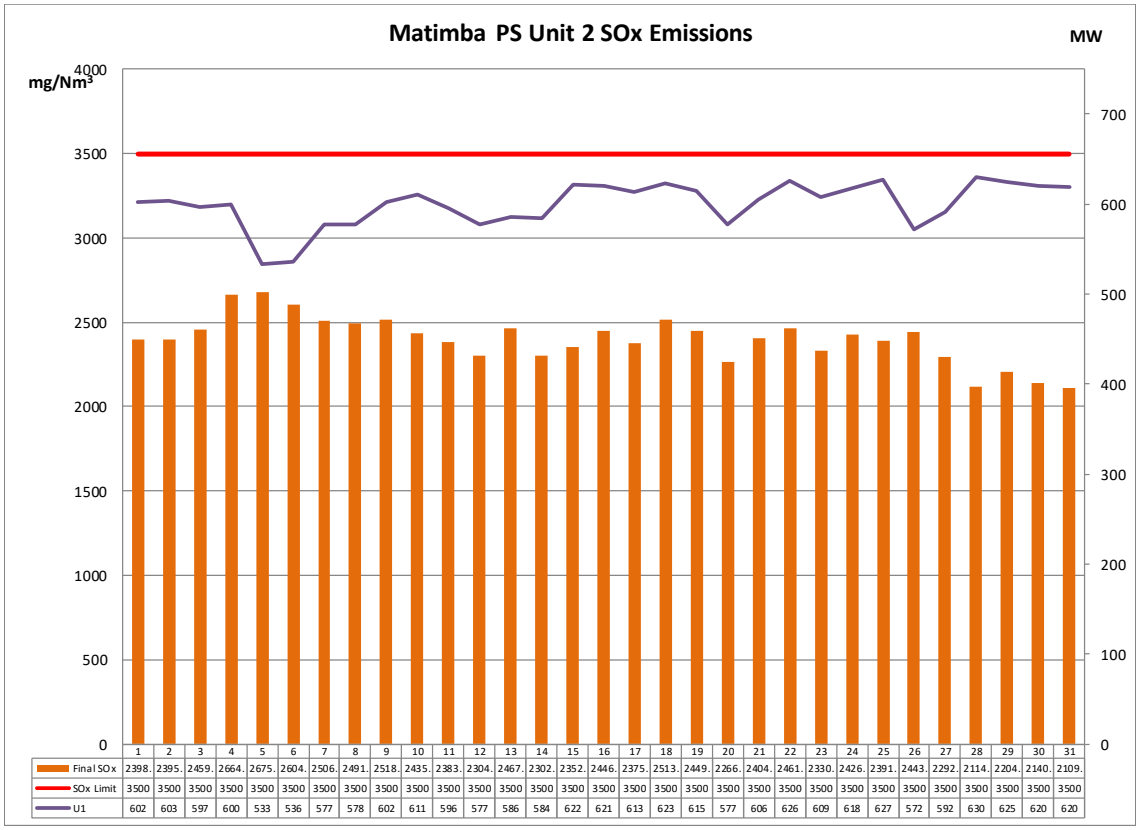
Unit 1 SO_2 emissions



Graph 7: SO_2 daily average emissions against emission limit for unit 1 for the month of January 2020

Interpretation:
All daily averages below SO_2 emission limit of 3500 mg/Nm^3.

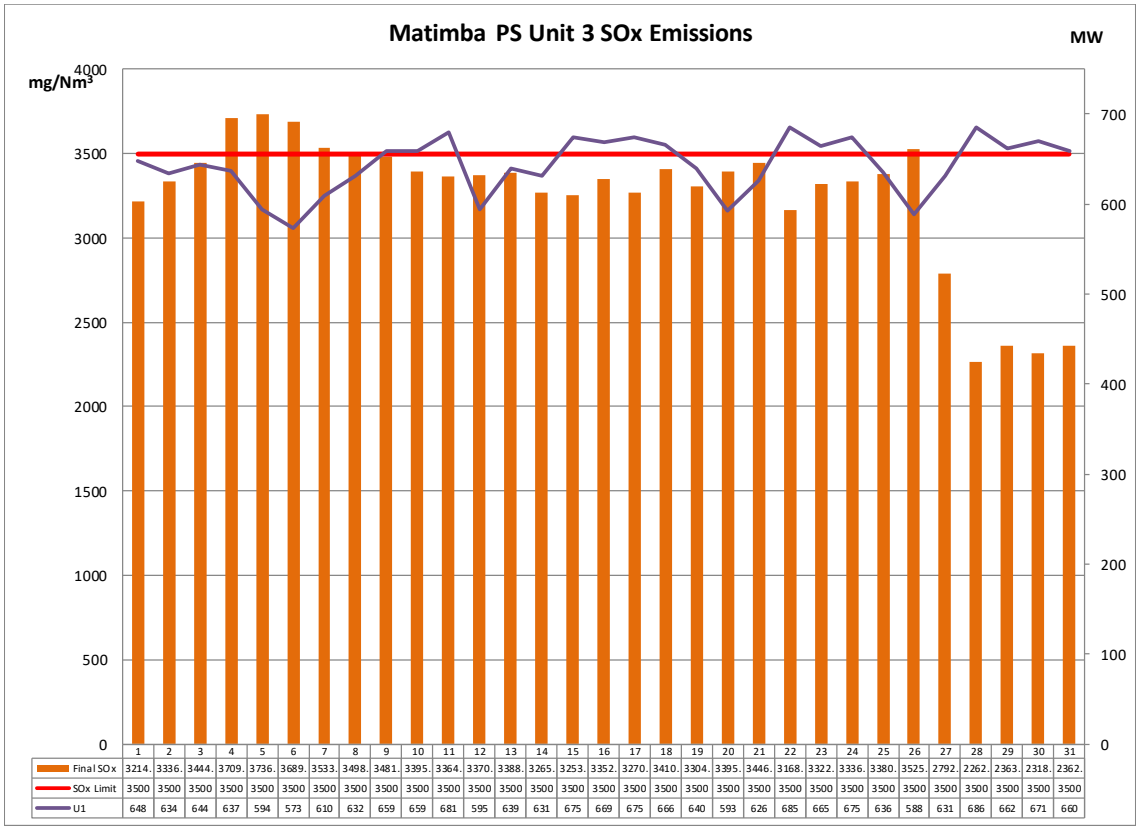
Unit 2 SO_2 emissions



Graph 8: SO_2 daily average emissions against emission limit for unit 2 for the month of January 2020

Interpretation:
All daily averages below SO_2 emission limit of 3500 mg/Nm^3.

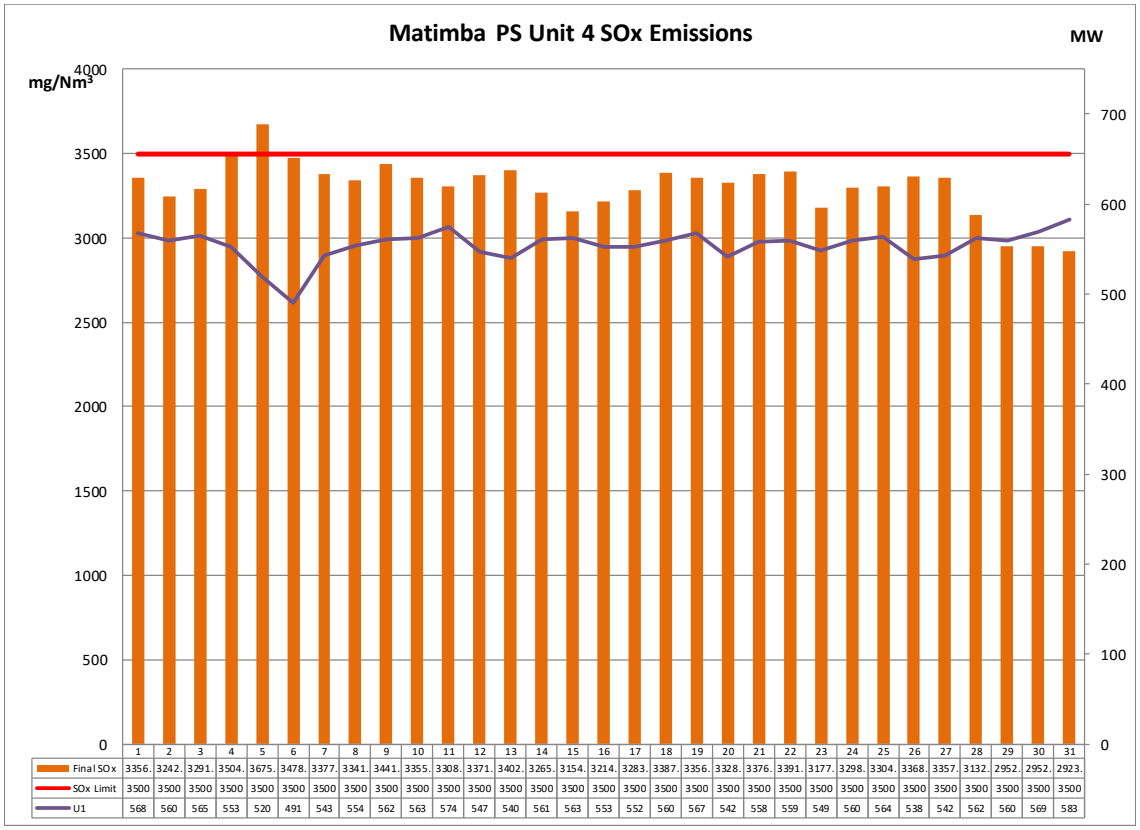
Unit 3 SO_2 emissions



Graph 9: SO_2 daily average emissions against emission limit for unit 3 for the month of January 2020

Interpretation:
The SO_2 daily average of 3500mg/Nm^3 was exceeded on the 4th to the 7th and the 26th of January 2020. It is suspected that the exceedances are due to an increase in the sulphur content of the coal used in the combustion process. The exceedances will be thoroughly investigated to determine the root cause.

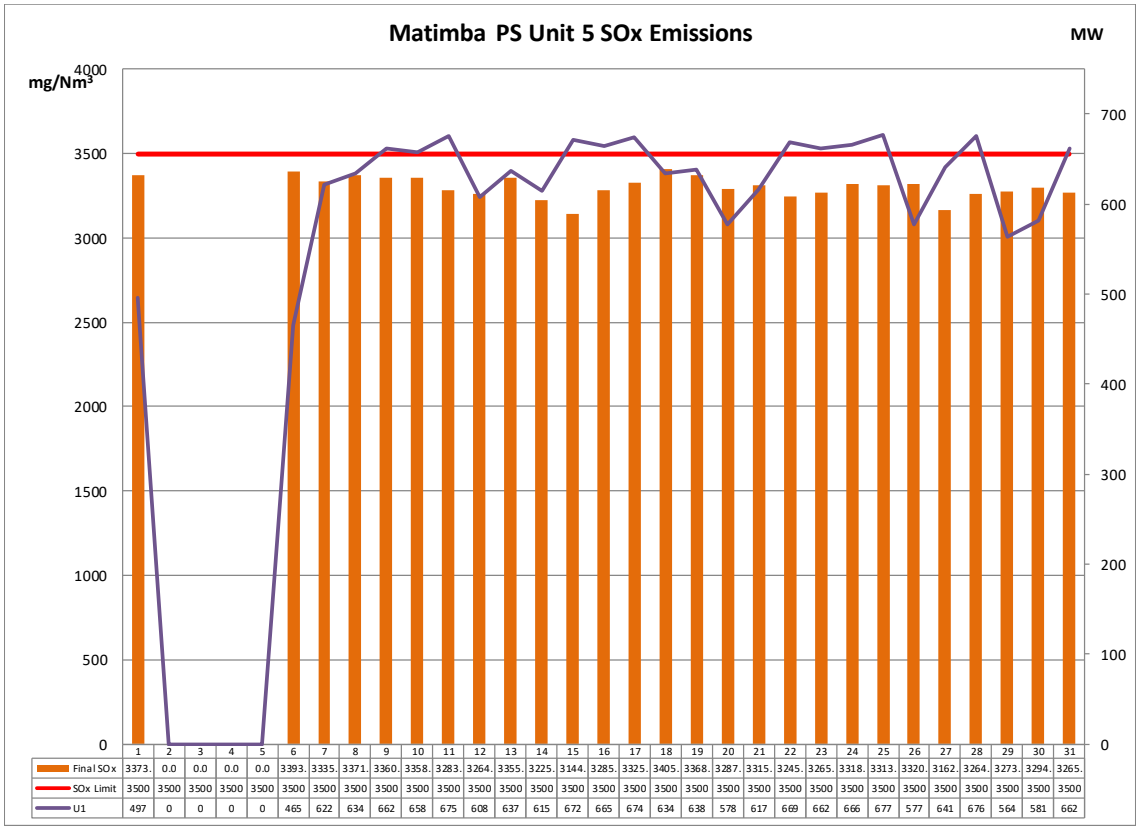
Unit 4 SO_2 emissions



Graph 10: SO_2 daily average emissions against emission limit for unit 4 for the month of January 2020

Interpretation:
The SO_2 daily average of 3500mg/Nm^3 was exceeded on the 4th and the 5th of January 2020. It is suspected that the exceedances are due to an increase in the sulphur content of the coal used in the combustion process. The exceedances will be thoroughly investigated to determine the root cause.

Unit 5 SO_2 emissions

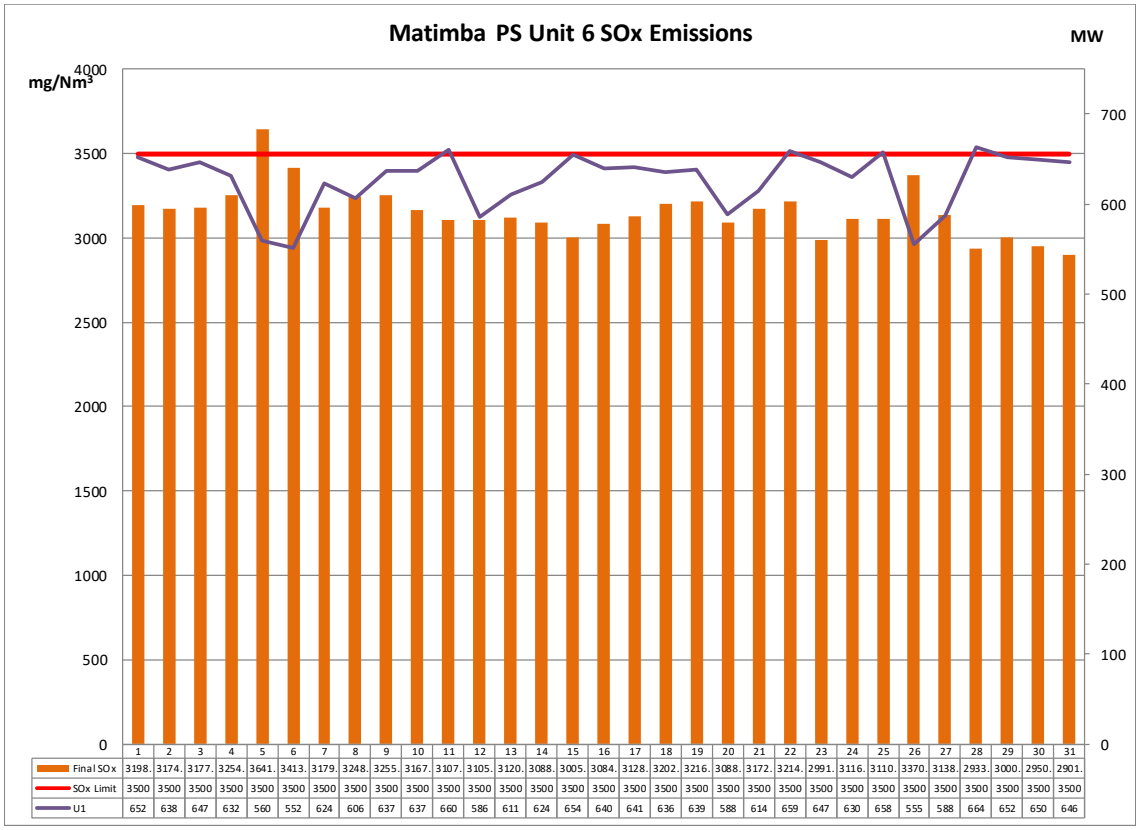


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final SOx	3373.	0.0	0.0	0.0	0.0	3393.	3335.	3371.	3360.	3358.	3283.	3264.	3355.	3225.	3144.	3285.	3325.	3405.	3368.	3287.	3315.	3245.	3265.	3318.	3313.	3320.	3162.	3264.	3273.	3294.	3265.
SOx Limit	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
U1	497	0	0	0	0	465	622	634	662	658	675	608	637	615	672	665	674	634	638	578	617	669	662	666	677	577	641	676	564	581	662

Graph 11: SO_2 daily average emissions against emission limit for unit 5 for the month of January 2020

Interpretation:
All daily averages below SO_2 emission limit of 3500 mg/Nm^3.

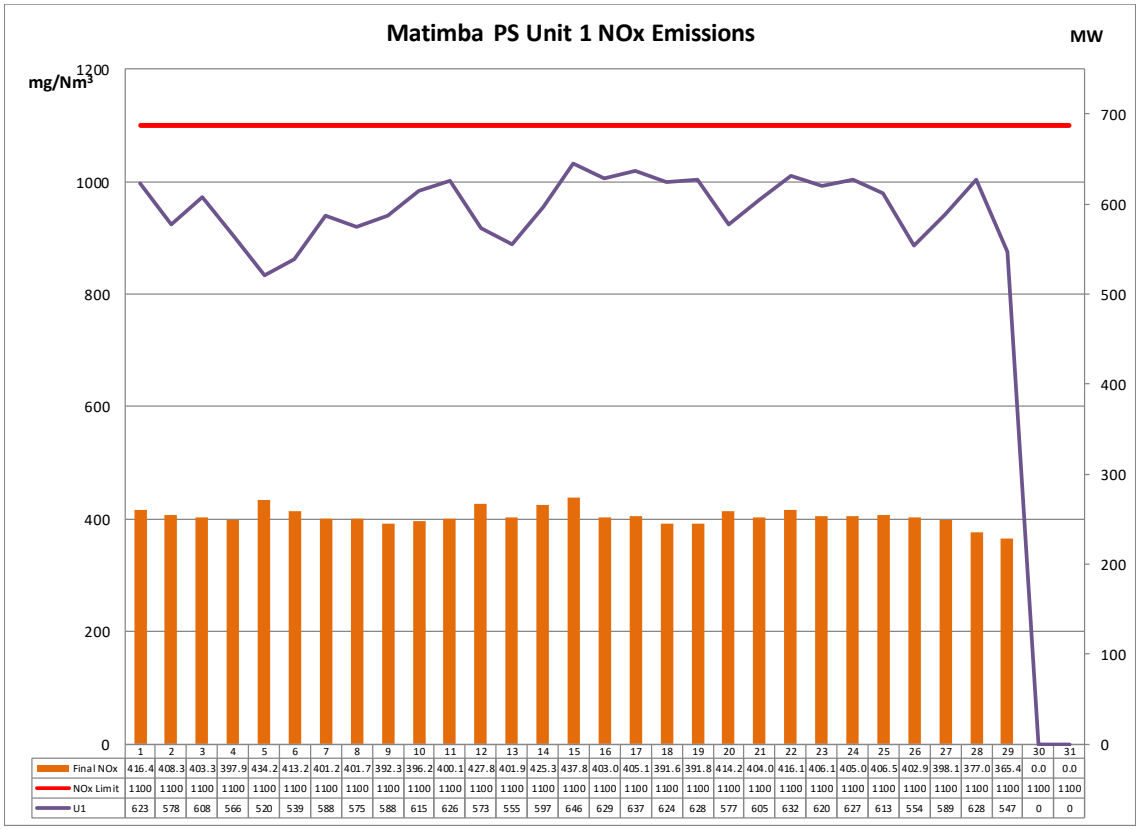
Unit 6 SO_2 emissions



Graph 12: SO_2 daily average emissions against emission limit for unit 6 for the month of January 2020

Interpretation:
The SO_2 daily average of 3500mg/Nm^3 was exceeded on the 5th of January 2020. It is suspected that the exceedances are due to an increase in the sulphur content of the coal used in the combustion process. The exceedances will be thoroughly investigated to determine the root cause.

Unit 1 NO_x emissions

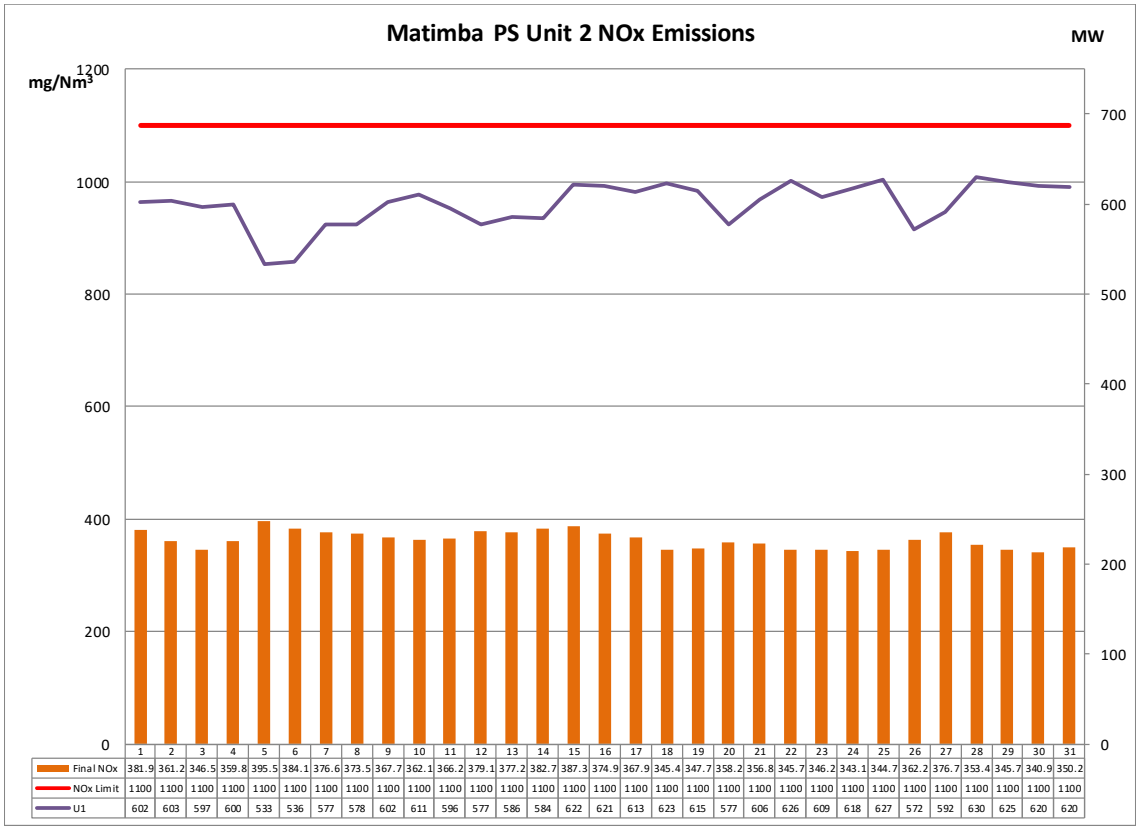


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final NOx	416.4	408.3	403.3	397.9	434.2	413.2	401.2	401.7	392.3	396.2	400.1	427.8	401.9	425.3	437.8	403.0	405.1	391.6	391.8	414.2	404.0	416.1	406.1	405.0	406.5	402.9	398.1	377.0	365.4	0.0	0.0
NOx Limit	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
U1	623	578	608	566	520	539	588	575	588	615	626	573	555	597	646	629	637	624	628	577	605	632	620	627	613	554	589	628	547	0	0

Graph 13: NO_x daily average emissions against emission limit for unit 1 for the month of January 2020

Interpretation:
All daily averages below NO_x emission limit of 1100 mg/Nm^3.

Unit 2 NO_x emissions

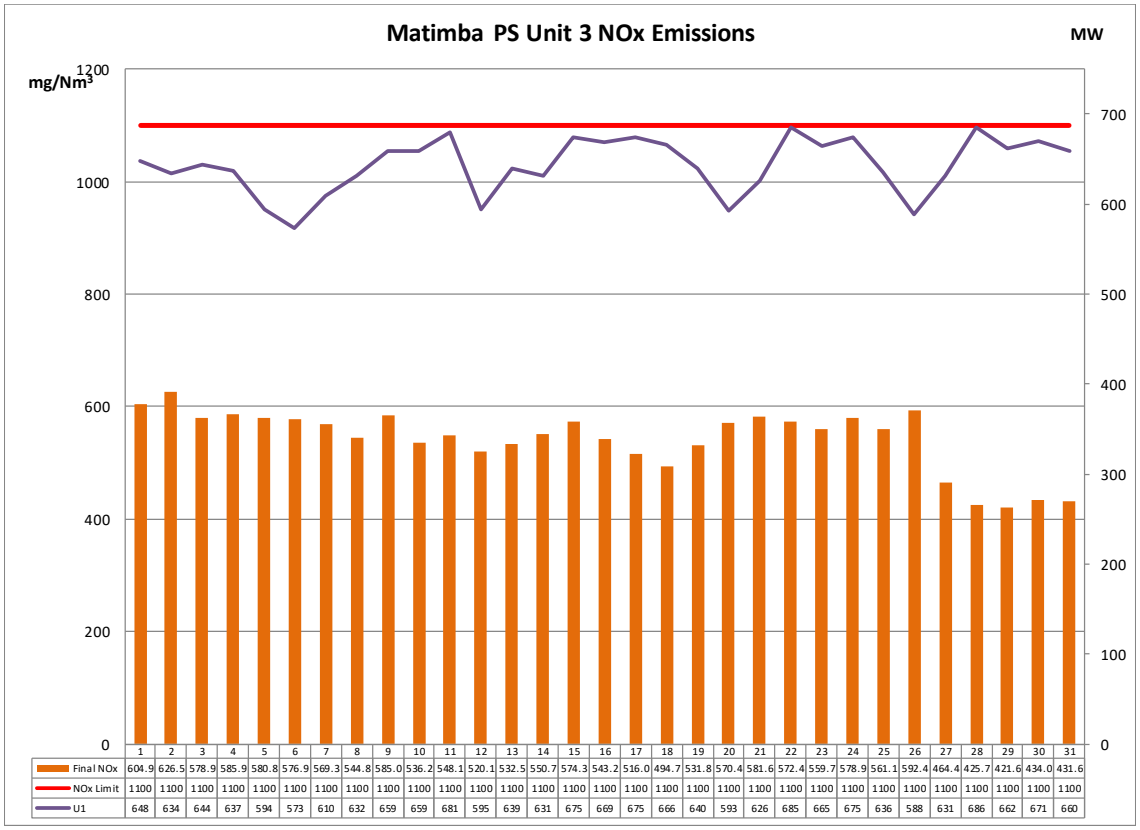


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final NOx	381.9	361.2	346.5	359.8	395.5	384.1	376.6	373.5	367.7	362.1	366.2	379.1	377.2	382.7	387.3	374.9	367.9	345.4	347.7	358.2	356.8	345.7	346.2	343.1	344.7	362.2	376.7	353.4	345.7	340.9	350.2
NOx Limit	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
U1	602	603	597	600	533	536	577	578	602	611	596	577	586	584	622	621	613	623	615	577	606	626	609	618	627	572	592	630	625	620	620

Graph 14: NO_x daily average emissions against emission limit for unit 2 for the month of January 2020

Interpretation:
All daily averages below NO_x emission limit of 1100 mg/Nm^3.

Unit 3 NO_x emissions

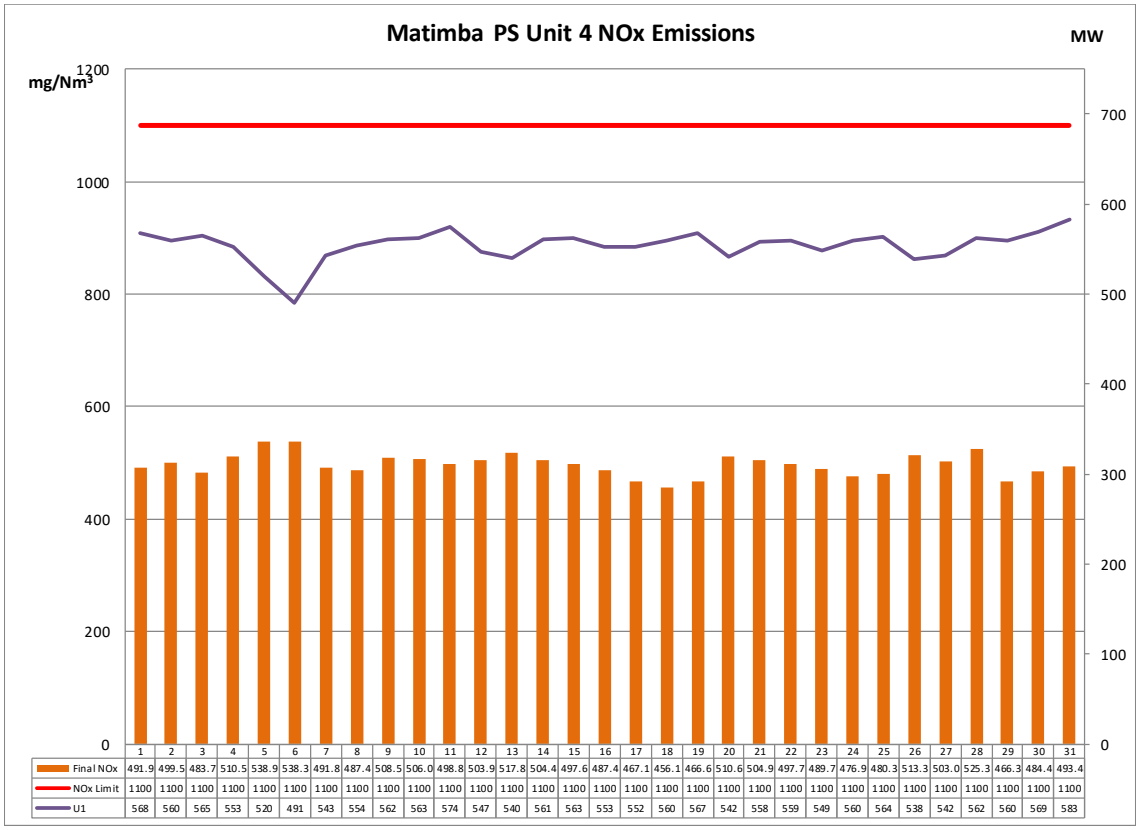


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final NOx	604.9	626.5	578.9	585.9	580.8	576.9	569.3	544.8	585.0	536.2	548.1	520.1	532.5	550.7	574.3	543.2	516.0	494.7	531.8	570.4	581.6	572.4	559.7	578.9	561.1	592.4	464.4	425.7	421.6	434.0	431.6
NOx Limit	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
U1	648	634	644	637	594	573	610	632	659	659	681	595	639	631	675	669	675	666	640	593	626	685	665	675	636	588	631	686	662	671	660

Graph 15: NO_x daily average emissions against emission limit for unit 3 for the month of January 2020

Interpretation:
All daily averages below NO_x emission limit of 1100 mg/Nm^3.

Unit 4 NO_x emissions

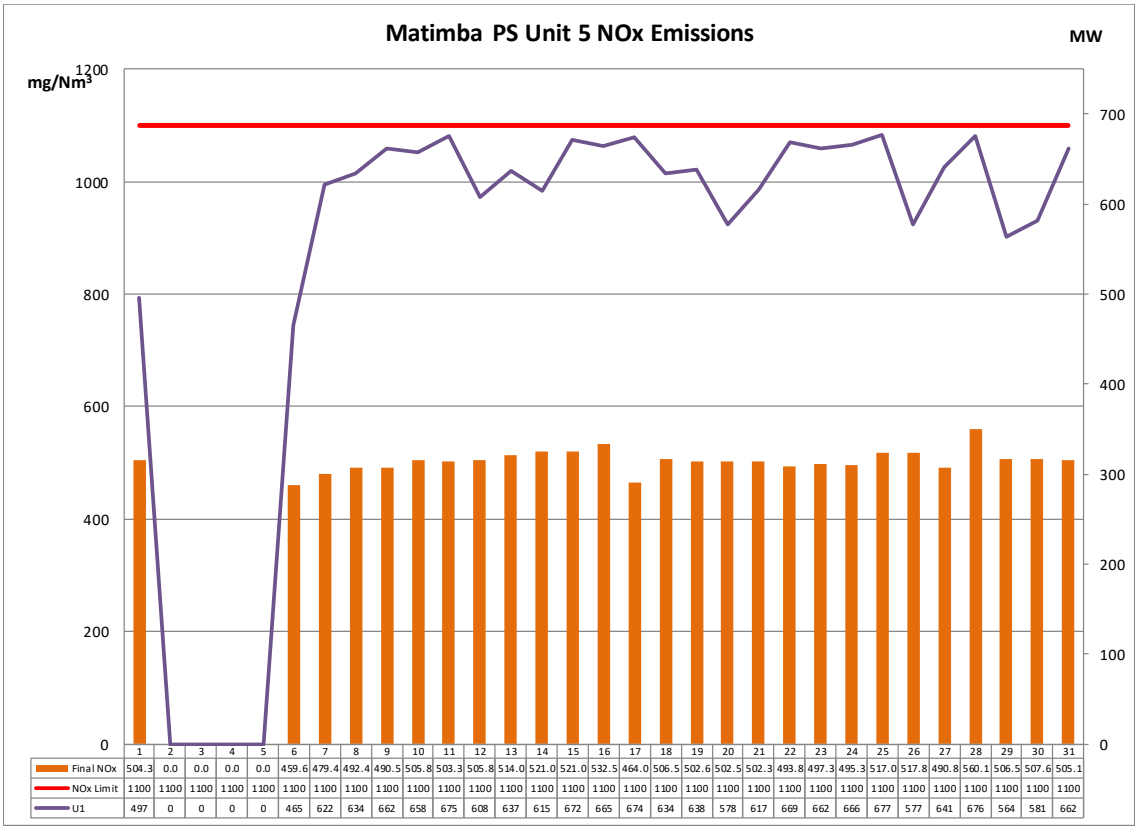


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final NOx	491.9	499.5	483.7	510.5	538.9	538.3	491.8	487.4	508.5	506.0	498.8	503.9	517.8	504.4	497.6	487.4	467.1	456.1	466.6	510.6	504.9	497.7	489.7	476.9	480.3	513.3	503.0	525.3	466.3	484.4	493.4
NOx Limit	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
U1	568	560	565	553	520	491	543	554	562	563	574	547	540	561	563	553	552	560	567	542	558	559	549	560	564	538	542	562	560	569	583

Graph 16: NO_x daily average emissions against emission limit for unit 4 for the month of January 2020

Interpretation:
All daily averages below NO_x emission limit of 1100 mg/Nm^3.

Unit 5 NO_x emissions

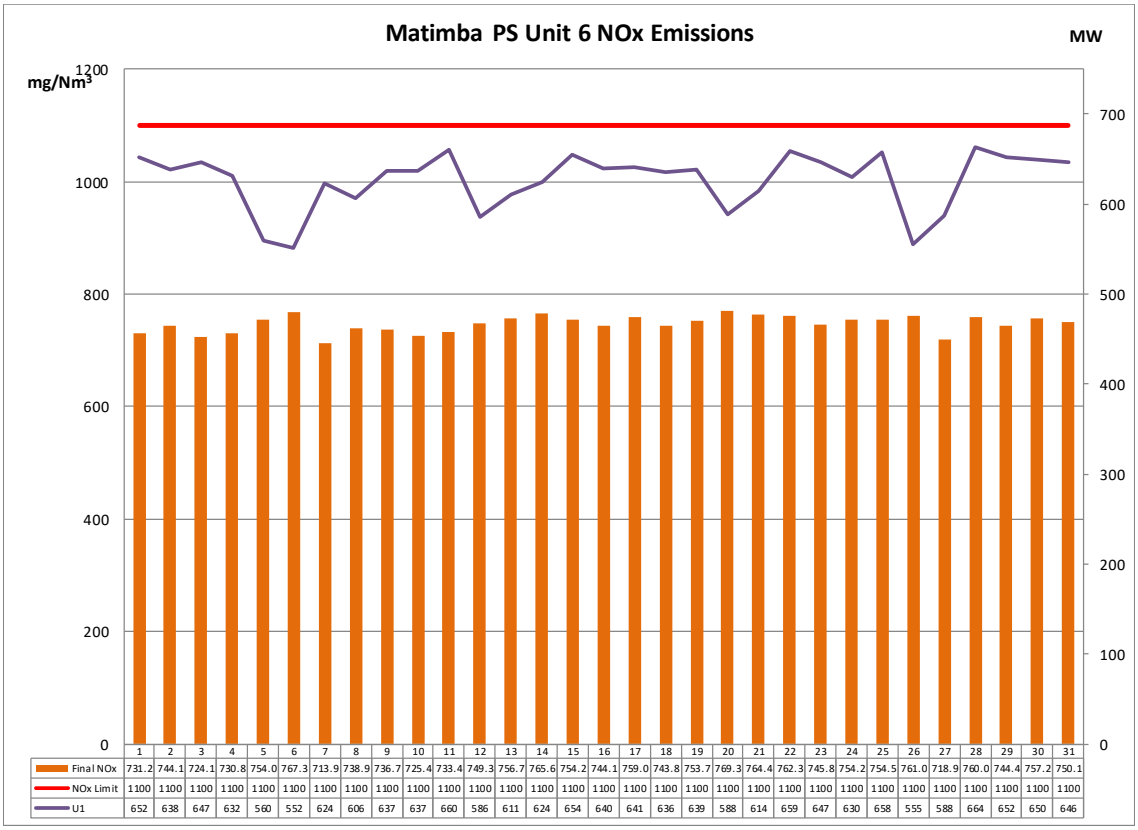


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final NOx	504.3	0.0	0.0	0.0	0.0	459.6	479.4	492.4	490.5	505.8	503.3	505.8	514.0	521.0	521.0	532.5	464.0	506.5	502.6	502.5	502.3	493.8	497.3	495.3	517.0	517.8	490.8	560.1	506.5	507.6	505.1
NOx Limit	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
U1	497	0	0	0	0	465	622	634	662	658	675	608	637	615	672	665	674	634	638	578	617	669	662	666	677	577	641	676	564	581	662

Graph 17: NO_x daily average emissions against emission limit for unit 5 for the month of January 2020

Interpretation:
All daily averages below NO_x emission limit of 1100 mg/Nm^3.

Unit 6 NO_x emissions



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Final NOx	731.2	744.1	724.1	730.8	754.0	767.3	713.9	738.9	736.7	725.4	733.4	749.3	756.7	765.6	754.2	744.1	759.0	743.8	753.7	769.3	764.4	762.3	745.8	754.2	754.5	761.0	718.9	760.0	744.4	757.2	750.1
NOx Limit	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
U1	652	638	647	632	560	552	624	606	637	637	660	586	611	624	654	640	641	636	639	588	614	659	647	630	658	555	588	664	652	650	646

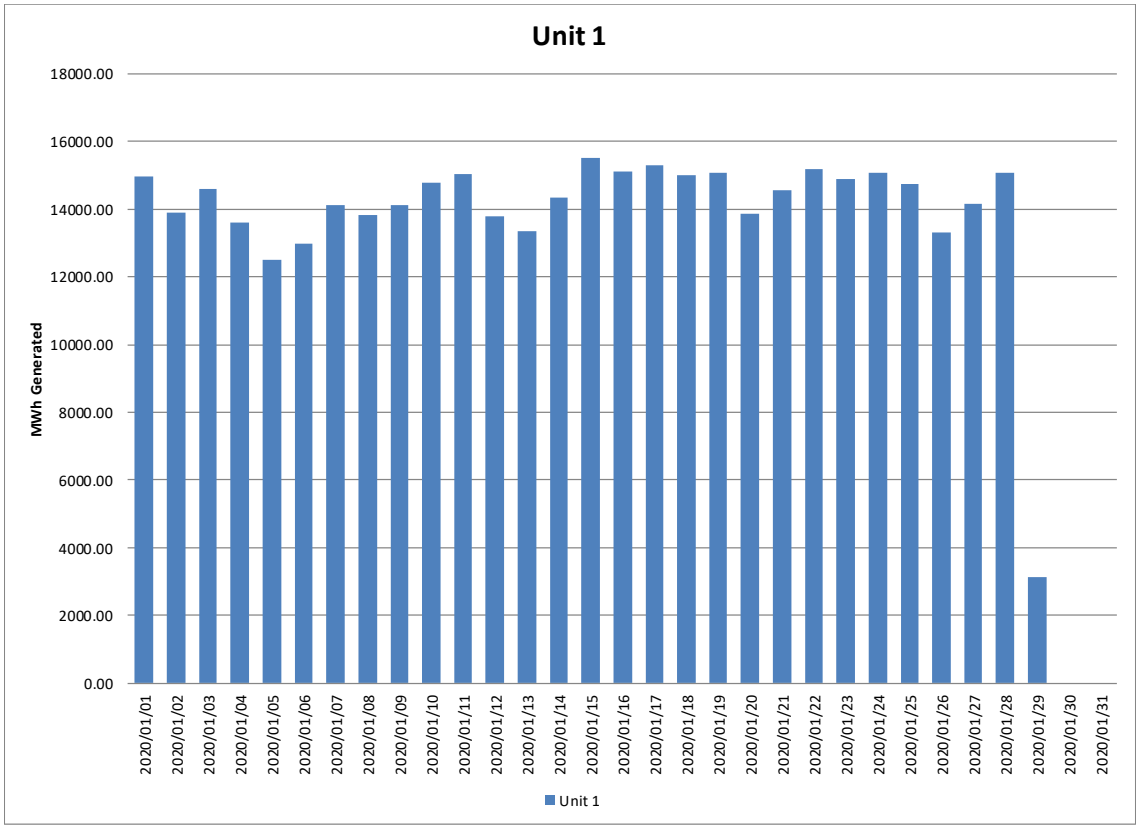
Graph 18: NO_x daily average emissions against emission limit for unit 6 for the month of January 2020

Interpretation:
All daily averages below NO_x emission limit of 1100 mg/Nm^3.

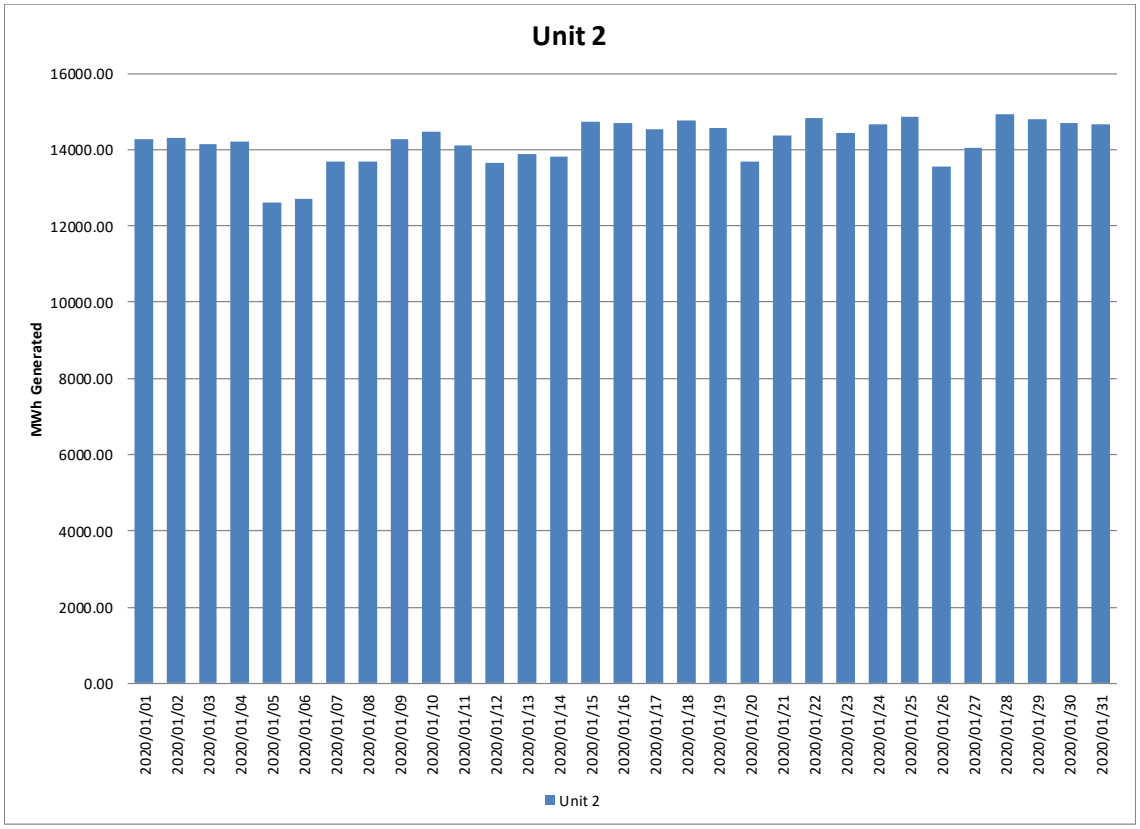
Table 4: Daily power generated per unit in MWh for the month of January 2020

Date	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
2020/01/01	14967.73	14278.20	15314.87	13511.07	1688.60	15513.20
2020/01/02	13883.53	14305.27	14933.00	13334.60	0.00	15170.33
2020/01/03	14596.33	14151.07	15177.47	13444.93	0.00	15381.20
2020/01/04	13588.47	14215.80	14994.93	13143.47	0.00	15031.60
2020/01/05	12503.73	12622.73	13971.93	12378.60	0.00	13317.40
2020/01/06	12958.47	12710.27	13479.93	11692.40	10307.70	13121.73
2020/01/07	14114.07	13678.13	14336.40	12913.67	14799.90	14840.07
2020/01/08	13804.33	13687.67	14878.80	13186.47	15082.40	14420.00
2020/01/09	14117.00	14260.80	15548.80	13343.27	15747.90	15180.80
2020/01/10	14778.07	14466.20	15538.07	13408.53	15657.40	15180.20
2020/01/11	15032.00	14120.80	16057.07	13674.27	16071.60	15719.60
2020/01/12	13772.73	13668.80	13965.53	13021.53	14471.90	13933.27
2020/01/13	13325.67	13882.33	15040.60	12860.73	15167.40	14533.60
2020/01/14	14328.67	13832.20	14829.87	13394.33	14632.50	14848.53
2020/01/15	15503.87	14742.27	15900.00	13436.47	15999.60	15567.53
2020/01/16	15114.87	14706.53	15749.60	13207.93	15830.90	15235.80
2020/01/17	15289.60	14533.80	15894.27	13190.80	16048.10	15246.73
2020/01/18	14988.87	14771.47	15701.80	13377.20	15085.10	15121.67
2020/01/19	15081.67	14578.80	15071.73	13540.20	15181.50	15200.47
2020/01/20	13856.40	13682.40	13871.00	12943.27	13758.20	13988.87
2020/01/21	14537.60	14365.27	14671.00	13323.73	14672.30	14608.87
2020/01/22	15181.33	14836.73	16090.54	13349.73	15914.50	15683.00
2020/01/23	14888.47	14437.53	15603.40	13108.87	15766.90	15389.40
2020/01/24	15063.53	14657.13	15839.87	13371.47	15837.40	14973.87
2020/01/25	14720.67	14866.13	14910.27	13458.13	16099.30	15642.53
2020/01/26	13320.20	13564.93	13743.07	12854.27	13730.20	13194.00
2020/01/27	14154.53	14039.87	14782.40	12951.07	15244.00	13982.40
2020/01/28	15074.60	14934.93	16059.80	13411.87	16081.40	15787.13
2020/01/29	3149.80	14808.80	15465.20	13368.53	13413.70	15520.53
2020/01/30	0.00	14701.07	15688.27	13590.87	13831.00	15461.93
2020/01/31	0.00	14679.60	15401.67	13916.73	15751.20	15376.80

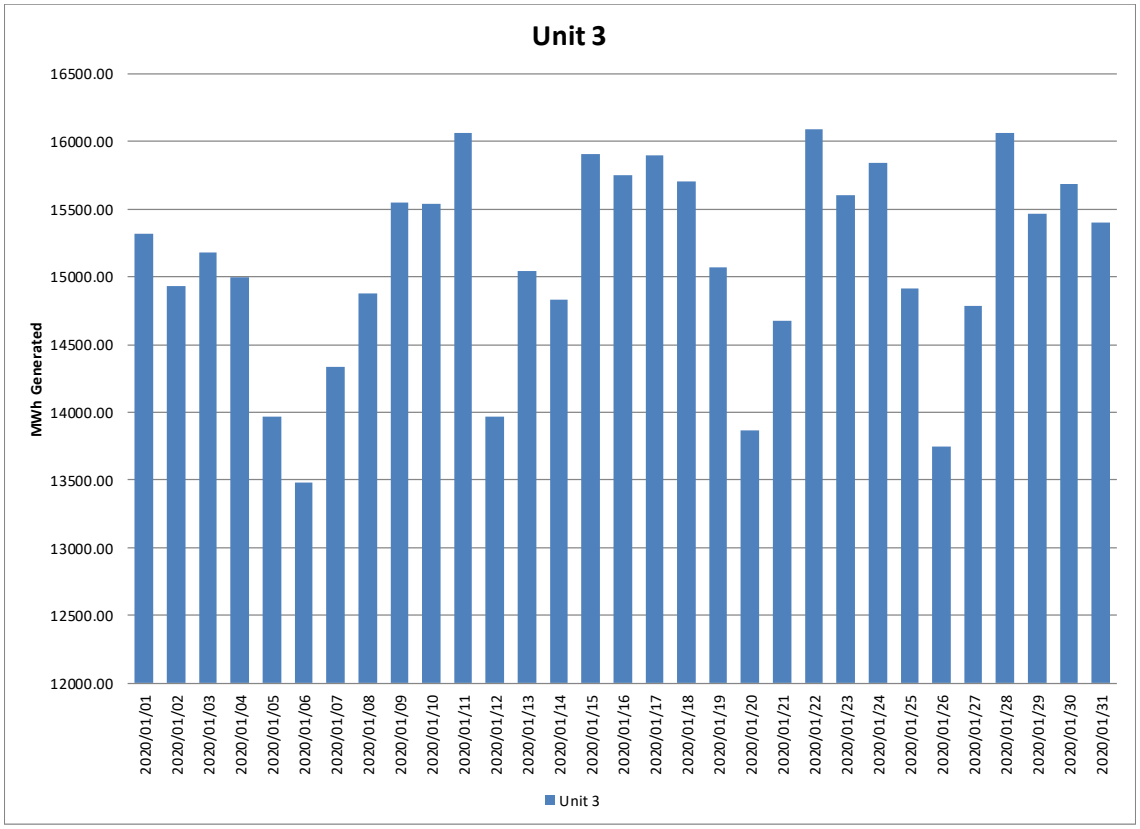
Graph 19: Unit 1 daily generated power in MWh for the month of January 2020



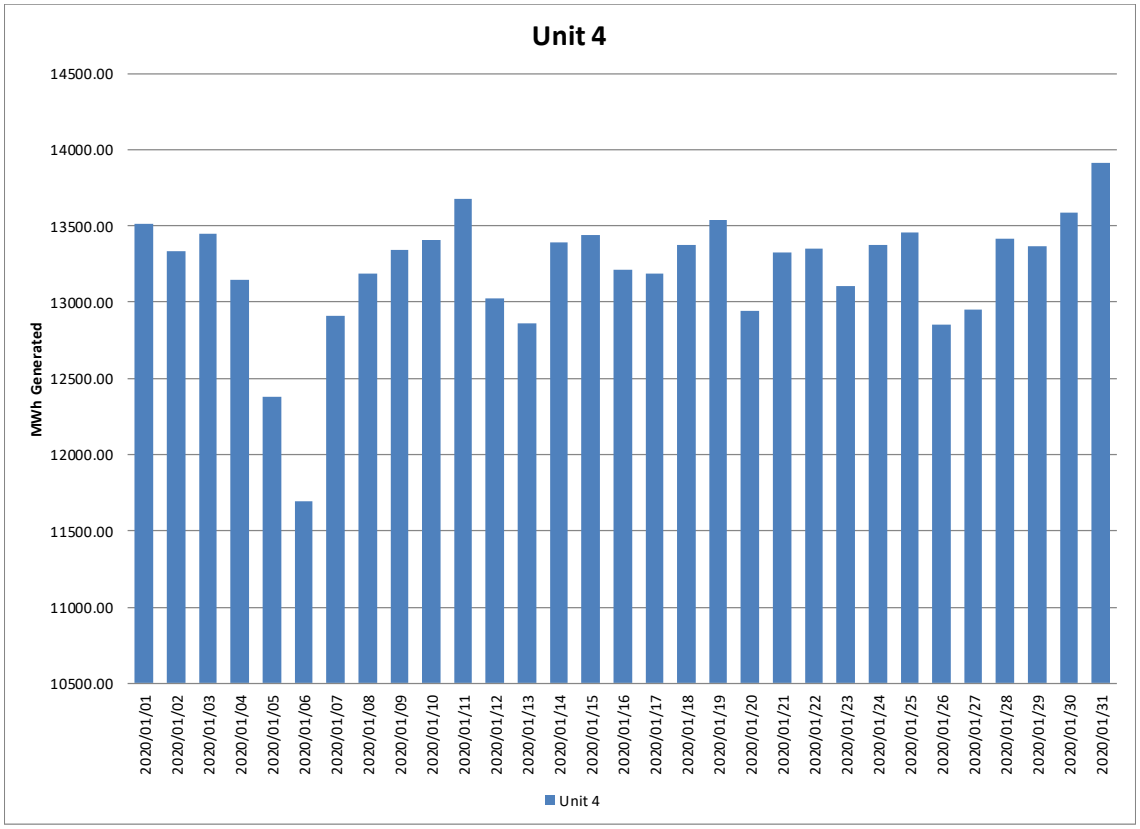
Graph 20: Unit 2 daily generated power in MWh for the month of January 2020



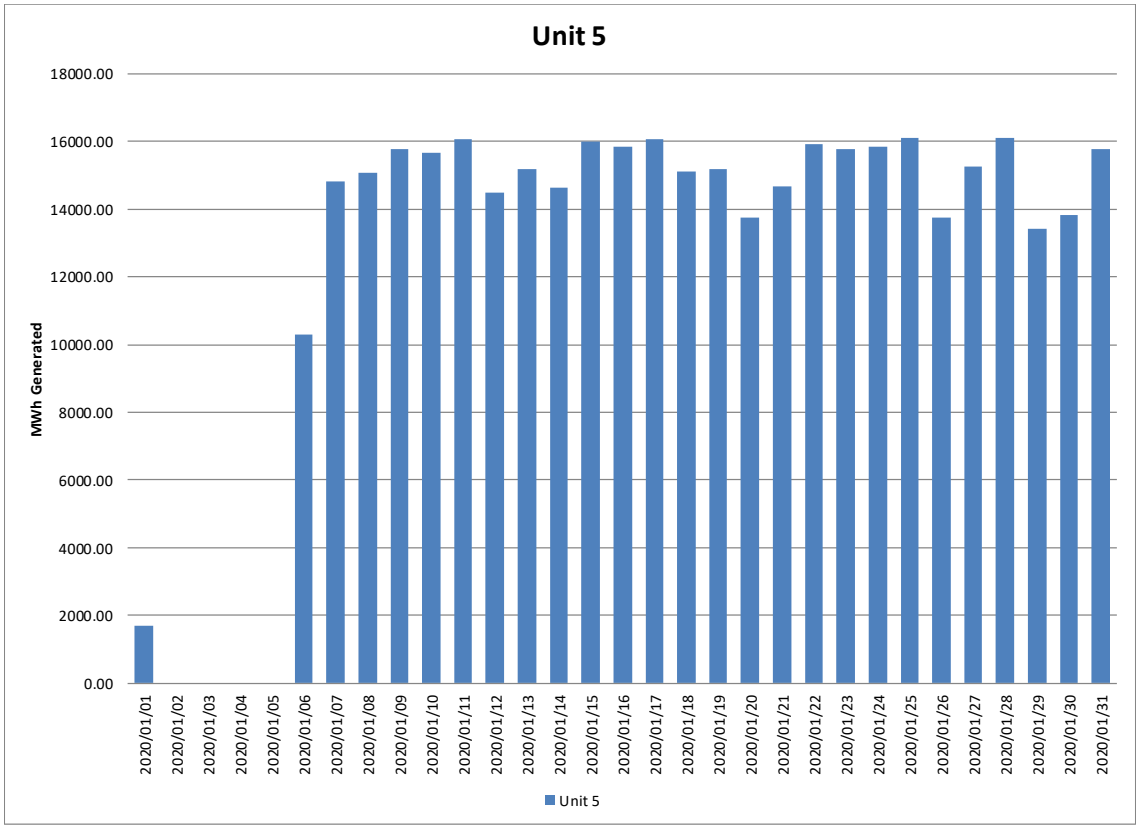
Graph 21: Unit 3 daily generated power in MWh for the month of January 2020



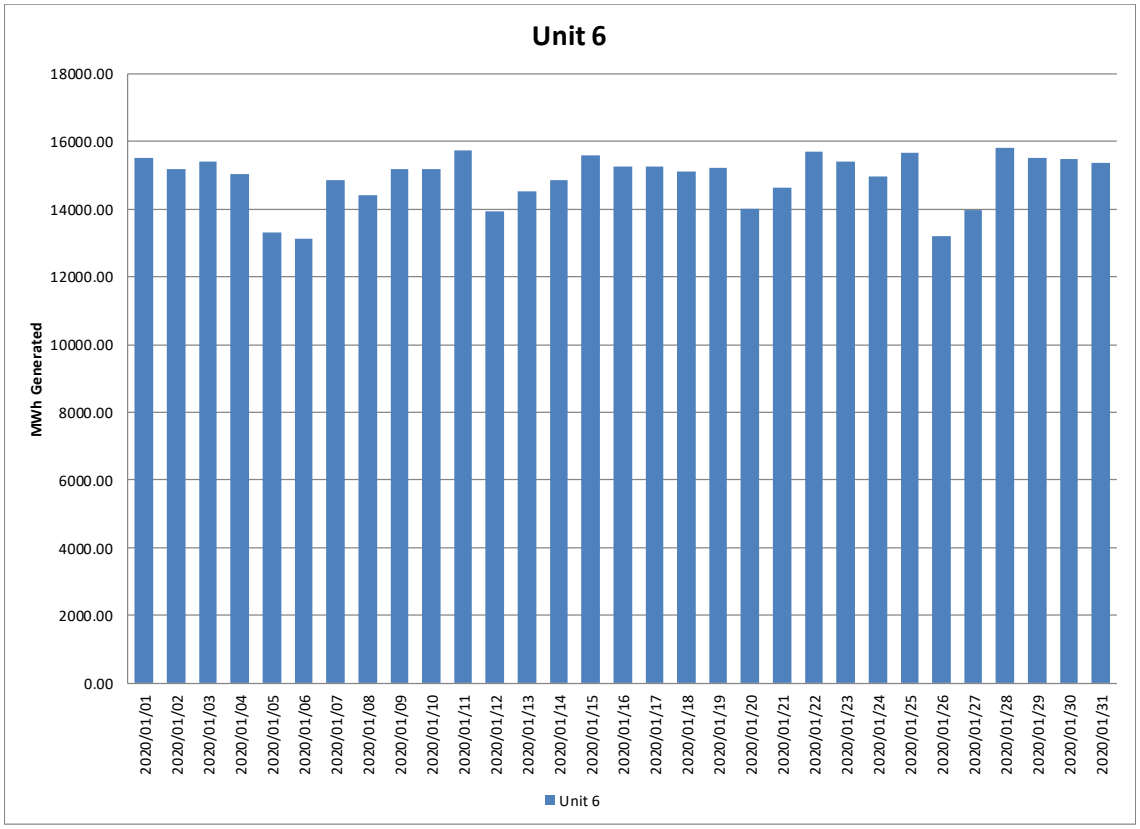
Graph 22: Unit 4 daily generated power in MWh for the month of January 2020



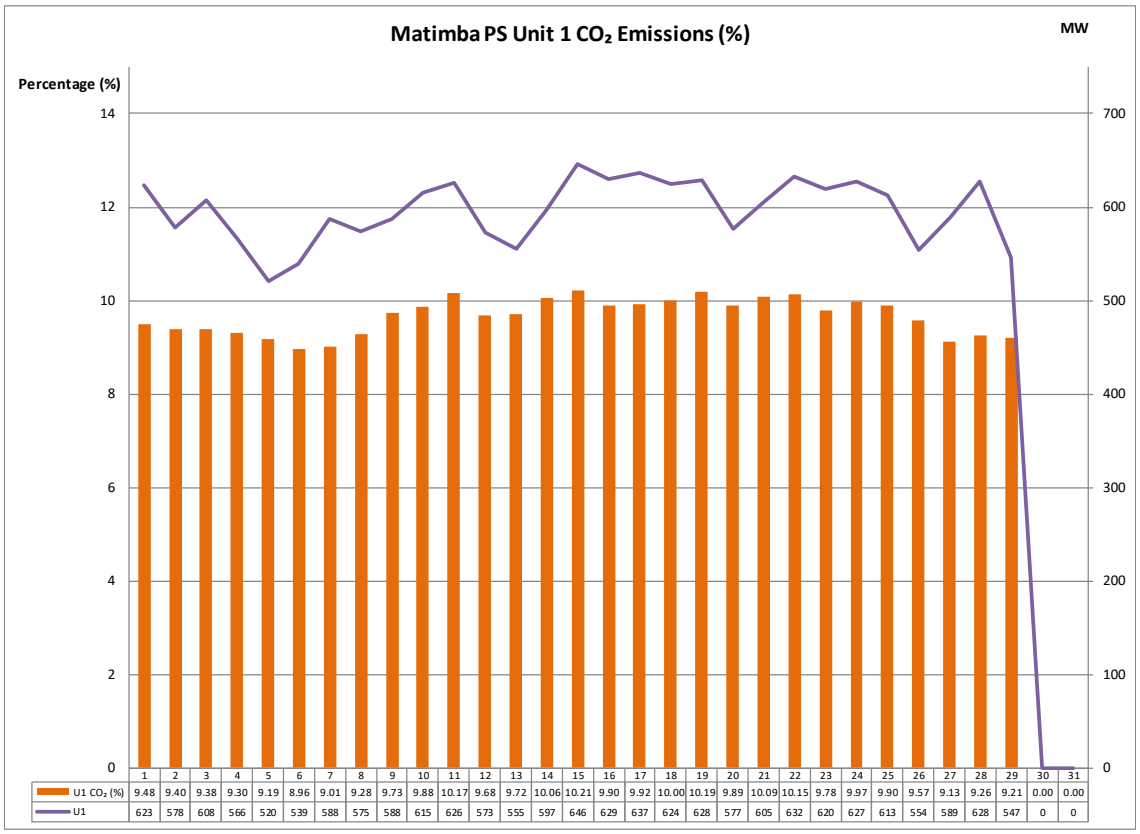
Graph 23: Unit 5 daily generated power in MWh for the month of January 2020



Graph 24: Unit 6 daily generated power in MWh for the month of January 2020

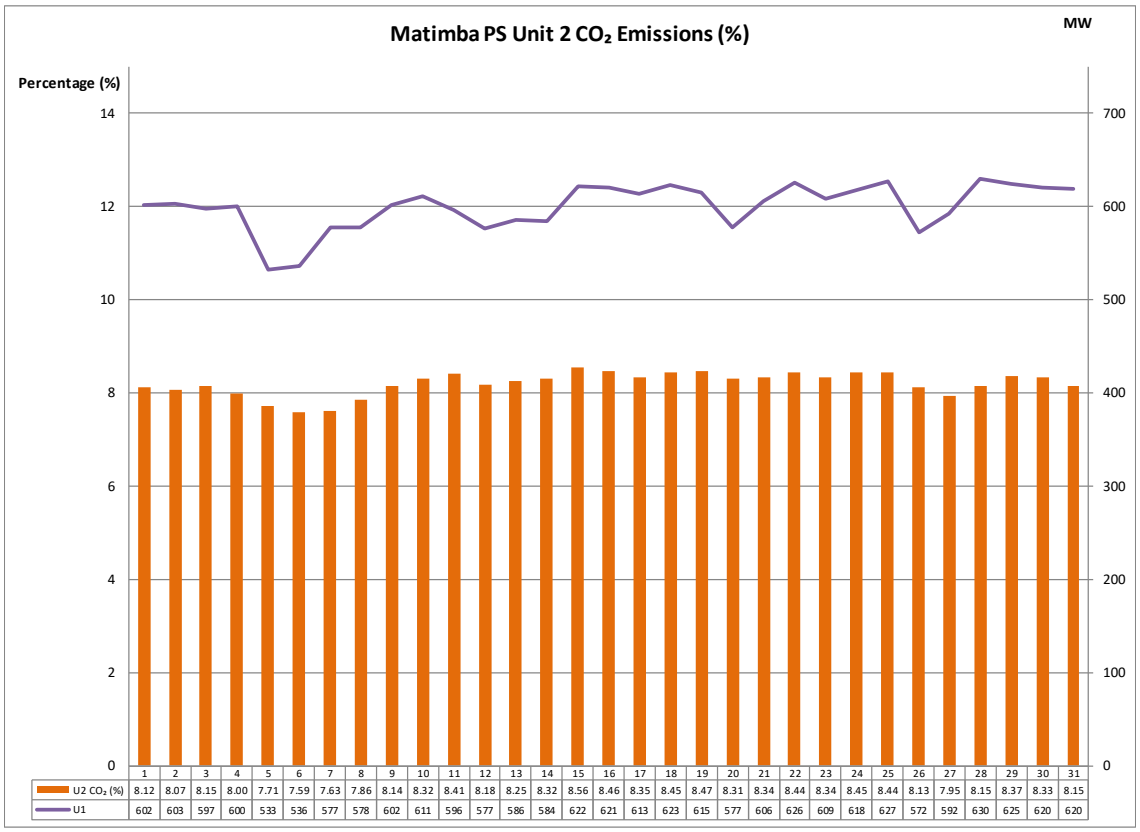


Graph 25: Unit 1 daily average CO_2 emission concentration for the month of January 2020



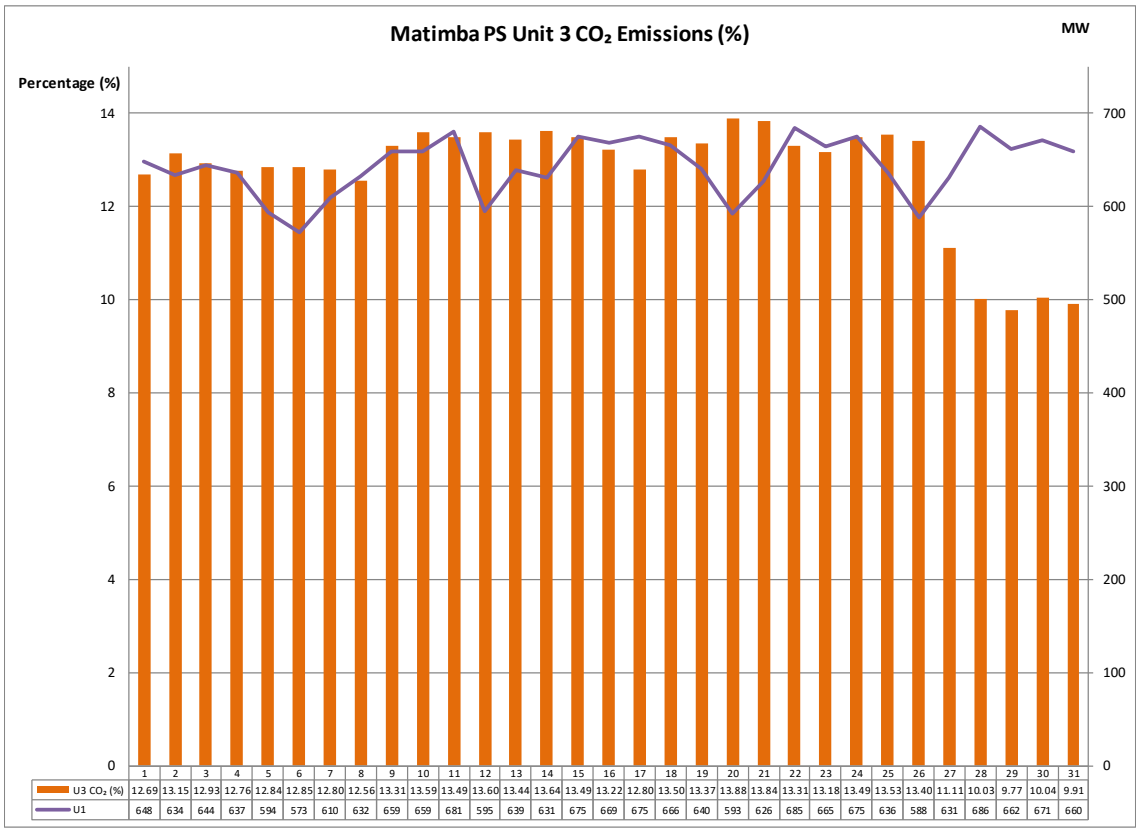
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
U1 CO_2 (%)	9.48	9.40	9.38	9.30	9.19	8.96	9.01	9.28	9.73	9.88	10.17	9.68	9.72	10.06	10.21	9.90	9.92	10.00	10.19	9.89	10.09	10.15	9.78	9.97	9.90	9.57	9.13	9.26	9.21	0.00	0.00
U1	623	578	608	566	520	539	588	575	588	615	626	573	555	597	646	629	637	624	628	577	605	632	620	627	613	554	589	628	547	0	0

Graph 26: Unit 2 daily average CO_2 emission concentration for the month of January 2020



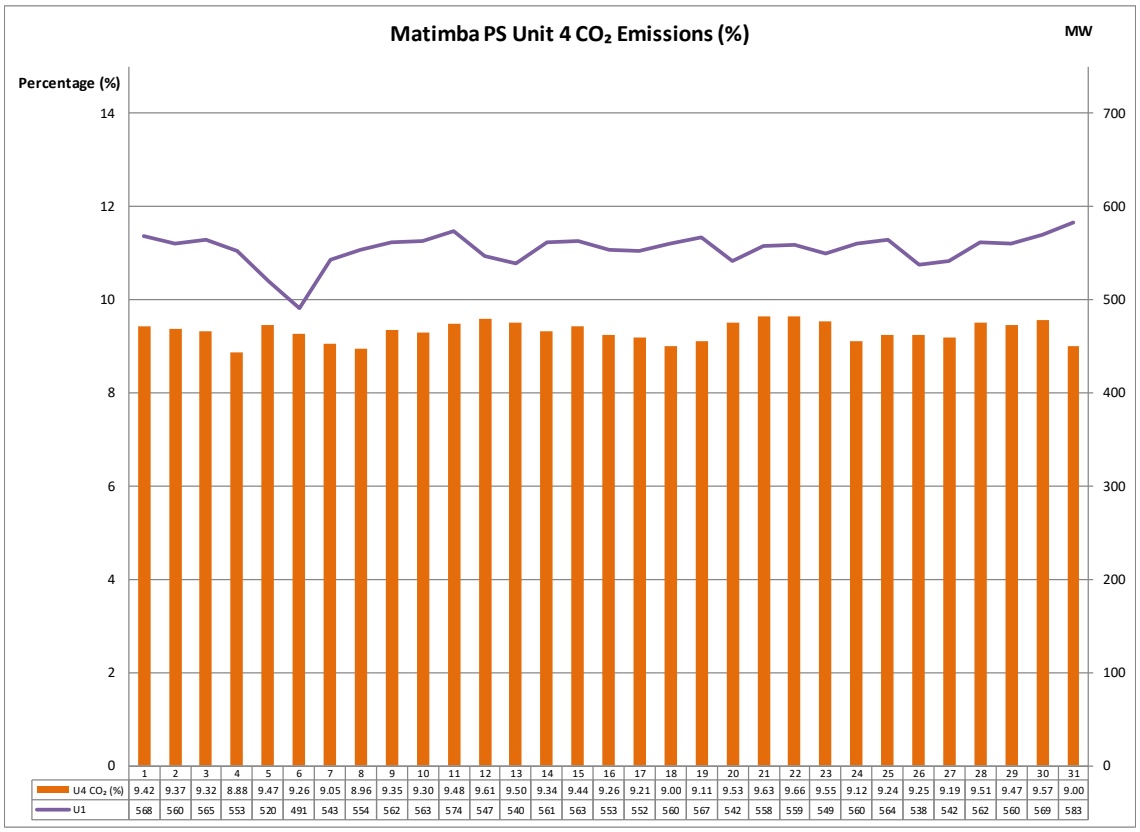
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
U2 CO_2 (%)	8.12	8.07	8.15	8.00	7.71	7.59	7.63	7.86	8.14	8.32	8.41	8.18	8.25	8.32	8.56	8.46	8.35	8.45	8.47	8.31	8.34	8.44	8.34	8.45	8.44	8.13	7.95	8.15	8.37	8.33	8.15
U1	602	603	597	600	533	536	577	578	602	611	596	577	586	584	622	621	613	623	615	577	606	626	609	618	627	572	592	630	625	620	620

Graph 27: Unit 3 daily average CO_2 emission concentration for the month of January 2020



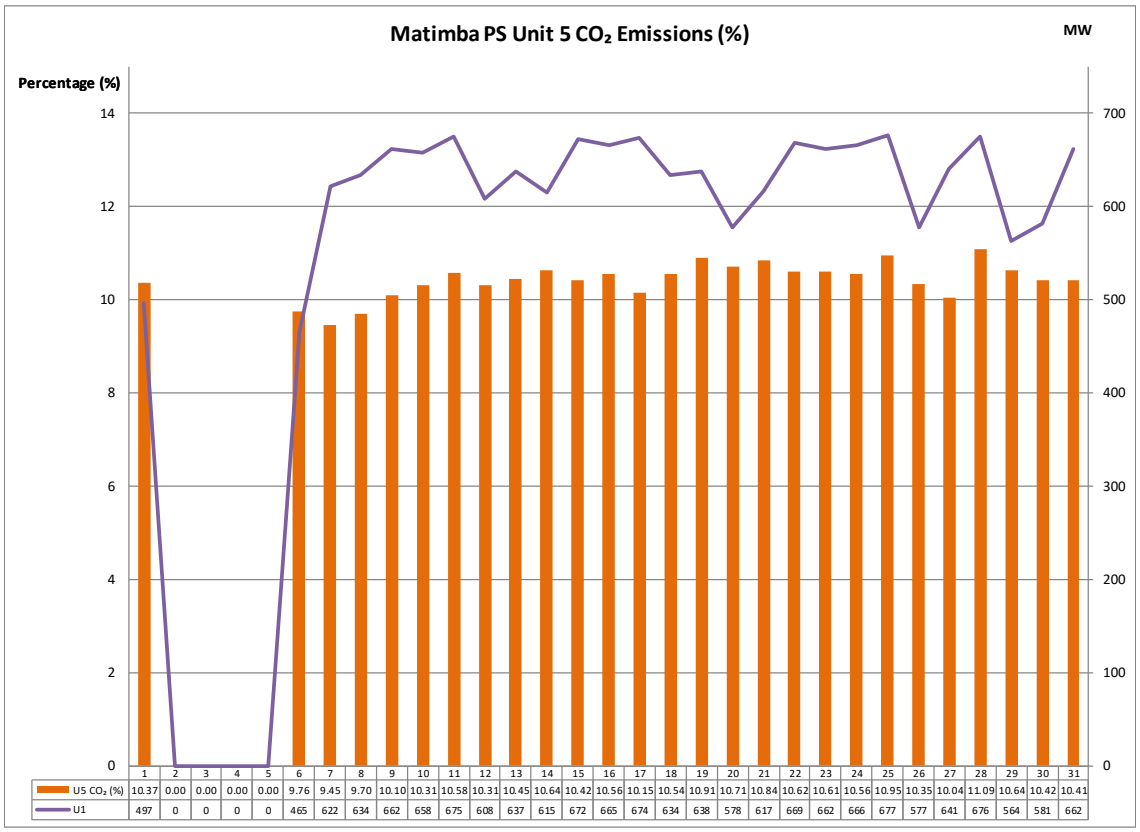
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
U3 CO_2 (%)	12.69	13.15	12.93	12.76	12.84	12.85	12.80	12.56	13.31	13.59	13.49	13.60	13.44	13.64	13.49	13.22	12.80	13.50	13.37	13.88	13.84	13.31	13.18	13.49	13.53	13.40	11.11	10.03	9.77	10.04	9.91
U1	648	634	644	637	594	573	610	632	659	659	681	595	639	631	675	669	675	666	640	593	626	685	665	675	636	588	631	686	662	671	660

Graph 28: Unit 4 daily average CO_2 emission concentration for the month of January 2020



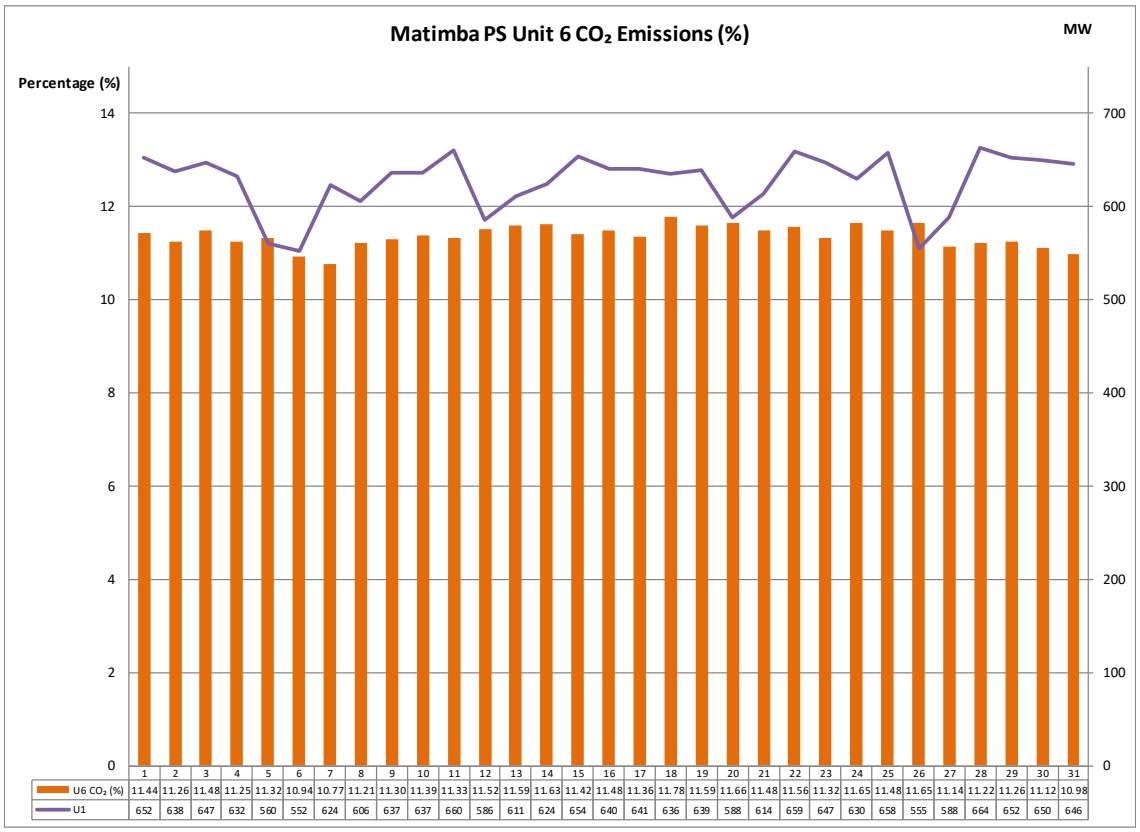
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
U4 CO_2 (%)	9.42	9.37	9.32	8.88	9.47	9.26	9.05	8.96	9.35	9.30	9.48	9.61	9.50	9.34	9.44	9.26	9.21	9.00	9.11	9.53	9.63	9.66	9.55	9.12	9.24	9.25	9.19	9.51	9.47	9.57	9.00
U1	568	560	565	553	520	491	543	554	562	563	574	547	540	561	563	553	552	560	567	542	558	559	549	560	564	538	542	562	560	569	583

Graph 29: Unit 5 daily average CO_2 emission concentration for the month of January 2020



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
U5 CO_2 (%)	10.37	0.00	0.00	0.00	0.00	9.76	9.45	9.70	10.10	10.31	10.58	10.31	10.45	10.64	10.42	10.56	10.15	10.54	10.91	10.71	10.84	10.62	10.61	10.56	10.95	10.35	10.04	11.09	10.64	10.42	10.41
U1	497	0	0	0	0	465	622	634	662	658	675	608	637	615	672	665	674	634	638	578	617	669	662	666	677	577	641	676	564	581	662

Graph 30: Unit 6 daily average CO_2 emission concentration for the month of January 2020



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
U6 CO_2 (%)	11.44	11.26	11.48	11.25	11.32	10.94	10.77	11.21	11.30	11.39	11.33	11.52	11.59	11.63	11.42	11.48	11.36	11.78	11.59	11.66	11.48	11.56	11.32	11.65	11.48	11.65	11.14	11.22	11.26	11.12	10.98
U1	652	638	647	632	560	552	624	606	637	637	660	586	611	624	654	640	641	636	639	588	614	659	647	630	658	555	588	664	652	650	646

Table 5: Pollutant tonnages for the month of January 2020

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)	CO_2 (tons)
Unit 1	17.9	7 083.6	906.4	426 607
Unit 2	48.7	7 304.5	1 106.9	494 072
Unit 3	27.6	6 301.9	1 054.4	489 769
Unit 4	51.2	6 749.5	1 015.8	376 326
Unit 5	25.8	6 470.7	988.2	403 496
Unit 6	55.3	7 352.6	1 744.5	523 798
SUM	226.4	41 262.8	6 816.2	2 714 067

Table 6: Reference values for data provided.

Compound / Parameter	Units of Measure	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Oxygen	%	7.06	5.07	8.98	9.56	6.71	8.38
Moisture	%	4.91	4.45	4.31	5.27	4.65	5.01
Velocity	m/s	27.7	30.8	26.7	29.2	26.5	30.8
Temperature	°C	137.2	129.2	135.8	125.6	127.6	129.6
Pressure	mBar	961.3	927.3	930.6	924.8	923.3	913.7

Start-up information.

Table 7: Start-up information

Unit	5	
Fires in	19H28	2020-01-05
Synchronization with Grid	01H38	2020-01-06
Emissions below limit	03H05	2020-01-06
Fires in to synchronization	6.166	Hours
Synchronization to < limit	1.45	Hours

Emergency Generation

Table 8: Emergency Generation.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Emergency Generation hours declared by national Control	452	521	521	521	273	521
Emergency Hours declared including hours after stand down	467	537	537	537	288	537
Days over the Limit during Emergency Generation	0	0	0	0	0	0

Complaints Register

Table 9: Complaints.

Source Code/ Name	Root Cause Analysis	Calculation of Impacts/ emissions associated with the incident	Dispersion modeling of pollutants where applicable	Measures implemented to prevent reoccurrence	Date by which measure will be implemented
None					

Table 10: Total volatile compound estimates.

Eskom

CALCULATION OF EMISSIONS OF TOTAL VOLATILE COMPOUNDS FROM FUEL OIL STORAGE TANKS*

Date:	Friday, 06 March 2020
Station:	Matimba Power Station
Province:	Limpopo Province
Tank no.	1-4
Description:	Outdoor fuel oil storage tank
Tank Type:	Vertical fixed roof (vented to atmosphere)
Material stored:	Fuel Oil 150

MONTHLY INPUT DATA FOR THE STATION

Please only insert relevant monthly data inputs into the *blue cells* below
Choose from a dropdown menu in the *green cells*
The total VOC emissions for the month are in the *red cells*

IMPORTANT: Do not change ***any*** other cells without consulting the AQ CoE

MONTH:	**January**	
GENERAL INFORMATION:	**Data**	**Unit**
Total number of fuel oil tanks:	4	NA
Height of tank:	13.34	m
Diameter of tank:	9.53	m
Net fuel oil throughput for the month:	***212.427***	tons/month
Molecular weight of the fuel oil:	166.00	Lb/lb-mole
METEROLOGICAL DATA FOR THE MONTH	**Data**	**Unit**
Daily average ambient temperature	25.11	°C
Daily maximum ambient temperature	31.57	°C
Daily minimum ambient temperature	17.48	°C
Daily ambient temperature range	14.10	°C
Daily total insolation factor	5.87	kWh/m²/day
Tank paint colour	***Grey/medium***	NA
Tank paint solar absorbtance	0.68	NA
FINAL OUTPUT:	**Result**	**Unit**
Breathing losses:	0.60	kg/month
Working losses:	0.01	kg/month
TOTAL LOSSES (Total TVOC Emissions for the month):	**0.60**	**kg/month**

*Calculations performed on this spreadsheet are taken from the USEPA AP-42- Section 7.1 Organic Liquid Storage Tanks - January 1996. This spreadsheet is derived from materials provided by Jimmy Peress, PE, Tritech Consulting Engineers, 85-93 Chevy Chase Street, Jamaica, NY 11432 USA, Tel - 718-454-3920, Fax - 718-454-6330, e-mail - PeressJ@nyc.rr.com.

Table 11: Average % availability of monitors for the month of January 2020.

Associated Unit/Stack	PM	SO_2	NO	CO_2
Unit 1	*100.0*	*100.0*	*100.0*	*99.9*
Unit 2	*100.0*	*100.0*	*100.0*	*99.9*
Unit 3	*100.0*	*100.0*	*100.0*	*100.0*
Unit 4	*100.0*	*100.0*	*100.0*	*100.0*
Unit 5	*99.5*	*99.5*	*99.5*	*99.5*
Unit 6	*100.0*	*100.0*	*100.0*	*100.0*

Ambient Air quality Monitoring

No exceedances were noted at the Marapong monitoring station during January 2020.

Ambient CO, PM10, PM2.5 and NO2 concentrations at Marapong monitoring site show influence of emissions from low level sources in the area.

The average data recovery for the period was 66.4% and the station availability was 73.5%.

Detailed results can be found in Attachment 1, "*Marapong air quality monthly report for January 2020*".

General

Name and reference number of the monitoring method used:

1. Particulate and gas monitoring according to standards
    a. BS EN 14181:2004 - Quality Assurance of Automated Measuring Systems
    b. ESKOM internal standard 240-56242363 Emissions Monitoring and Reporting Standard

Sampling locations:

1. Stack one
    a. Particulates:
        i. S23^0 40' 2.8" E027^0 36' 34.8" 175m from ground level and 75m from the top.
    b. Gas:
        i. S23^0 40' 2.8" E027^0 36' 34.8" 100m from ground level and 150m from the top.
    c. Stack height
        i. 250 meter consist of 3 flues
2. Stack two
    a. Particulates:
        i. S23^0 40' 14.8" E027^0 36' 47.5" 175m from ground level and 75m from the top.
    b. Gas:
        i. S23^0 40' 14.8" E027^0 36' 47.5" 100m from ground level and 150m from the top.
    c. Stack height
        i. 250 meter consist of 3 flues

Unit 1

1. Three out of 32 precipitator fields is out of service. Repairs will be done during the next opportunity outage.
1. No abnormalities on the SO_3 plant. Preventative maintenance done during the month.

Unit 2

1. Four out of 32 precipitator fields is out of service. Repairs will be done during the next opportunity outage.
2. No abnormalities on the SO_3 plant. Preventative maintenance done during the month.

Unit 3

1. Two out of 32 precipitator fields is out of service. Repairs will be done during the next opportunity outage.
2. No abnormalities on the SO3 plant. Preventative maintenance done during the month.

Unit 4

1. Five precipitator fields out of service. Repairs will be done during the next opportunity outage.
2. No abnormalities on the SO_3 plant. Preventative maintenance done during the month.

Unit 5

1. All precipitator fields in service.
2. No abnormalities on the SO_3 plant.

Unit 6

1. Three out of 32 precipitator fields is out of service. Repairs will be done during the next opportunity outage.
2. No abnormalities on the SO_3 plant. Preventative maintenance done during the month.

SO3 common plant

1. No abnormalities on the sulphur storage plant.

CEMs

1. No adjustments done on the CEMs. Calibration is done every second week.

Particulate monitors

2. No downtime or repairs done on the particulate monitors.

Air quality improvements

1. None

Social responsibility conducted

No campaigns conducted in January 2020

Sampling dates and times

1. Continuous

Attachments

1. Marapong air quality monthly report for January 2020

The rest of the information demonstrating compliance with the emission license conditions is supplied in the annual emission report sent to your office.

Hoping the above will meet your satisfaction.

I hereby declare that the information in this report is correct.

Yours sincerely

O. Mabotja

2020/03/10

GENERAL MANAGER: MATIMBA POWER STATION

Eskom

RESEARCH, TESTING AND DEVELOPMENT

SUSTAINABILITY DEPARTMENT

MARAPONG AIR QUALITY MONTHLY REPORT

JANUARY 2020

EXECUTIVE SUMMARY

This monthly report covers the ambient air quality data as monitored at Marapong monitoring site in January 2020.

There were no exceedances of all the parameters monitored at the monitoring station during the period under review.

Ambient CO, PM_{10}, $PM_{2.5}$ and NO_2 concentrations at Marapong monitoring site show influence of emissions from low level sources in the area.

The average data recovery for the period was 66.4% and the station availability was 73.5%.

DISCLAIMER

1. INTRODUCTION

At the request of Eskom Environmental Management, Research, Testing and Development Department (RT&D) commissioned an ambient air quality monitoring site at Marapong Township to assess impacts from Matimba Power Station and other pollution source emissions in the area.

The Marapong site is equipped for continuous monitoring of ambient concentrations of sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), mercury (Hg) and fine particulate matter (FPM) of particulate sizes <10µm and <2.5µm in diameter (PM_{10} and $PM_{2.5}$). In addition, meteorological parameters of wind velocity (WVL), wind direction (WDR) and ambient temperature (TMP) were also recorded.

Standard Specifications, Equipment/Techniques used for the measurement of SO_2, O_3 and NO_x conform to US-EPA equivalent method No EQSA-0486-060, EQOA-0880-047 and RFNA-1289-074 respectively.

This report has been compiled and submitted in accordance with the Conditional Authorisation issued in respect of The Construction of the Proposed Eskom Holdings Limited: Generation Division 4800MW Medupi Coal-Fired Power Station and Associated Infrastructure near Lephalale (Ref:12/12/20/695), especially in respect of condition 3.2.1 Air Quality Management. The results presented are compared to the National Air Quality Standards, as published in DEA discussion document, Ref: AQM&CC/24/10/07/4. In addition, this monitoring is undertaken as part of Eskom's Environmental Management Plan and to further validate the CALPUFF dispersion model that was utilized in the original EIA, but was consistently over predicting. The results of the study will be tested for compliance against the national ambient air quality standards. The monitoring site is accredited by the South African National Accreditation System (SANAS).

2. SITE LOCATION

The monitoring site is located in Marapong at co-ordinates: S23° 39' 21.8" E27° 37' 41.3" and was commissioned in September 2006 (Figure 1).

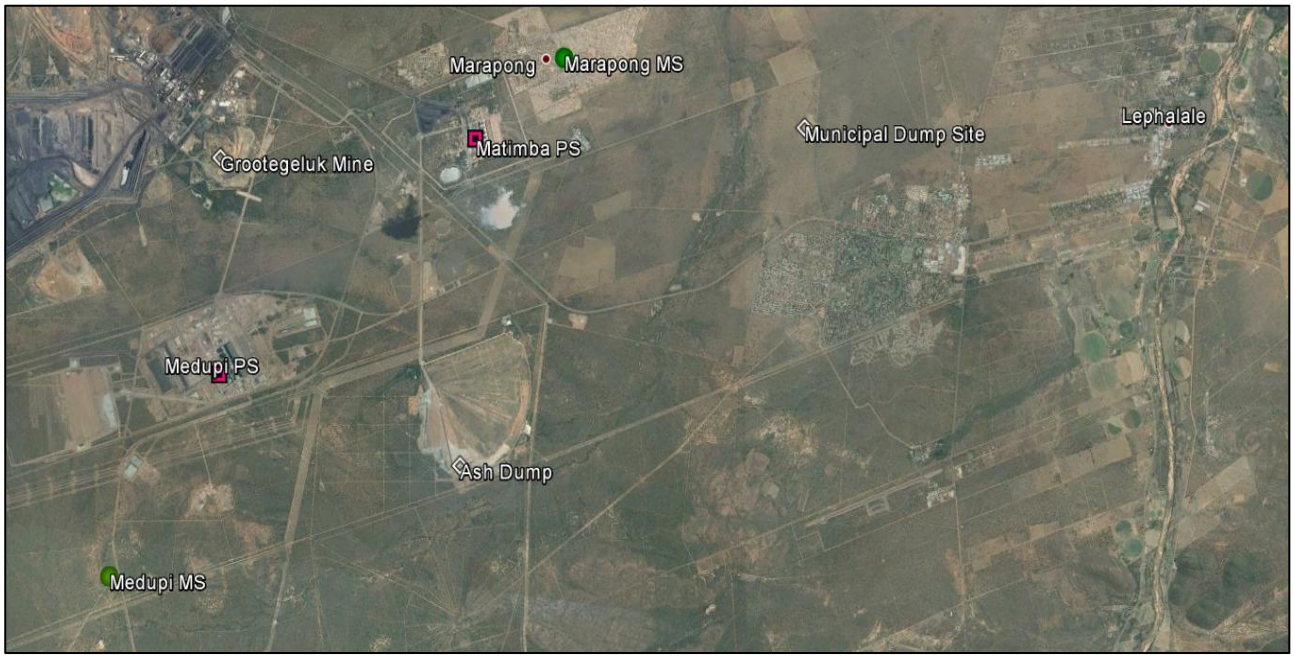


Figure 1: Marapong air quality monitoring site in relation to Matimba Power Station and other pollution sources.

3. DATA RECOVERY

The SANAS guideline figure of 90% per parameter monitored is used as a standard for representative data capture. This describes the required completeness of data set for the reporting of averages and is based on standard arithmetic calculations. The completeness calculations for data sets exclude zero and span data and times where service and/or maintenance is being conducted on the instruments in question.

Availability is a management definition related to system reliability. The availability target is not set in terms of data quality criteria and has no associated quality objectives. A target of 100% availability has been set for performance evaluation. Availability is reported as a measure of the percentage of time that electrical power was available to the monitoring station.

Table 1: Percentage Data Recovery for January 2020

Month	NO_1	NO_2	NO_x	O_3	SGT	SO_2	TMP	WDR	WSP	WVL	$PM_{2.5}$	PM_{10}	CO	HG	HUM	Data Rec	Station Avail.
Dec	40.3	40.3	40.3	4.2	82.4	39.9	82.4	82.4	82.4	82.4	69.9	71.2	73.7	82.4	82.4	66.4	73.5

The average data recovery for the period was 66.4% and the station availability was 73.5%. There were no data recorded for ozone analyser since it was removed from site due to low light intensity on channel A and low sample flow. The data loss was due to frequent power interruptions because of load shedding. The SO_2 and NO_x analysers were damaged by these frequent power losses and the data recorded was only 40% on the two instruments.

4. SUMMARY OF RESULTS FOR REPORTED PERIOD

Table 2 presents the National Ambient Air Quality Standards and Table 3 is a summary report presenting the highest mean concentrations and the number of exceedances above the respective national air quality standards for each measured parameter.

Table 2: National Ambient Air Quality Standards

Pollutant	Unit	Period	Limit	Number of annual exceedances allowed	Source
Carbon Monoxide	ppm	1hr	26	88	DEA
Carbon Monoxide	ppm	8hr	8.7	11	DEA
PM_{10}	$\mu g/m^3$	24hr	75	4	DEA
PM_{10}	$\mu g/m^3$	1year	40	0	DEA
$PM_{2.5}$	$\mu g/m^3$	24hr	40	4	DEA
$PM_{2.5}$	$\mu g/m^3$	1year	20	0	DEA
Nitrogen dioxide	ppb	1year	21	0	DEA
Nitrogen dioxide	ppb	1hr	106	88	DEA
Ozone	ppb	8hr	61	11.	DEA
Sulphur dioxide	ppb	1hr	134	88	DEA
Sulphur dioxide	ppb	10min	191	526	DEA
Sulphur dioxide	ppb	24hr	48	4	DEA
Sulphur dioxide	ppb	1year	19	0	DEA

Table 3: Summary report of parameters at Marapong monitoring site for January 2020

Pollutant	Highest Hourly Mean	No of Hourly National Limit Exceedances	Highest Daily Mean	No of Daily National Limit Exceedances	No of 8hr Moving Average Limit	Highest 10min Mean	No of 10min National Limit Exceedances
FPM (PM−2.5) by Beta gauge [ug/m^3]	108.5		29.6	0		125.3	
FPM (PM−10) by Beta gauge [ug/m^3]	158.8		40.9	0		178.4	
Nitric oxide [ppb]	58.5		16.			154.5	
Nitrogen dioxide [ppb]	20.6	0	10.9			29.8	
Nitrogen oxide [ppb]	67.7		21.2			162.2	
Ozone [ppb]	35.5		31.3		0	36.9	
Sigma theta [deg]	50.9		27.			74.1	
Sulphur dioxide [ppb]	8.4	0	5.1	0		10.	0
Ambient temperature [deg C]	37.1		31.6			37.8	
Wind speed [m/s]	5.7		2.4			8.3	
Wind velocity [m/s]	5.4		2.2			8.	

There were no exceedances of all the parameters monitored at the monitoring station during the period under review.

Figure 2 shows the daytime and night-time wind roses for the reporting period. The centre of the wind rose depicts the position of the air quality monitoring station. The positions of the spokes in the polar diagram represent directions from which the wind was blowing. The length of the segment indicates the percentage of the time the wind blew from that direction and the speed in the various categories are denoted by colours and width.

The dominant wind directions during the daytime were north-east, east-north-east and east. During the night, the most frequent directions were east-north-east, east, and north-east.

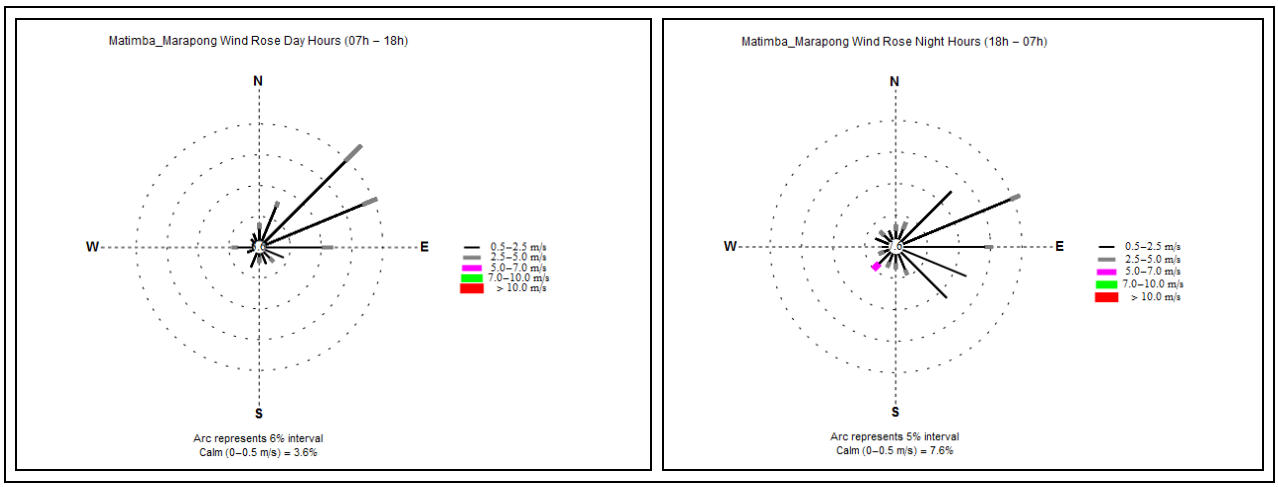


Figure 2: Wind roses at Marapong monitoring site during day and night hours

6. DISCUSSION OF POLLUTANTS

Emissions of primary pollutants such as PM_{10}, $PM_{2.5}$, SO_2 and NO_X from low level sources such as domestic combustion, motor vehicles and smouldering dumps are expected to impact at ground level more significantly during the evening and early morning hours as a result of temperature inversion. Emissions of such pollutants from tall stacks (power stations and other industries), are expected to have more significant impact at ground level during the day, due to atmospheric turbulence influences. O_3 and other oxidants are formed in polluted atmospheres as a result of a rather wide variety of photochemical reactions. A gradual increase of O_3 throughout the day is expected, peaking at mid-afternoon and then decaying once more during the night.

6.1. FINE PARTICULATE MATTER (PM_{10})

6.1.1 Source identification by PM_{10} diurnal variations

Figure 3 shows the PM_{10} hourly mean diurnal variation. Impact of emissions from low level sources such as evening motor vehicle emissions are shown with a peak observed at 21:00 in the evening. Minor concentration peaks observed during the day could be associated with emissions from activities taking place during the day, such as coal mining activities. Impact from low level sources such as morning vehicle emissions is once again shown in the morning with a peak at 08:00.

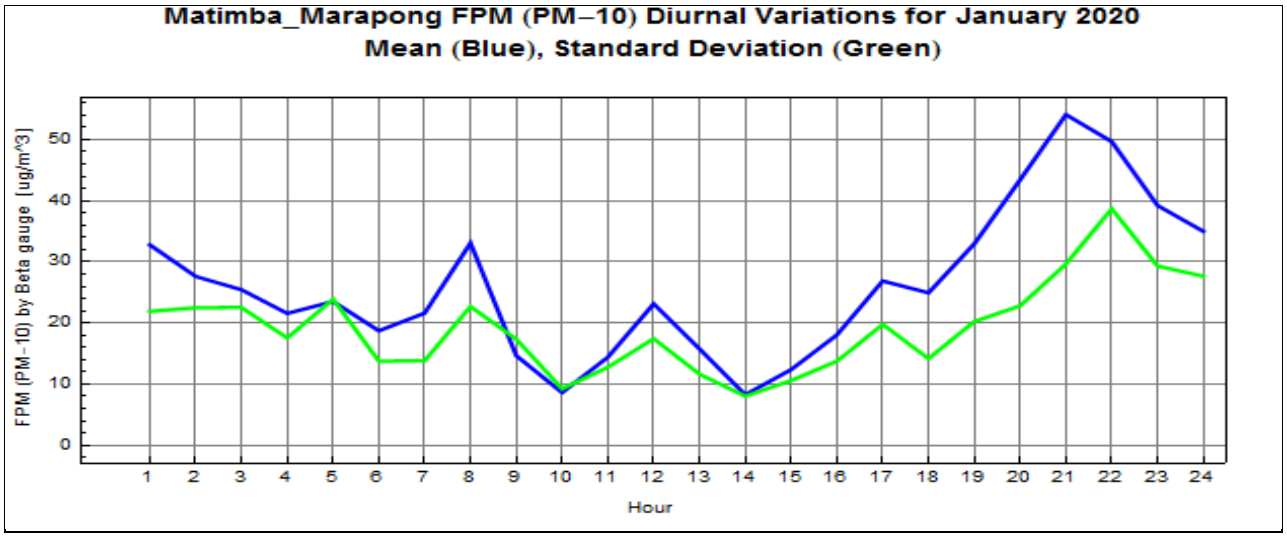


Figure 3: Diurnal variation by PM_{10} (Mean concentrations = Blue line, Standard Deviation = Green line)

6.1.2. PM_{10} hourly mean event roses and tables.

As there is no national hourly PM_{10} limit, the 98th percentile daytime and night-time event rose is presented in Figure 4 to identify the wind sectors from which the highest concentrations are derived.

The most dominant hourly mean concentrations above 64.69µg/m^3 (98th percentile value) at Marapong monitoring site during the daytime period were recorded from east-south-east, west, north-east and east sectors. Exxaro Grootegeluk coal mine is located in the west-south-west to north-west of the monitoring site. The dominant hourly mean concentrations above 99.83µg/m^3 (98th percentile value) at Marapong monitoring site during the night-time period were recorded from north, south-east, south-south-east and west-north-west sectors. Traffic and domestic combustion emissions in and around Marapong could also be impacting on the ambient PM_{10} concentrations at the monitoring site.

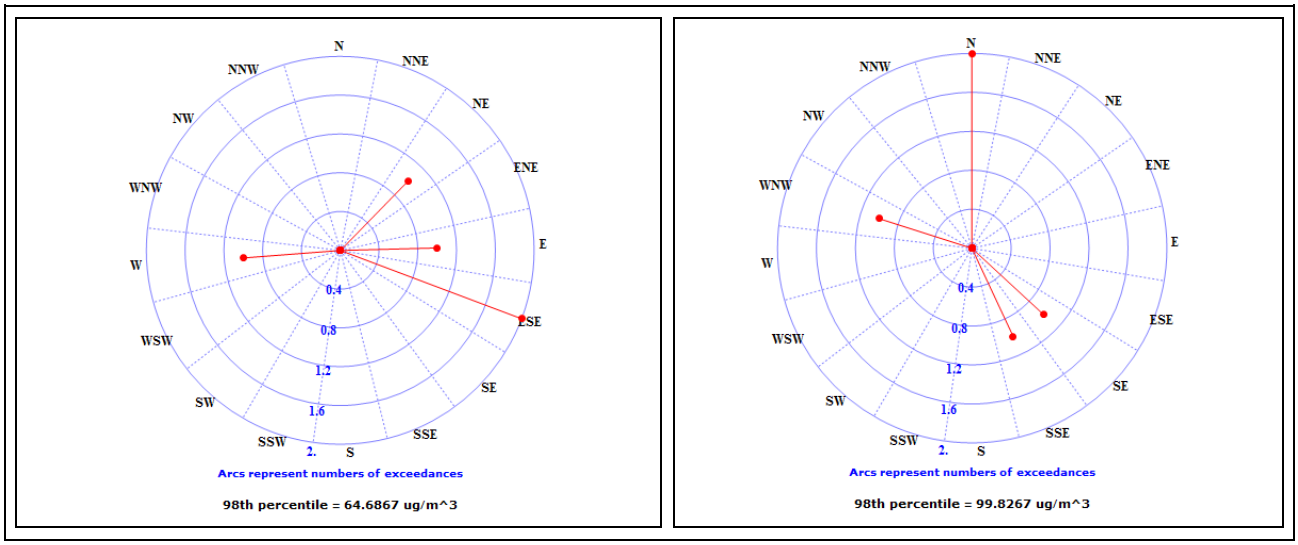


Figure 4: PM_{10} hourly mean 98th percentile event roses. Left - daytime (06:00-18:00) and right - night time (18:01-05:59)

Table 5: PM_{10} daytime hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	1	0	1	2	0	0	0	0	0	0	1	0	0	0
%	0	0	20	0	20	40	0	0	0	0	0	0	20	0	0	0

Table 6: PM_{10} night-time hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	2	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0
%	40	0	0	0	0	0	20	20	0	0	0	0	0	20	0	0

6.2. FINE PARTICULATE MATTER ($PM_{2.5}$)

6.2.1 Source identification by $PM_{2.5}$ diurnal variations

Figure 5 shows the $PM_{2.5}$ hourly mean diurnal variation. $PM_{2.5}$ levels are shown to be lower during the day and rise sharply in the afternoon peaking at 21:00 in the evening. This suggests that there is a low-level source of $PM_{2.5}$ or $PM_{2.5}$ formation in the evening. Impact from low level sources such as morning vehicle emissions is once again shown in the morning with a peak at 08:00.

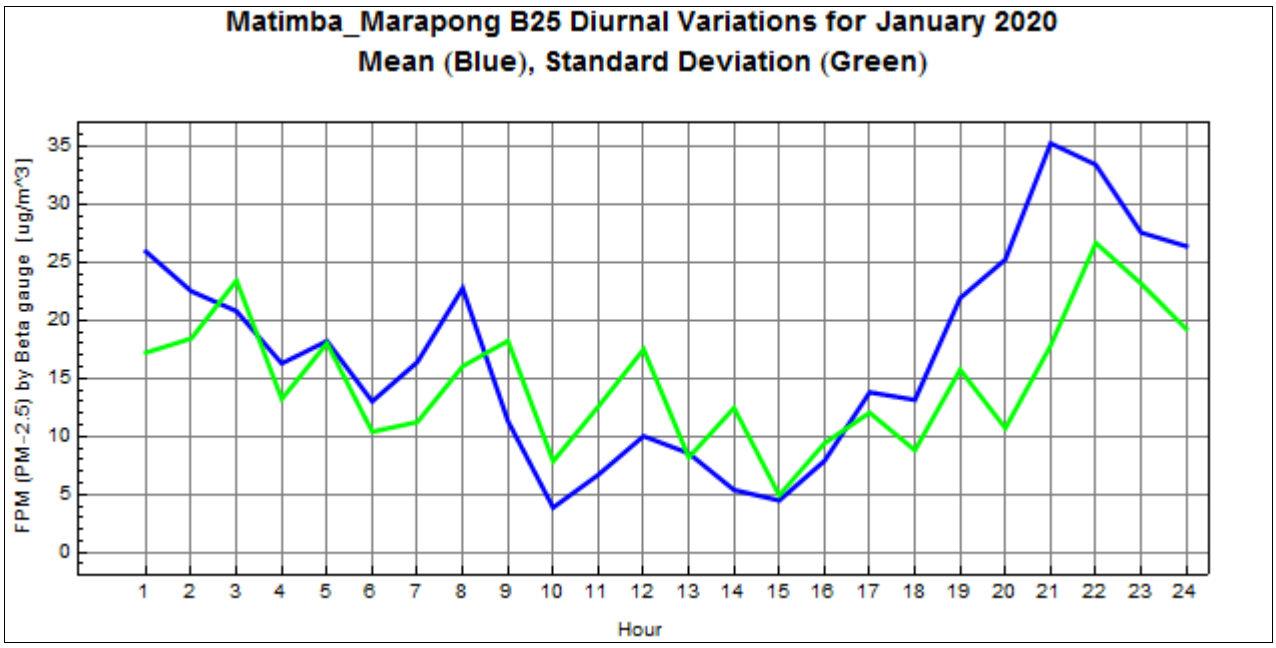


Figure 5: Diurnal variation by $PM_{2.5}$ (Mean concentrations = Blue line, Standard Deviation = Green line)

6.2.2. $PM_{2.5}$ hourly mean event roses and tables.

As there is no national hourly $PM_{2.5}$ limit, the 98th percentile daytime and night-time event roses are presented in Figure 6 to identify the wind sectors from which the highest concentrations are derived.

The most dominant hourly mean concentrations above 55.72µg/m^3 (98th percentile value) at Marapong monitoring site during the daytime period were recorded from east, east-south-east, south-south-east and north-north-west sectors. The most dominant hourly mean concentrations above 75.23µg/m^3 (98th percentile value) at Marapong monitoring site during the night-time period were recorded from north-east, east, south-east, south-south-east and west-north-west sectors.

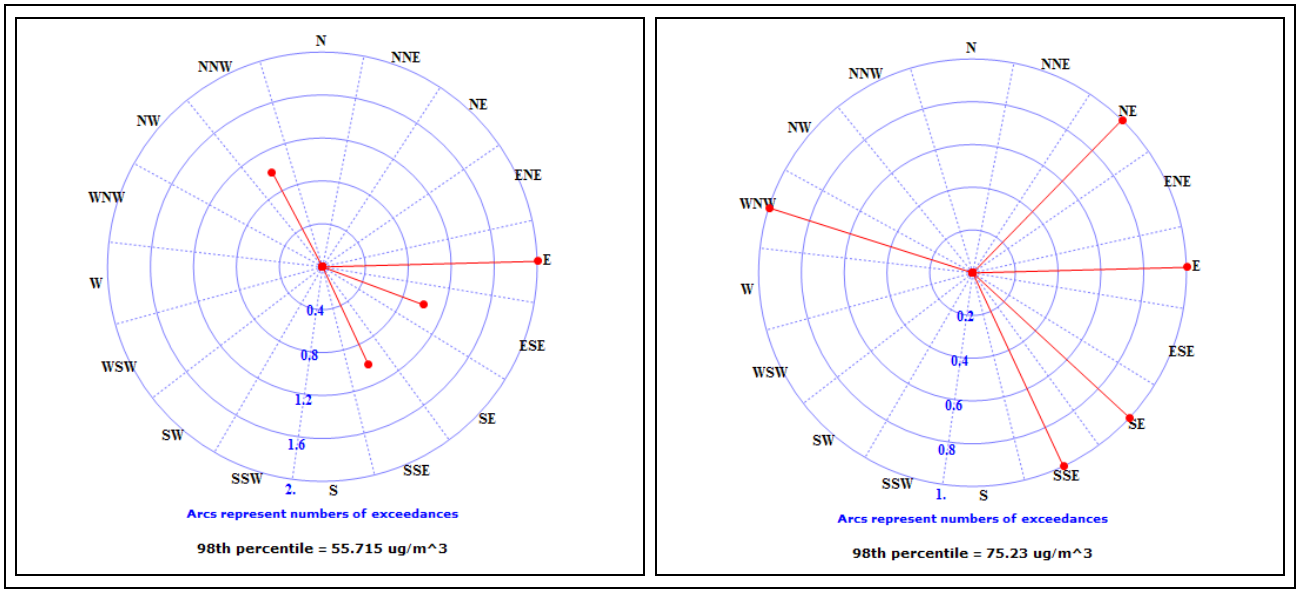


Figure 6: $PM_{2.5}$ hourly mean 98th percentile event roses. Left - daytime (06:00-18:00) and right - night time (18:01-05:59)

Table 7: $PM_{2.5}$ daytime hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	1
%	0	0	0	0	40	20	0	20	0	0	0	0	0	0	0	20

Table 8: $PM_{2.5}$ night-time hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	1	0	1	0	1	1	0	0	0	0	0	1	0	0
%	0	0	20	0	20	0	20	20	0	0	0	0	0	20	0	0

6.3 CARBON MONOXIDE (CO)

6.3.1 Source identification by CO diurnal variations

Figure 7 shows the CO hourly mean diurnal variation. CO levels are generally low during the day and are elevated at night peaking at 22:00. Elevation in CO levels is also noticeable with a peak at 08:00 in the morning. Both elevations could be attributed to low level source emissions such as domestic combustion from coal stoves and motor vehicles during morning and evening commuting of workers to/from work.

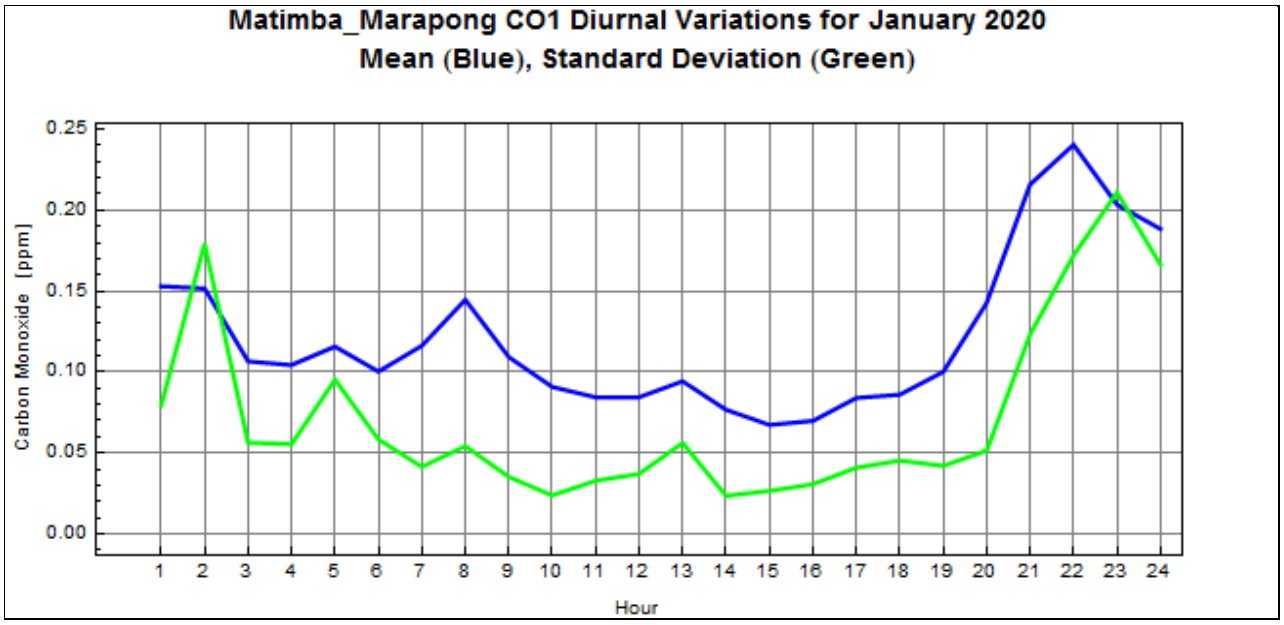


Figure 7: Diurnal variation by CO (Mean concentrations = Blue line, Standard Deviation = Green line)

The national ambient air quality hourly mean CO limit of 26 ppm was not exceeded during the period under review as shown in Figure 8 below.

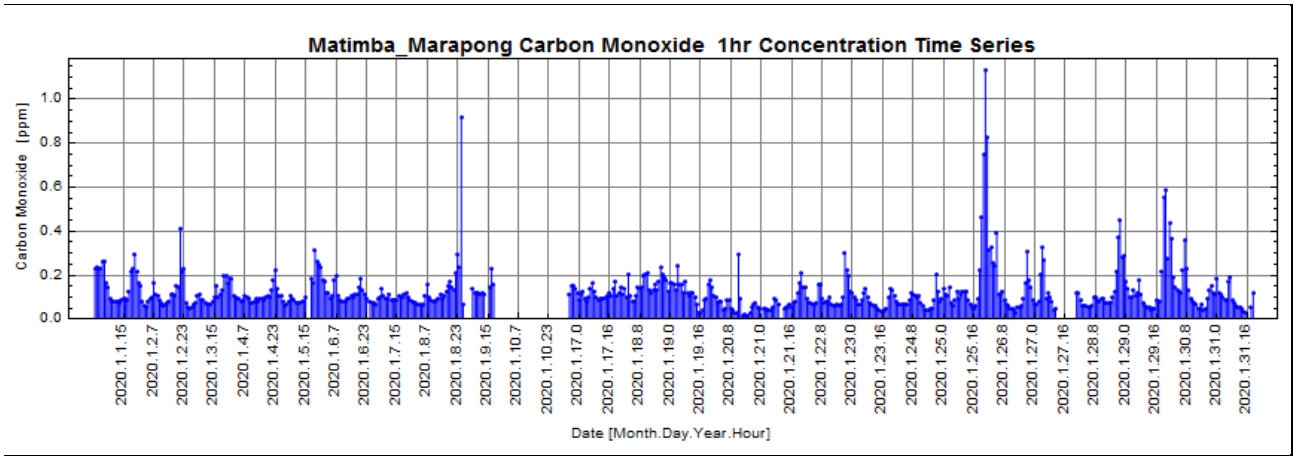


Figure 8: CO hourly Concentrations Time Series

6.3.2 CO hourly mean event roses and tables.

The daytime and night-time event roses are presented in Figure 9 to indicate the wind directions from which the highest concentrations are derived.

The most dominant hourly mean concentrations above 0.21 ppm at Marapong monitoring site during the daytime period were recorded from east-south-east, south-south-east, west, north-north-west and north-east sectors. The most dominant night-time concentrations above 0.55 ppm (98th percentile value) were recorded from south-east, south-south-east, west-north-west and north-west sectors. CO emissions measured at the monitoring station could be from different sources such as veld fires, back-up power generators, lawn mowers, leaf blowers, undiluted car exhausts without catalytic converters, combustion of fossil fuels. Other sources of CO could be from combustion of fuels such as natural gas, fuel oils from local industries and coal, wood, charcoal burning and also waste burning from Marapong Township.

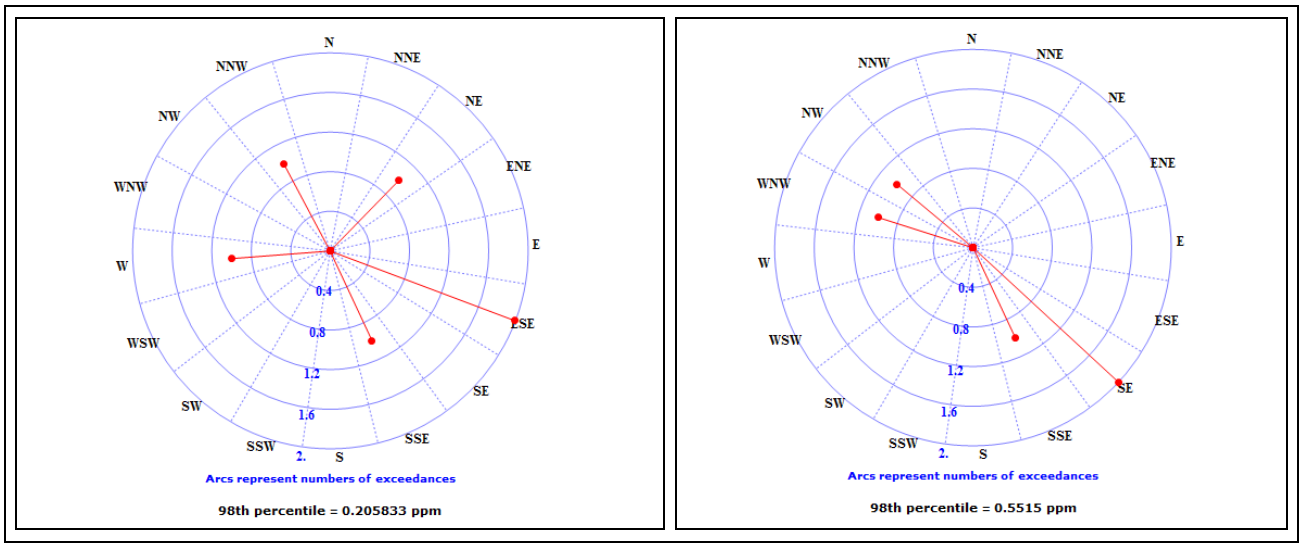


Figure 9: CO hourly mean 98th percentile event roses. Left - daytime (06:00-18:00) and right - night time (18:01-05:59)

Table 9: CO daytime hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	1	0	0	2	0	1	0	0	0	0	1	0	0	1
%	0	0	16.67	0	0	33.33	0	16.67	0	0	0	0	16.67	0	0	16.67

Table 10: CO night-time hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	0	0	0	0	2	1	0	0	0	0	0	1	1	0
%	0	0	0	0	0	0	40	20	0	0	0	0	0	20	20	0

6.4. SULPHUR DIOXIDE (SO_2)

6.4.1 Source identification by SO_2 diurnal variations

Figure 10 shows the SO_2 hourly mean diurnal variation. Owing to the fact that there was only 39.9% data recorded for SO_2, meaningful interpretation and conclusion cannot be made from the below graph.

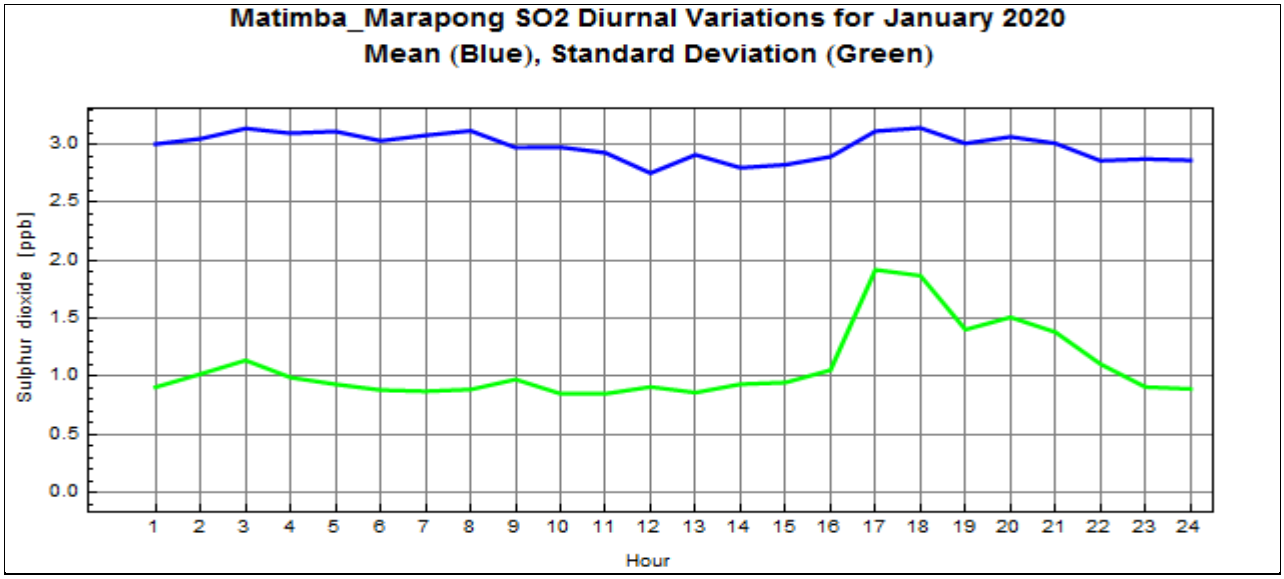


Figure 10: SO_2 diurnal variations (Mean concentrations = Blue line, Standard Deviation = Green line).

6.4.2 SO_2 daytime exceedance and night-time event roses and tables

The daytime and night-time event roses are presented in Figure 11 to indicate the wind directions from which the highest concentrations are derived.

The most dominant daytime concentrations above 6.78 ppb (98th percentile value) were from west and west-north-west sectors. The most dominant night-time concentrations above 5.45 ppb (98th percentile value) were recorded from north-north-east and north-west sectors.

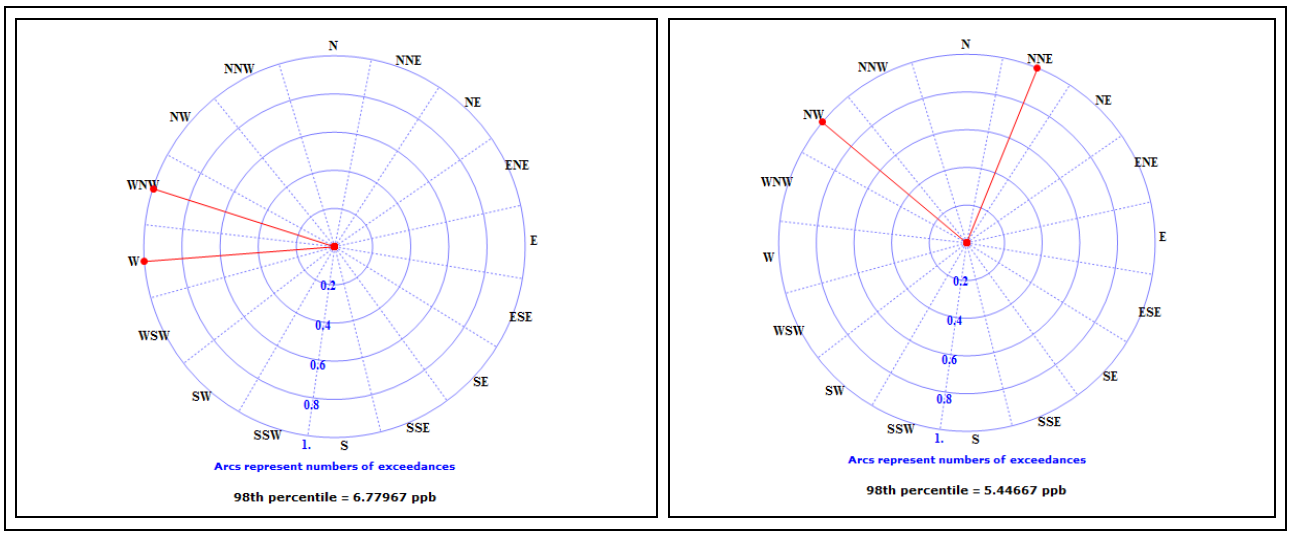


Figure 11: SO_2 hourly mean 98th percentile event roses. Left - daytime (06:00-18:00) and right - night time (18:01-05:59)

Table 11: SO_2 daytime hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Exc.	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
%	0	0	0	0	0	0	0	0	0	0	0	0	50	50	0	0

Table 12: SO_2 night-time hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
%	0	50	0	0	0	0	0	0	0	0	0	0	0	0	50	0

6.5. NITROGEN DIOXIDE (NO_2)

6.5.1 Source identification by NO_2 diurnal variations

Figure 12 below shows the NO_2 hourly mean diurnal variation. The graph shows a peak at 07:00 in the morning and 22:00 in the evening which are indicative of low level source emissions on ambient NO_2 concentrations, such as early morning and evening emissions from vehicles transporting workers from/to Marapong Township to/from Medupi, Matimba power stations, Grootegeluk coal mine and other industries in the area. The NO_2 concentrations are low during midday and throughout the afternoon as a result of absence or minimal number of vehicles in the township at those times.

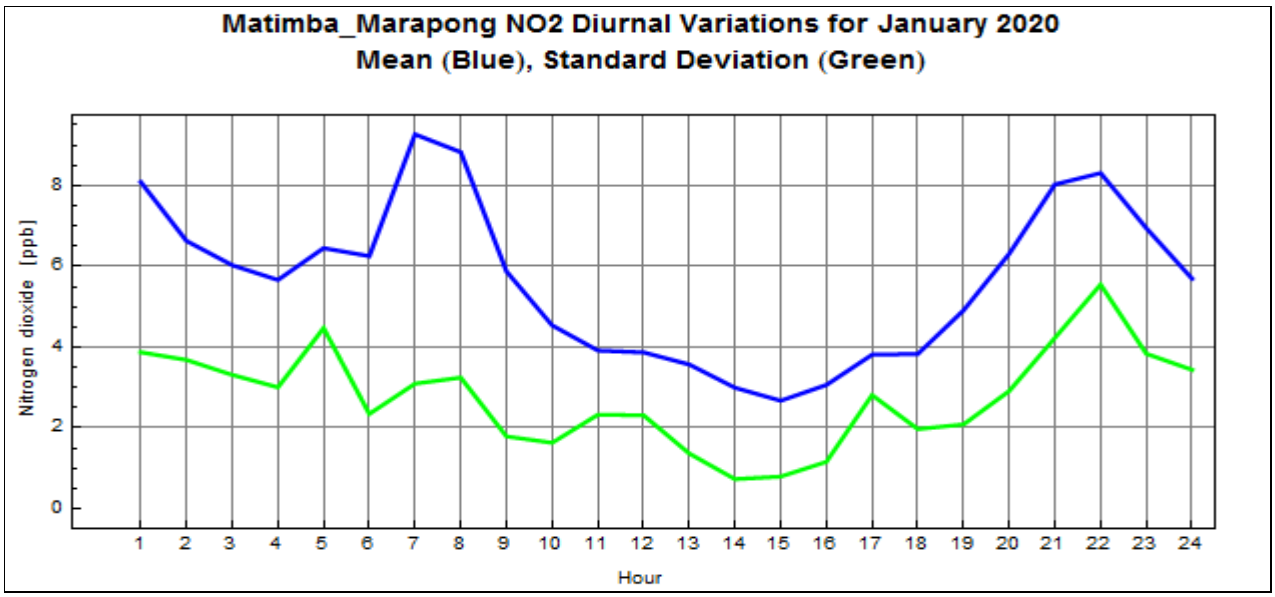


Figure 12: NO_2 diurnal variations (Mean concentrations = Blue line, Standard Deviation = Green line).

6.5.2. NO_2 hourly mean event roses and tables.

The daytime and night-time event roses are presented in Figure 13 to indicate the wind directions from which the highest concentrations are derived. The most dominant daytime concentrations above 11.65 ppb (98th percentile value) were from north-east, east-south-east and west sectors. The most dominant night-time concentrations above 16.88 ppb (98th percentile value) were recorded from north, east-south-east, south-east and south-west sectors. Traffic from Onverwacht and Marapong Township and trucks travelling to the municipal dump might have an influence in the NO_2 readings. There is a taxi rank and it is at a very close proximity to the monitoring site and Lowveld Bus Service just less than a kilometre to the east of the monitoring site. This could have an influence on the NO_2 readings.

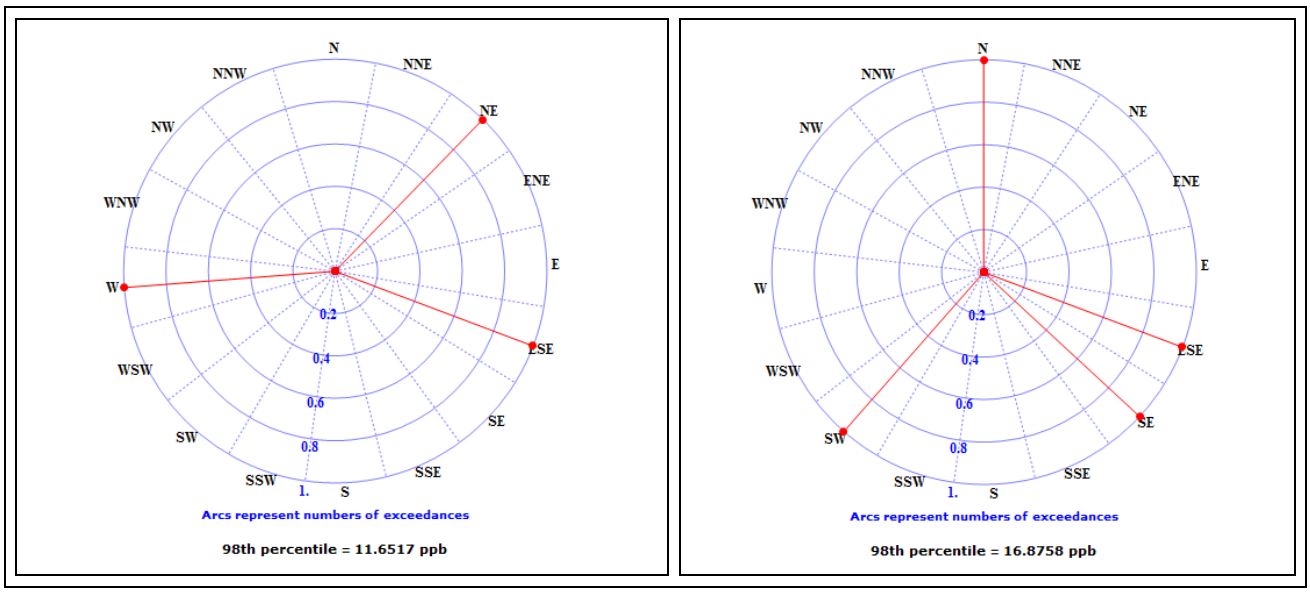


Figure 13: NO_2 hourly mean 98th percentile event roses. Left - daytime (06:00-18:00) and right - night time (18:01-05:59)

Table 13: NO_2 day-time hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0
%	0	0	33.33	0	0	33.33	0	0	0	0	0	0	33.33	0	0	0

Table 14: NO_2 night-time hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0
%	15	0	0	0	0	25	25	0	0	0	25	0	0	0	0	0

6.7 MERCURY (Hg)

6.7.1 Source identification by Hg diurnal variations

Figure 14 shows the Hg hourly mean diurnal variation.

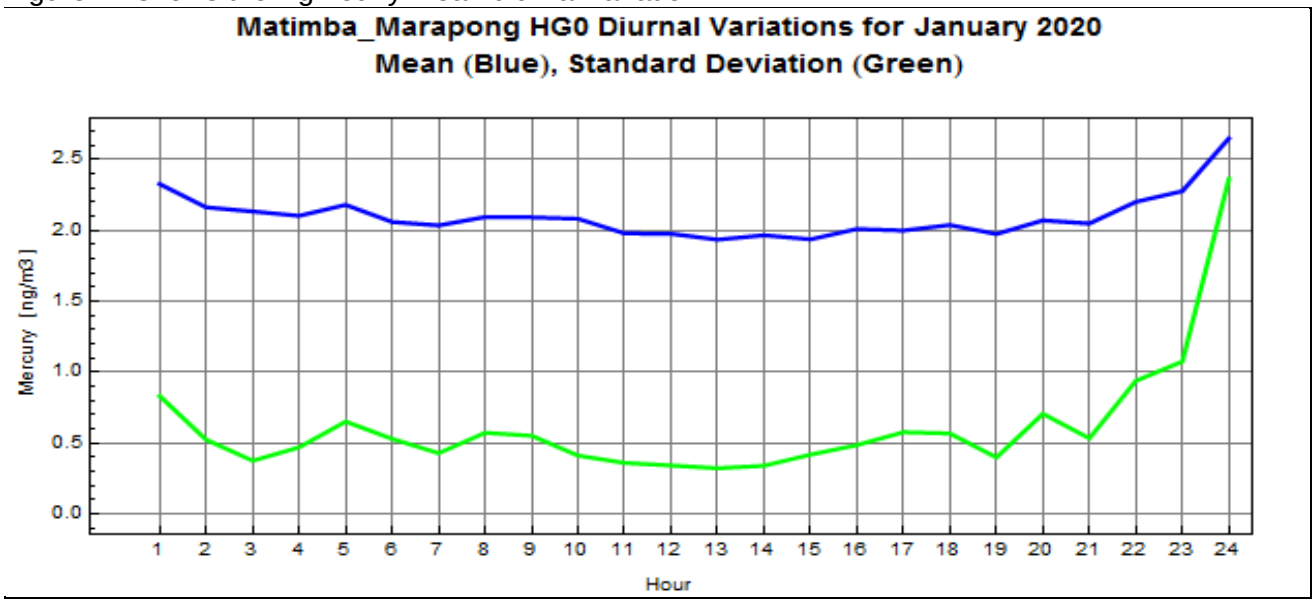


Figure 14: Diurnal variation by Hg (Mean concentrations = Blue line, Standard Deviation = Green line)

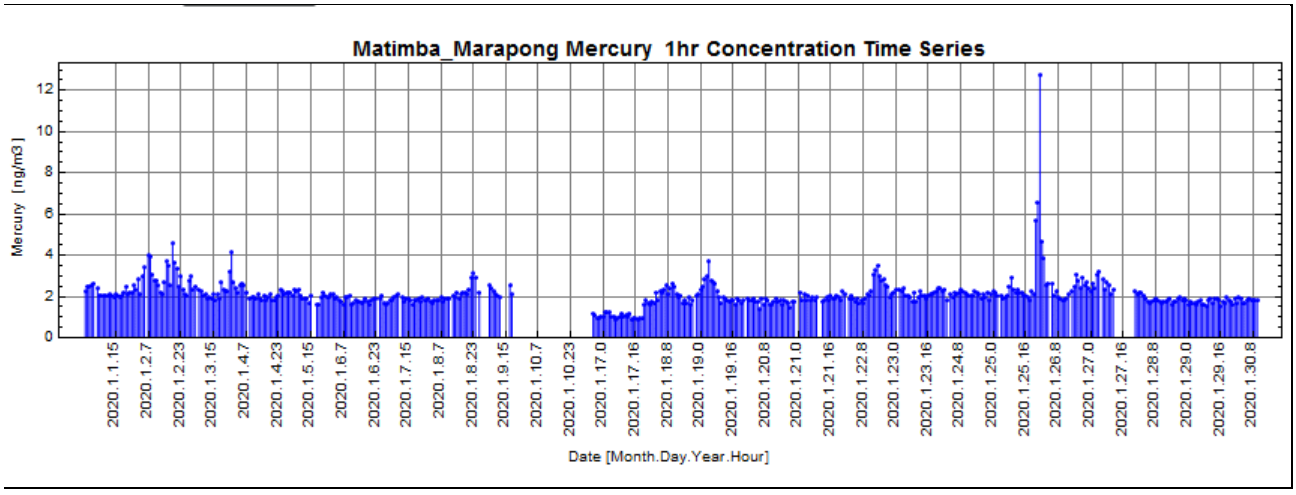


Figure 15: Hg hourly Concentrations Time Series

6.7.2 Hg hourly mean event roses and tables.

The daytime and night-time event roses are presented in Figure 16 to indicate the wind directions from which the highest concentrations are derived, since there are no national standards for ambient mercury.

The most dominant hourly mean concentrations above 3.49ng/m^3 at Marapong monitoring site during the daytime period were recorded from north-east, east-south-east and west sectors. The most dominant night-time concentrations above 4.19ng/m^3 (98th percentile value) were recorded from south-east, south-south-east and north-west sectors.

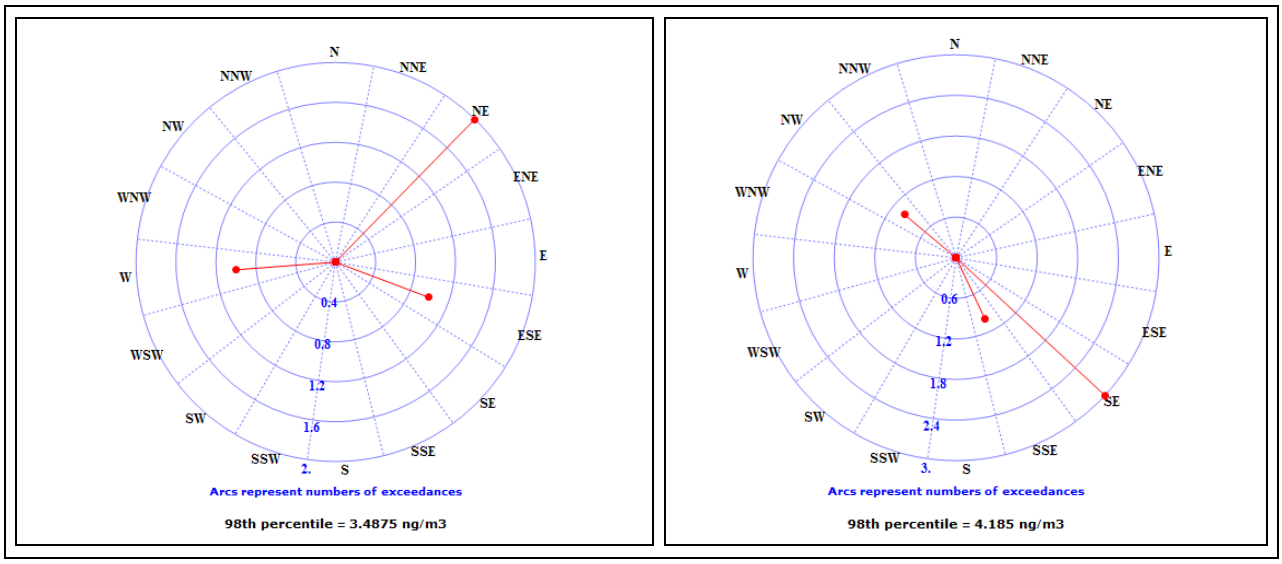


Figure 16: Hg hourly mean 98th percentile event roses. Left - daytime (06:00-18:00) and right - night time (18:01-05:59)

Table 17: Hg daytime hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	2	0	0	1	0	0	0	0	0	0	1	0	0	0
%	0	0	50	0	0	25	0	0	0	0	0	0	25	0	0	0

Table 18: Hg night-time hourly mean 98th percentile event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve.	0	0	0	0	0	0	3	1	0	0	0	0	0	0	1	0
%	0	0	0	0	0	0	60	20	0	0	0	0	0	0	20	0

7. HISTORICAL CONCENTRATIONS

7.1. RECENT TRENDS

Time series graphs (Figures 17 – 22) for each pollutant with respect to the National Ambient Air Quality Standards are represented from the beginning of the previous year until the end of the current reporting period or since inception of the monitors. The resultant period may vary for each analyser, depending on when it was installed.

Ambient CO and NO_2 concentrations at the monitoring site are well within their national ambient limits with no exceedances from January 2018 until January 2020. The trends show higher concentrations during winter than summer. Ambient PM_{10} and $PM_{2.5}$ concentrations have exceeded their daily limits on several occasions during the period under review and show increase in winter

and decrease in summer. The ambient SO_2 hourly limit has been exceeded several times during the period under review and there is no clear trends shown. There were no exceedances of the national SO_2 daily limit during the period under review. Ambient O_3 concentrations are higher in spring to summer months and lower in winter months. Gaps in the trend analysis are as a result of the instrument being out for service.

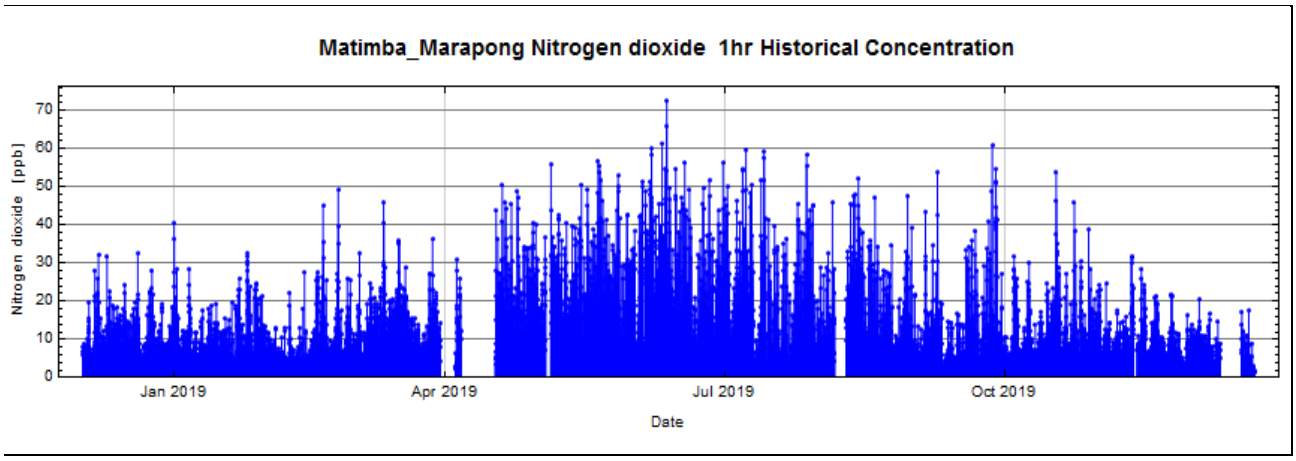


Figure 17: NO_2 Hourly Means

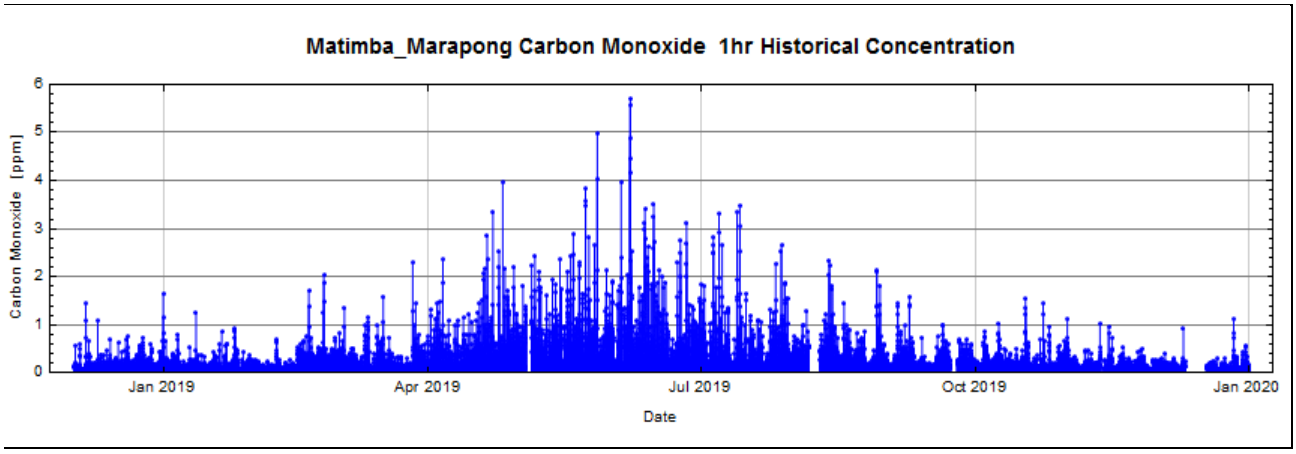


Figure 18: CO Hourly Means

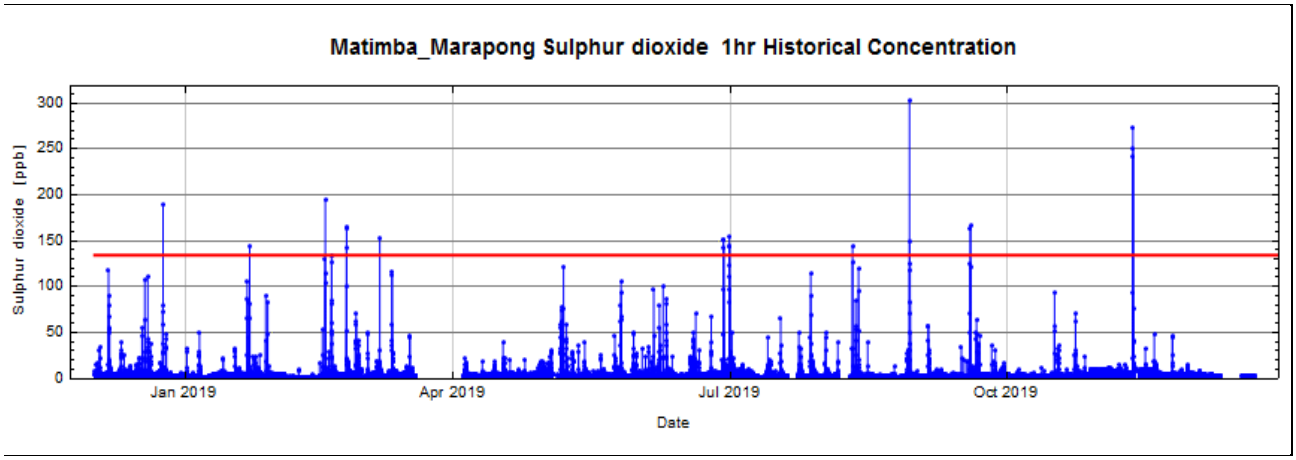


Figure 19: SO_2 Hourly Means

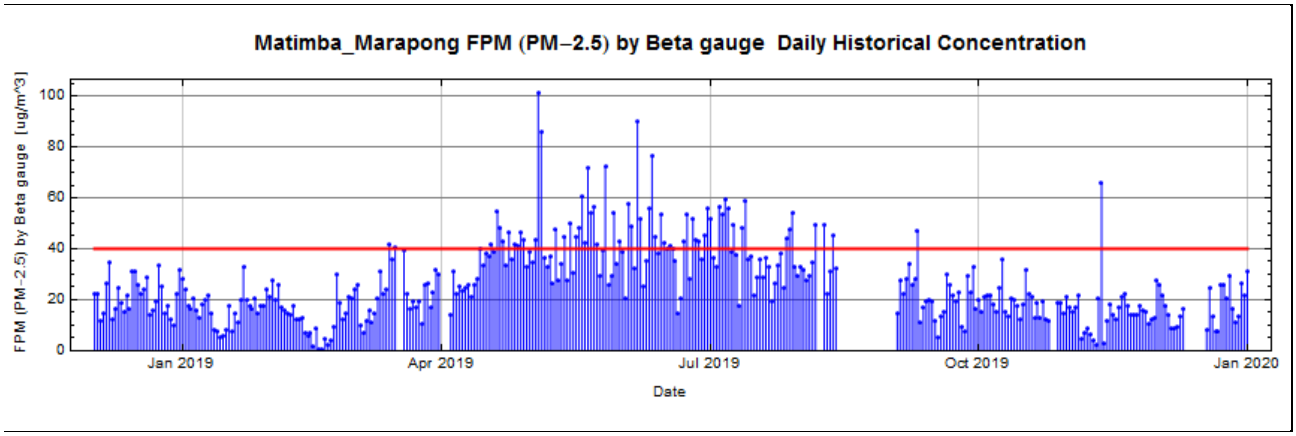


Figure 20: $PM_{2.5}$ Daily Means

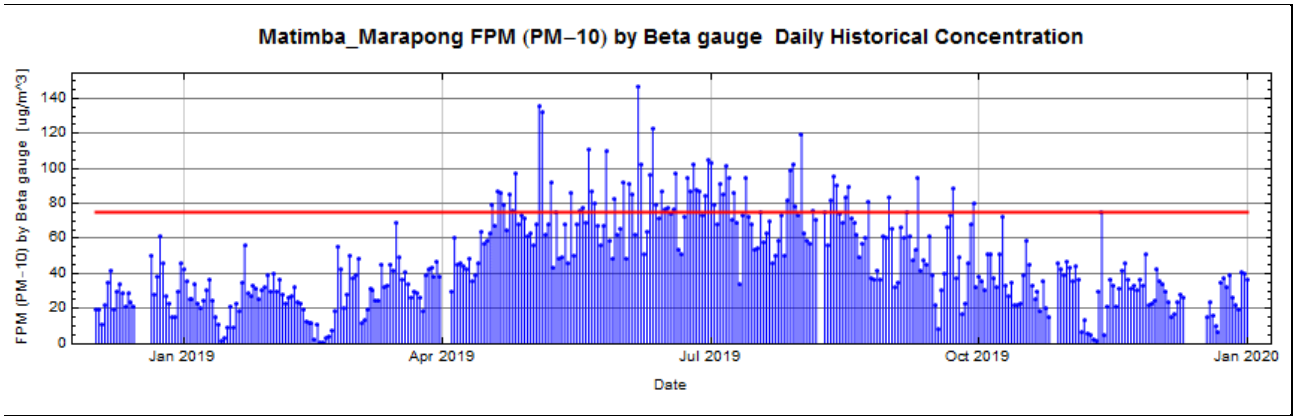


Figure 21: PM_{10} Daily Means

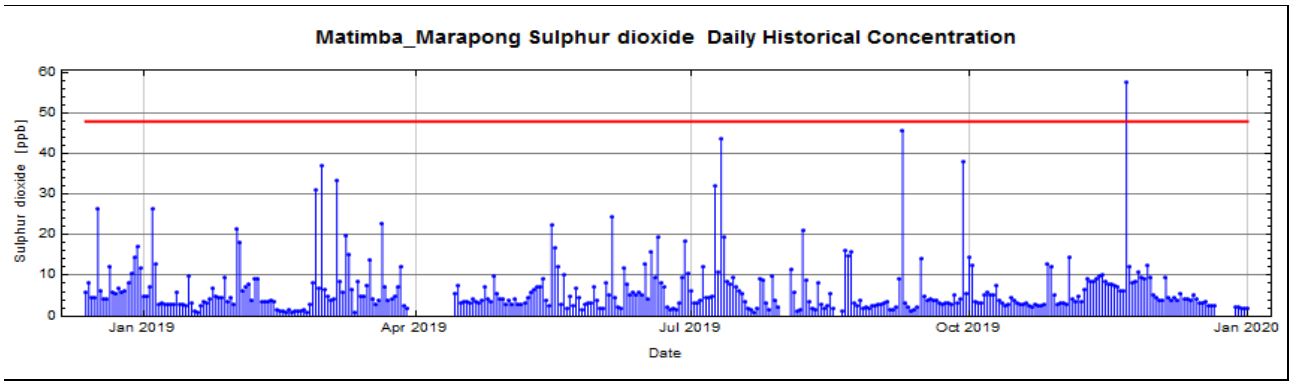


Figure 22: SO_2 Daily Means

7.2. MONTHLY MEANS FOR THE CURRENT CALENDAR YEAR 2020

Table 19: Monthly Means for current year 2020

Parameter measured	Jan
$PM_{2.5}$ ($\mu g/m^3$	17.2
PM_{10} ($\mu g/m^3$)	25.9
NO_2 (ppb)	5.6
CO (ppb)	0.1
O_3 (ppb)	27.6
SO_2 (ppb)	3

ND = No Data

The above table shows the monthly mean concentrations of pollutants in January 2020.

Table 20: Number of exceedances of the National Ambient Air Quality Limits

	SO_2 hourly	SO_2 daily	NO_2 hourly	PM_{10} daily	$PM_{2.5}$ daily	O_3 8-hourly	CO hourly	SO_2 10 minute
Jan 2020	0	0	0	0	0	0	0	0
Total No. of Exceedances	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Allowed no of exceedances	88	4	88	4	4	11	88	526

The numbers of exceedances of all national air quality limits are well below their respective allowed number of exceedances per year.

8. CONCLUSIONS

There were no exceedances of all the parameters monitored at the monitoring station during the period under review.

Ambient CO, PM_{10}, $PM_{2.5}$ and NO_2 concentrations at Marapong monitoring site show influence of emissions from low level sources in the area.

Report Compiled by:
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Reviewed and Authorised by: Date of Issue: 14 Feb 2020

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9. ABBREVIATIONS

DEA	Department of Environmental Affairs
FPM	Fine particulate matter
HG	Mercury
HUM	Humidity
NO_1	Nitric oxide
NO_2	Nitrogen dioxide
NO_X	Oxides of nitrogen
OZN / O_3	Ozone
CO	Carbon monoxide
SGT	Sigma theta
TMP	Ambient temperature
WDR	Wind direction from true North
WSP	Wind speed
WVL	Wind velocity
N	North
NNE	North-north-east
NE	North-east
ENE	East-north-east
E	East
ESE	East-south-east
SE	South-east
SSE	South-south-east
S	South
SSW	South-south-west
SW	South-west
WSW	West-south-west
W	West
WNW	West-north-west
NW	North-west
NNW	North-north-west
deg	Degree
deg C	Degree Celsius
ug/m^3	Microgram per cubic meter
m/s	Meters per second
$PM_{2.5}$	Particulate matter < 2.5 microns in diameter
PM_{10}	Particulate matter < 10 microns in diameter
ppb	Parts per billion
ppm	Parts per million
MWP	Megawatt Park
RT&D	Research Testing and Development

10. DISTRIBUTION LIST

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