Eskom	Matimba Power Station Emissions report	Matimba Power Station

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1. Report Summary

Matimba Power Station was issued with an Atmospheric Emission License (H16/1/13-WDM05) in November 2021. The License requires the license holder to submit monthly reports to the Department. This report contains the required information as specified in the license for January 2022.

During the period under review, Matimba experienced 11 exceedances of the daily particulate matter emission limit (50mg/Nm^3) all of these exceedances remained within the 48 hour grace period. One exceedance of the daily NO_x emission limit (750mg/Nm^3) occurred. No exceedances of the monthly SO_x limit (3500mg/Nm^3) occurred.

Issues mentioned above are discussed further under the respective sections within the report.

2. Emission information

2.1 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	1 115 673
	Fuel Oil	Tons/month	1 200	780,13
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate**
	Energy	GWh	4 212.6	1 979,191

The consumption rates for the month of January 2022 were within the permitted maximum limit.

2.2 Abatement technology

Table 2: Abatement Equipment Control Technology Utilised

Associated Unit	Technology Type	Minimum utilisation (%)	Efficiency (%)
Unit 1	Electrostatic Precipitator	100%	99,89%
Unit 2	Electrostatic Precipitator	100%	99,89%
Unit 3	Electrostatic Precipitator	100%	99,90%
Unit 4	Electrostatic Precipitator	100%	99,89%
Unit 5	Electrostatic Precipitator	100%	99,90%
Unit 6	Electrostatic Precipitator	100%	99,90%
Associated Unit	**Technology Type**	**Minimum utilisation (%)**	**Actual Utilisation (%)**
Unit 1	SO_3 Plant	100%	96,8%
Unit 2	SO_3 Plant	100%	100%
Unit 3	SO_3 Plant	100%	77,4%
Unit 4	SO_3 Plant	100%	100%
Unit 5	SO_3 Plant	100%	100%
Unit 6	SO_3 Plant	100%	100%

Fluegas conditioning plant availability was below the required 100% for unit 1 and 3 due to unexpected breakdowns. The defects were addressed, and additional shares were acquired to increase return time when defects occur.

2.3 Energy source characteristics

Table 3: Energy Source Material Characteristics.

	Characteristic	Stipulated Range (Unit)	Monthly Average Content
Coal burned	**Sulphur Content**	1.6%	1,20%
	Ash Content	40%	34,85%

Energy source characteristics remained within the ranges stipulated in the license.

2.4 Emissions reporting

2.4.1 Particulate Matter Emissions

Unit 1 Particulate Emissions

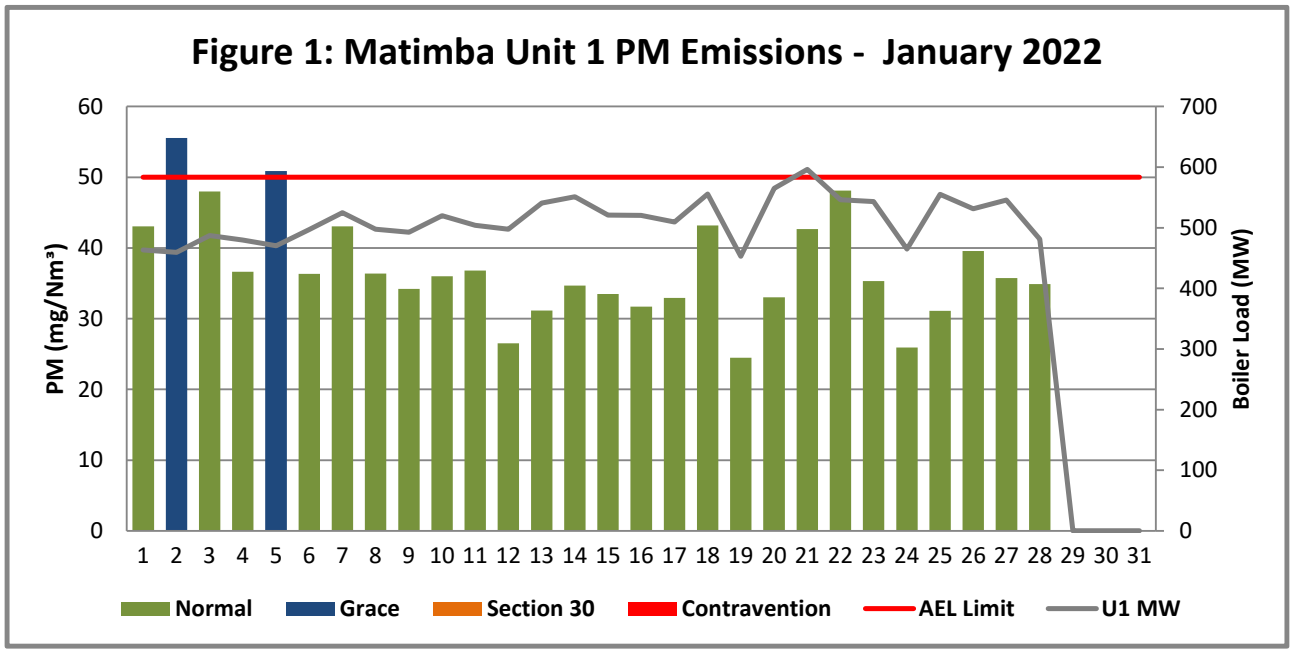

Figure 1: Particulate matter daily average emissions against emission limit for unit 1 for the month of January 2022

Interpretation:

Unit 1 exceeded the 50mg/Nm^3 emission limit on 2 and 5 January 2022. Exceedances were due to failures on the ash conveyancing system that caused ash to build-up within the dust handling plant. The defects were addressed, and no further exceedances were experienced in January 2022. The two exceedance remained within the 48 hour grace period.

Unit 2 Particulate Emissions

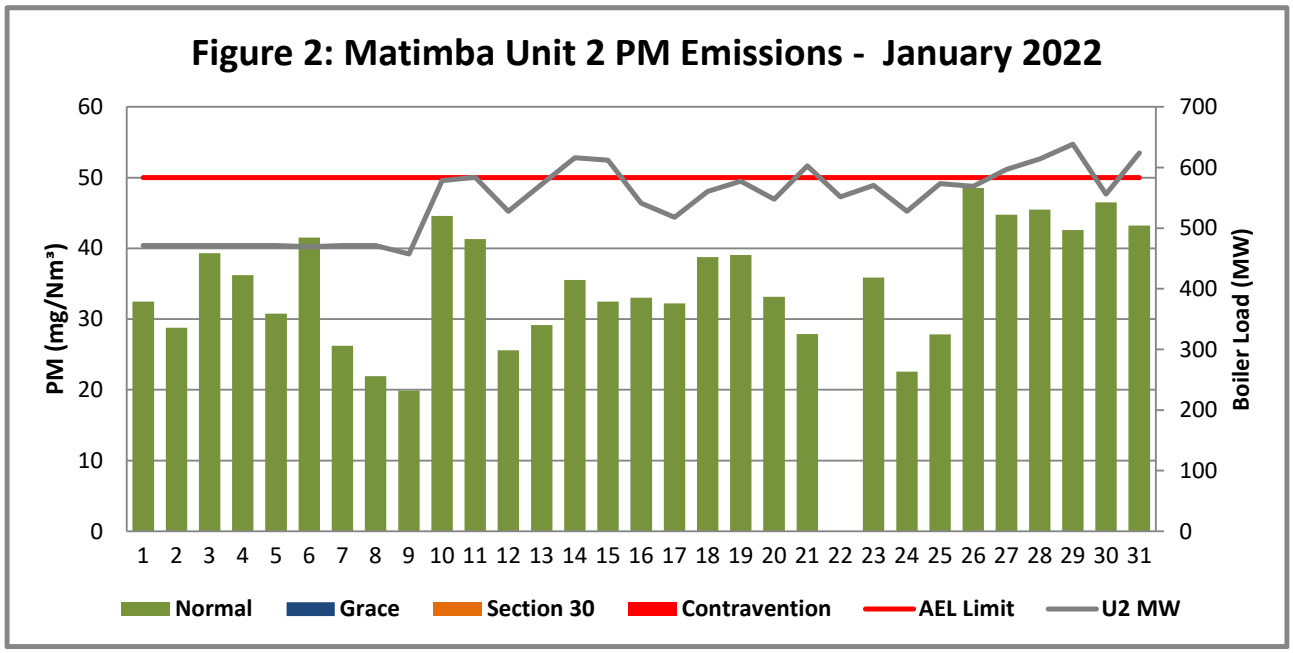

Figure 2: Particulate matter daily average emissions against emission limit for unit 2 for the month of January 2022

Interpretation:

All daily averages below particulate emission limit of 50 mg/Nm^3.

Unit 3 Particulate Emissions

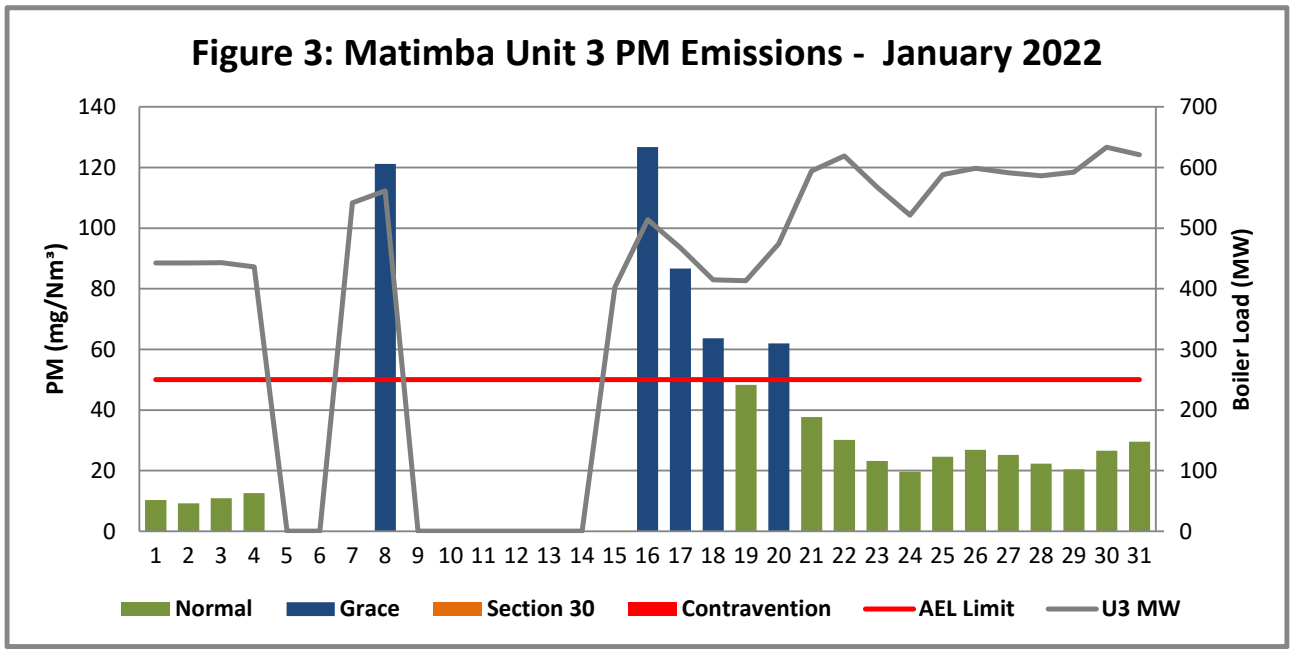

Figure 3: Particulate matter daily average emissions against emission limit for unit 3 for the month of January 2022

Interpretation:

Unit 3 exceeded the daily average limit of 50mg/Nm^3 on 8, 16, 17, 18 and 20 January 2022. Exceedances were due to the failure of the variable speed drive, which control the Sulphur plant, and ash build-up within the flue gas stream due to failures on the ash conveyancing plant. The variable speed drive was replaced, the ash conveyancing plant was repaired, and emissions returned to normal. The exceedances remained within the grace period allowed for cold start-up conditions.

Unit 4 Particulate Emissions

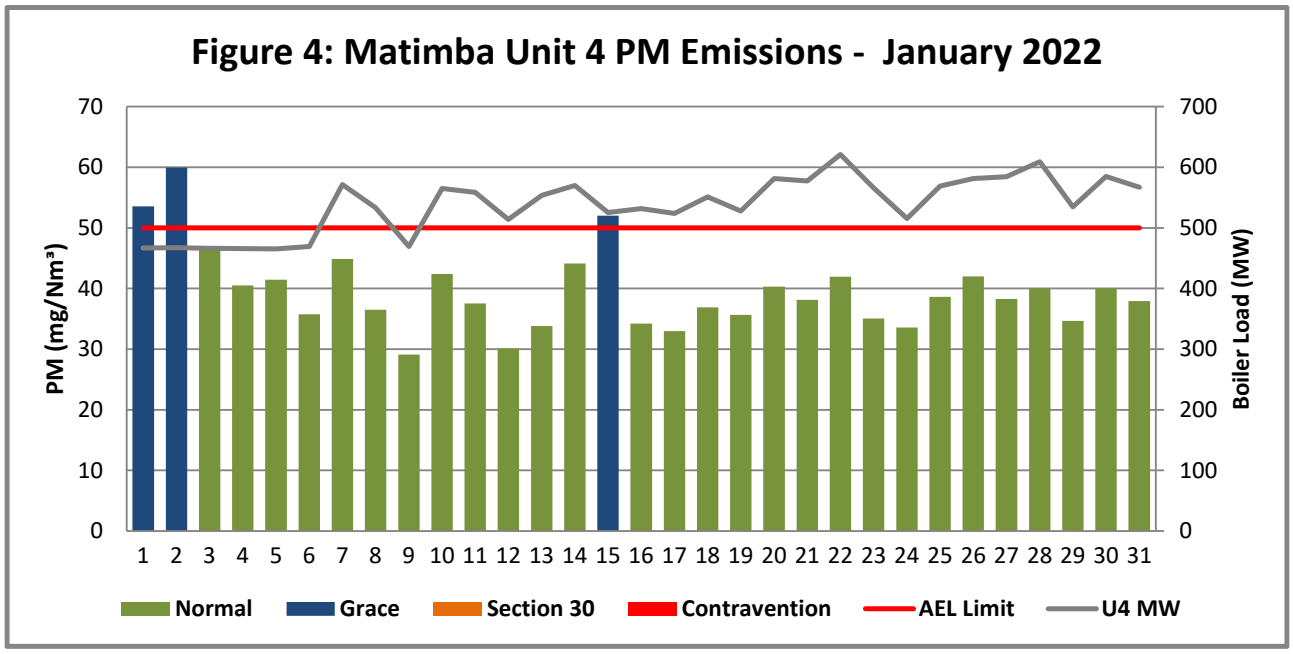

Figure 4: Particulate matter daily average emissions against emission limit for unit 4 for the month of January 2022

Interpretation:

Unit 4 exceeded the daily limit of 50mg/Nm^3 on 1, 2 and 15 January 2022. The exceedances occurred due to breakdowns on the ash conveyancing system. These breakdowns led to ash build-up within the flue gas cleaning stream which reduced the efficiency of the precipitator fields. All exceedances remained within the 48 hour grace period.

Unit 5 Particulate Emissions

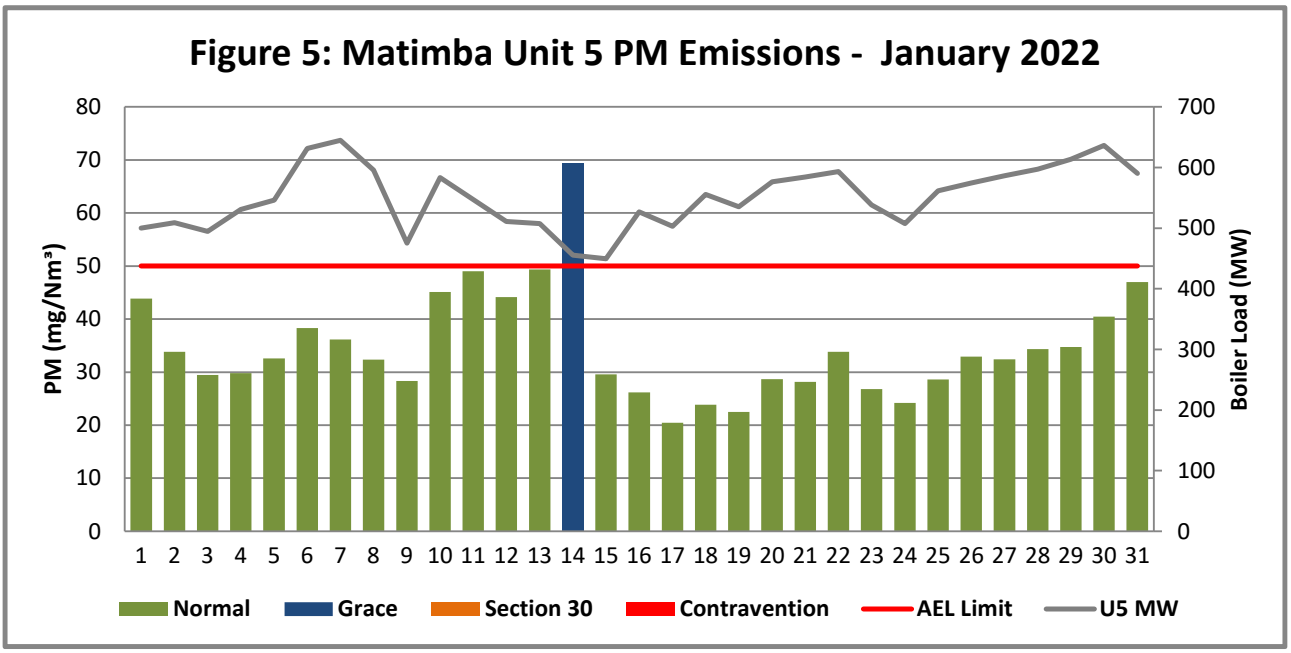

Figure 5: Particulate matter daily average emissions against emission limit for unit 5 for the month of January 2022

Interpretation:

Unit 5 exceeded the daily limit of 50mg/Nm^3 on 14 January 2022. The exceedance occurred due to breakdowns on the ash conveyancing system. These breakdowns led to ash build-up within the flue gas cleaning stream which reduced the efficiency of the precipitator fields. The exceedance remained within the 48 hour grace period

Unit 6 Particulate Emissions

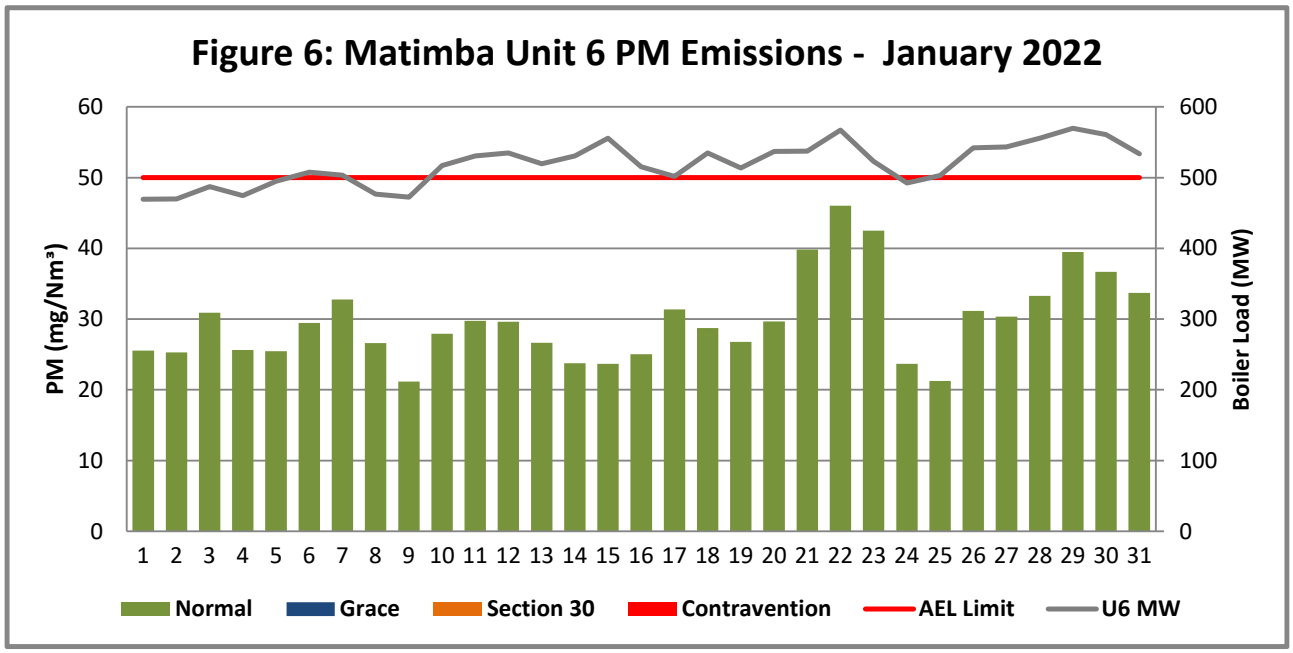

Figure 6: Particulate matter daily average emissions against emission limit for unit 6 for the month of January 2022

Interpretation:

All daily averages below particulate emission limit of 50 mg/Nm^3.

2.4.2 Gaseous Emissions

Unit 1 SO_2 Emissions

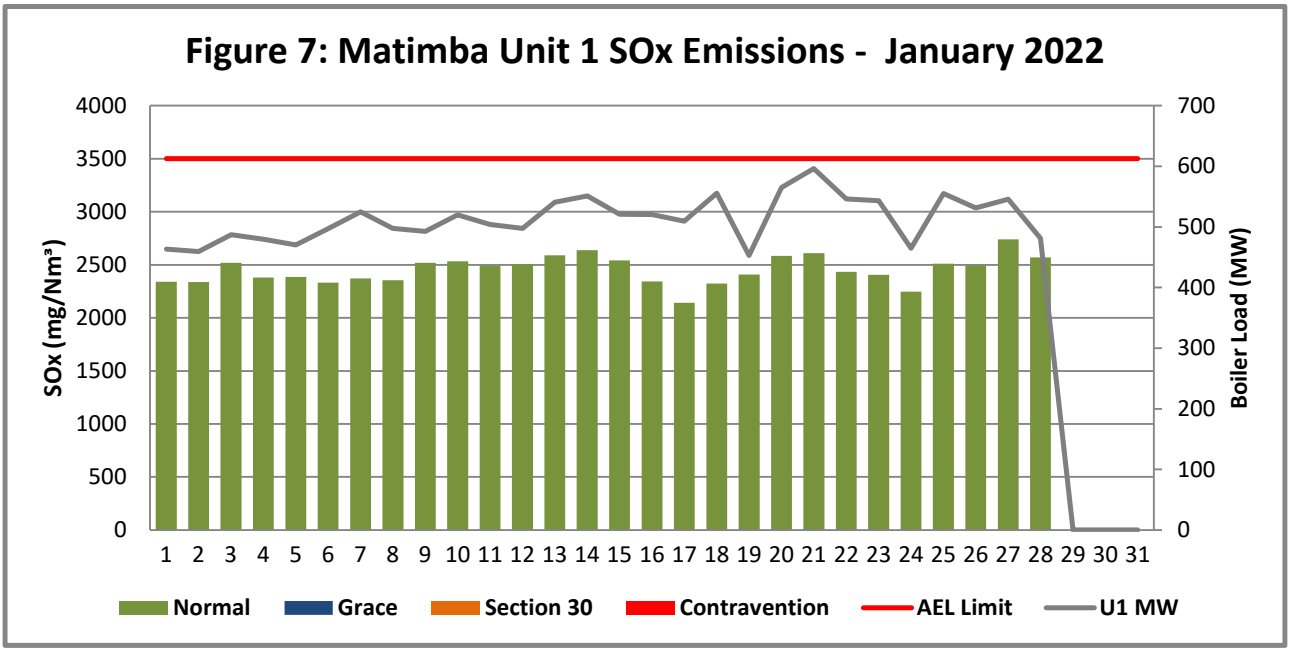

Figure 7: SO2 daily average emissions against emission limit for unit 1 for the month of January 2022

Interpretation:

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

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Unit 2 SO_2 Emissions

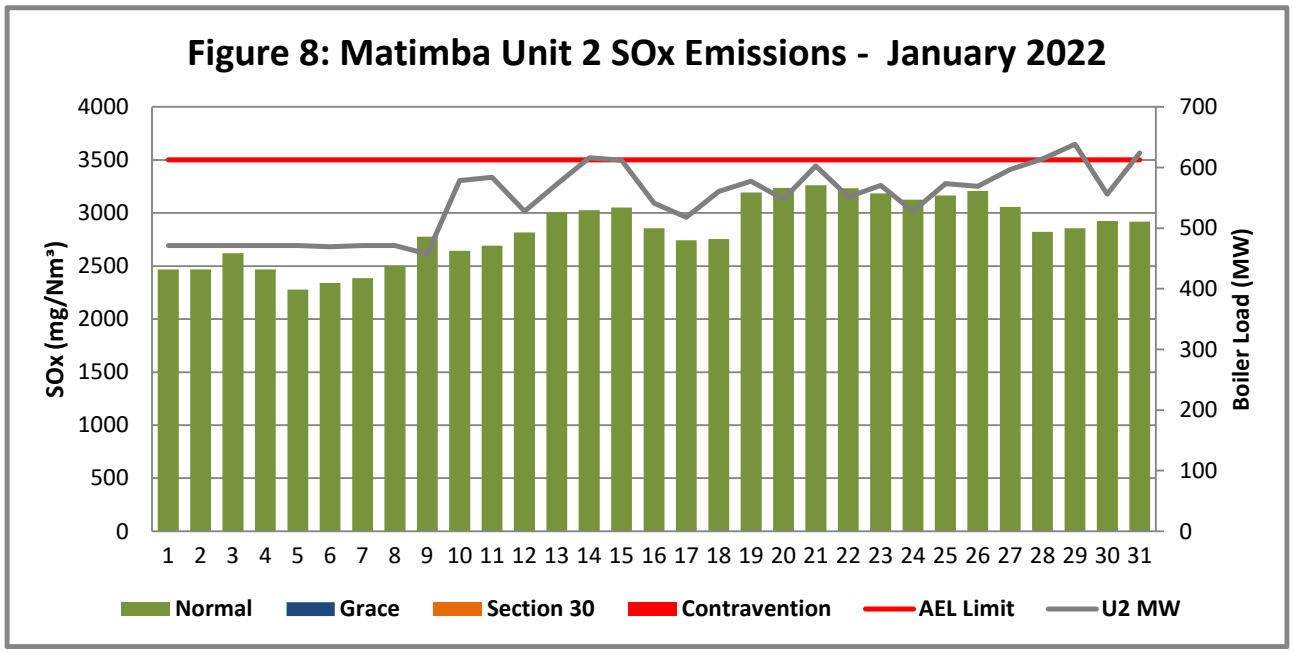

Figure 8: SO2 daily average emissions against emission limit for unit 2 for the month of January 2022

Interpretation:

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

Unit 3 SO_2 Emissions

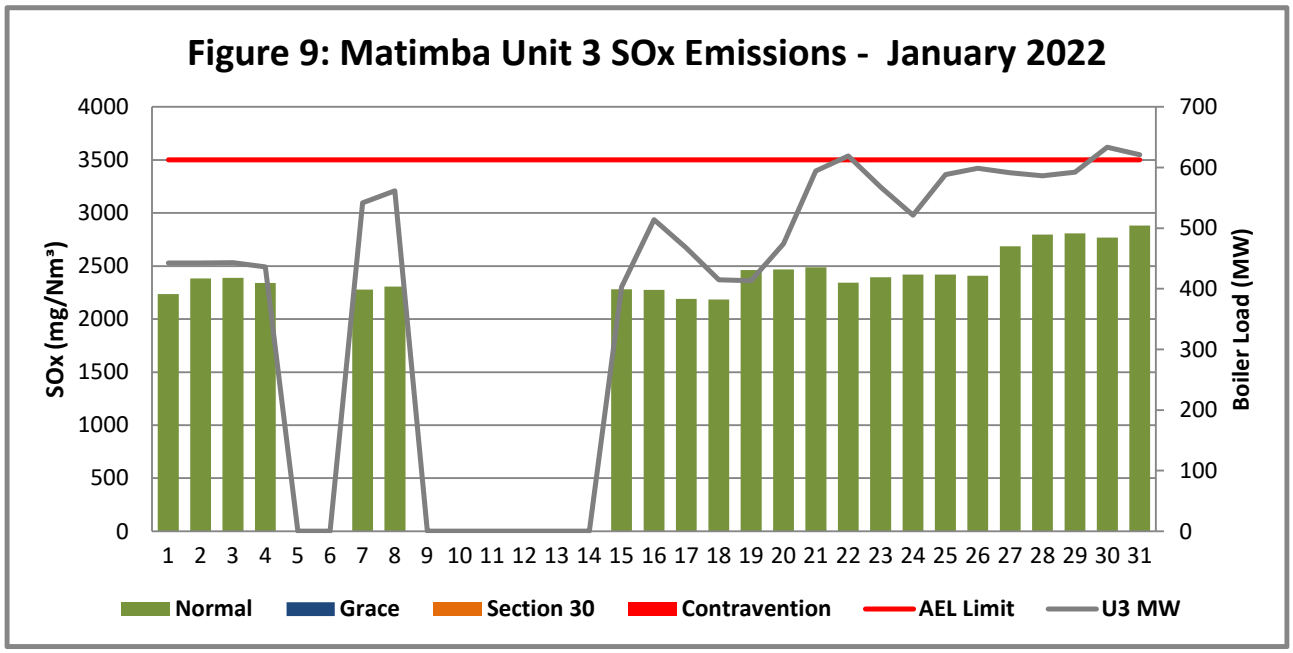

Figure 9: SO2 daily average emissions against emission limit for unit 3 for the month of January 2022

Interpretation:

Monthly average was 2 824 mg/Nm^3 which is below SO_2 emission monthly limit of 3500 mg/Nm^3. SO_x emissions increased during the period of 10 January 2022 until 21 January 2022. This was due to an increase in in the oxygen readings during this time in conjunction with occasional increases in the sulphur content of the coal used for electricity generation. The increase in emissions were investigated and required repairs were made.

Unit 4 SO_2 Emissions

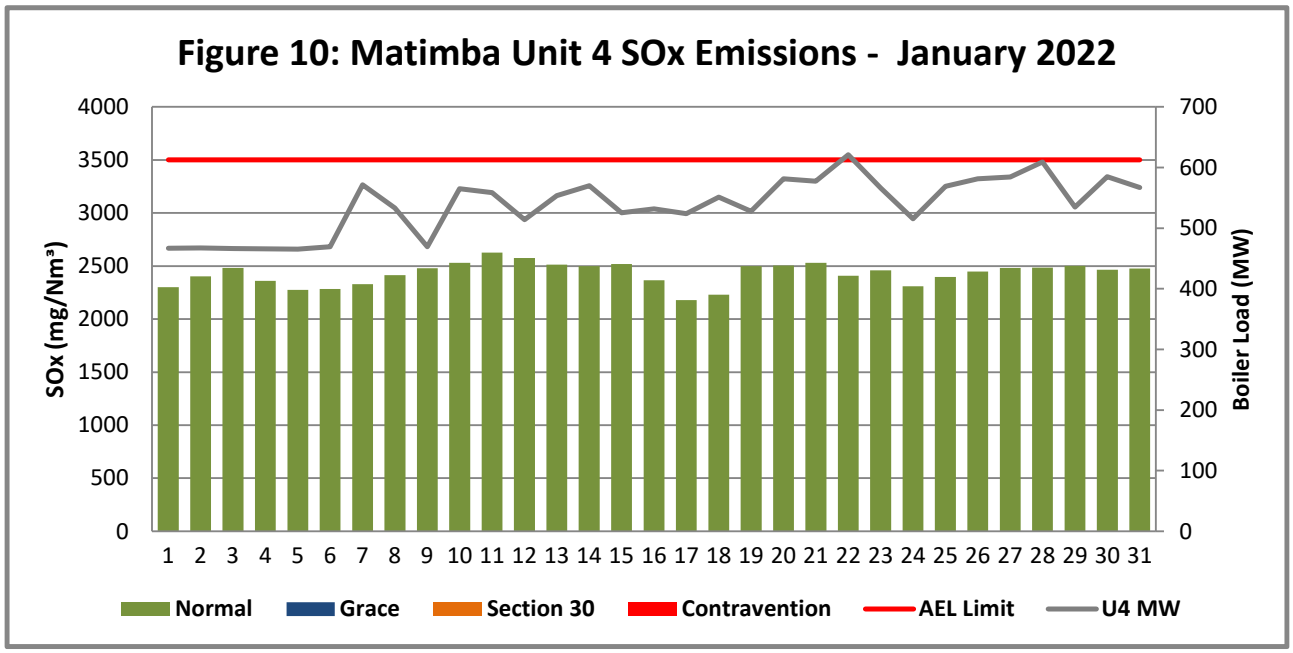

Figure 10: SO2 daily average emissions against emission limit for unit 4 for the month of January 2022

Interpretation:

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

Unit 5 SO_2 Emissions

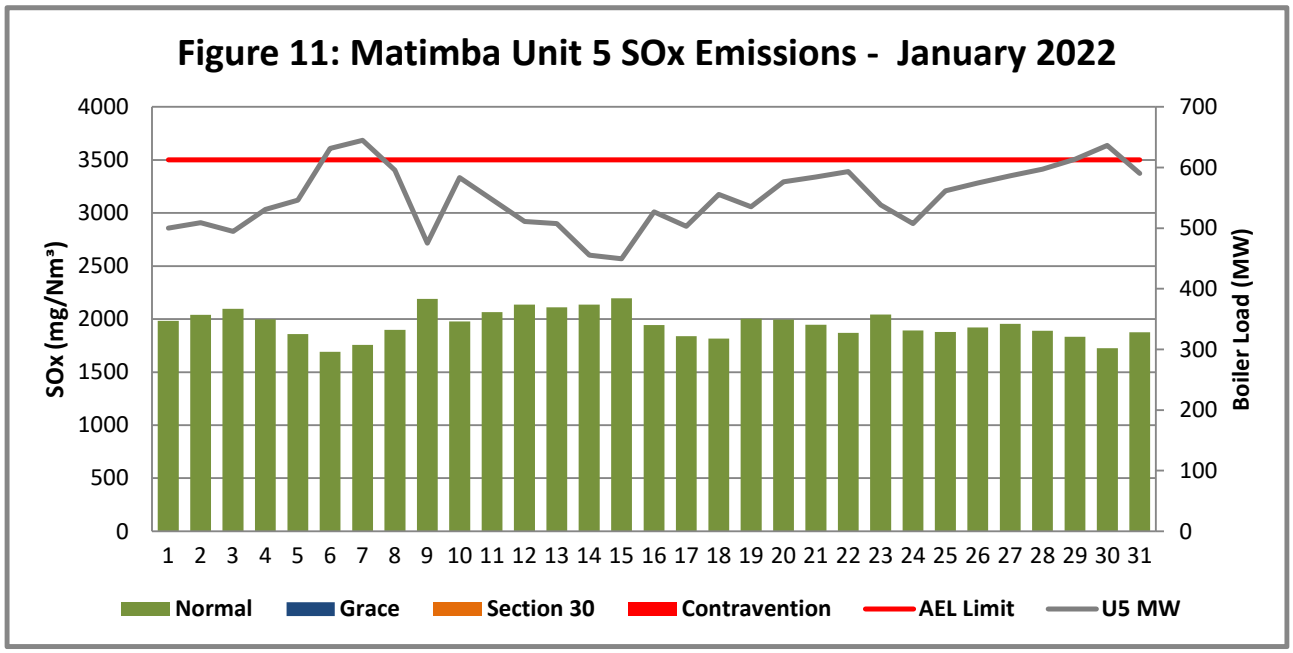

Figure 11: SO2 daily average emissions against emission limit for unit 5 for the month of January 2022

Interpretation:

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

Unit 6 SO_2 Emissions

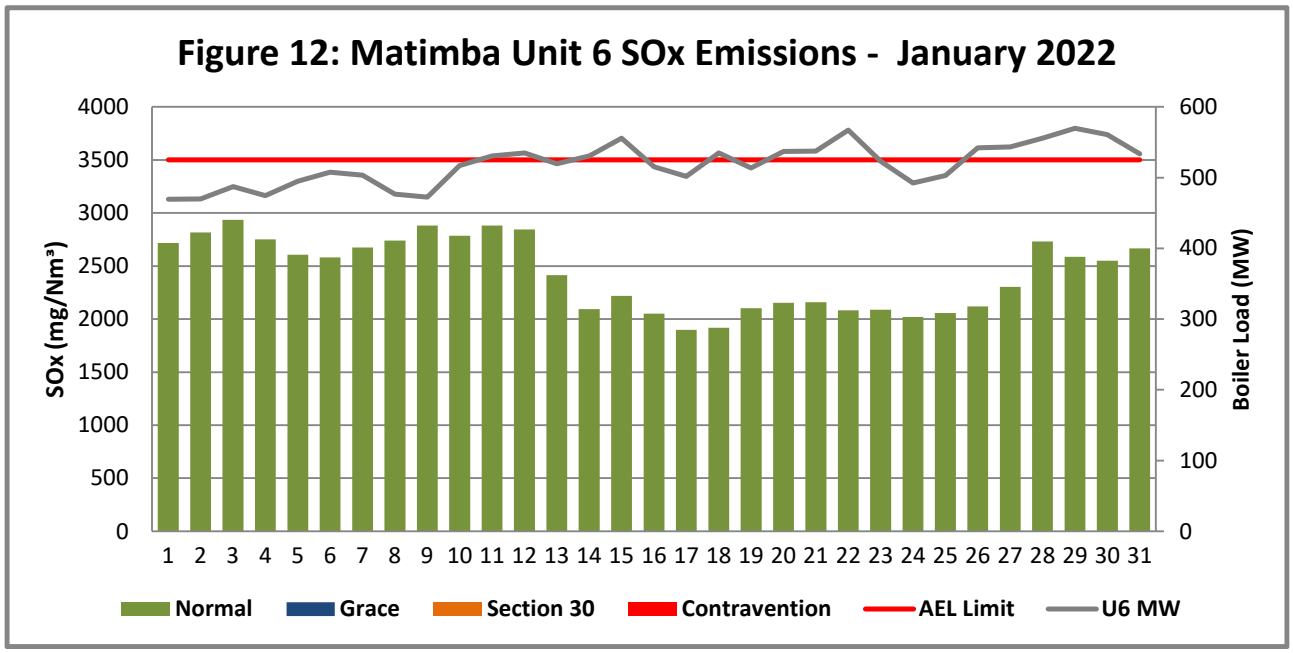

Figure 12: SO2 daily average emissions against emission limit for unit 6 for the month of January 2022

Interpretation:

All daily averages remained below SO_2 emission monthly limit of 3500 mg/Nm^3.

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Unit 1 NO_x Emissions

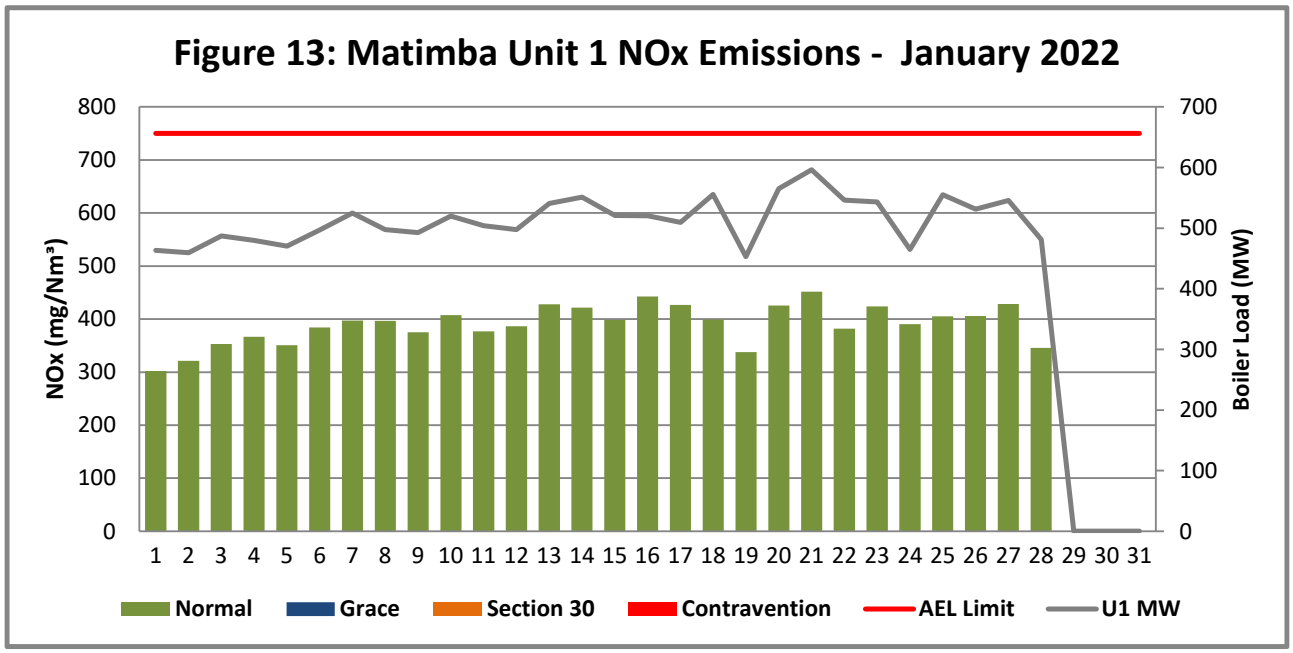

Figure 13: Figure 14: NOx daily average emissions against emission limit for unit 1 for the month of January 2022

Interpretation:

All daily averages below NOx emission limit of 750 mg/Nm^3.

Unit 2 NO_x Emissions

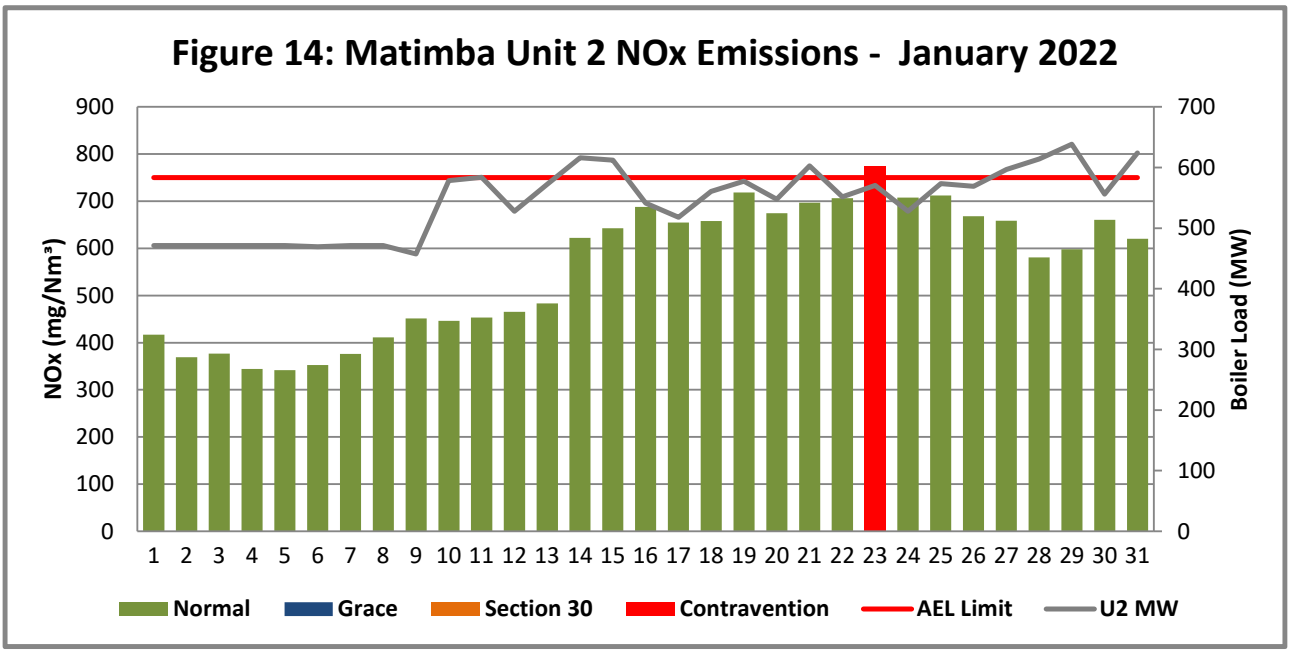

Figure 15: NOx daily average emissions against emission limit for unit 2 for the month of January 2022

Interpretation:

Unit 2 exceeded the daily NOx emission limit on 23 January 2022. The exceedance is suspected to be due to an inaccurate reading on the Oxygen monitor of unit 2 influencing the NOx concentration values. An action plan is in place to address the unreliability of the oxygen monitor and calibration and preventative maintenance is being performed every 14 days.

Unit 3 NO_x Emissions

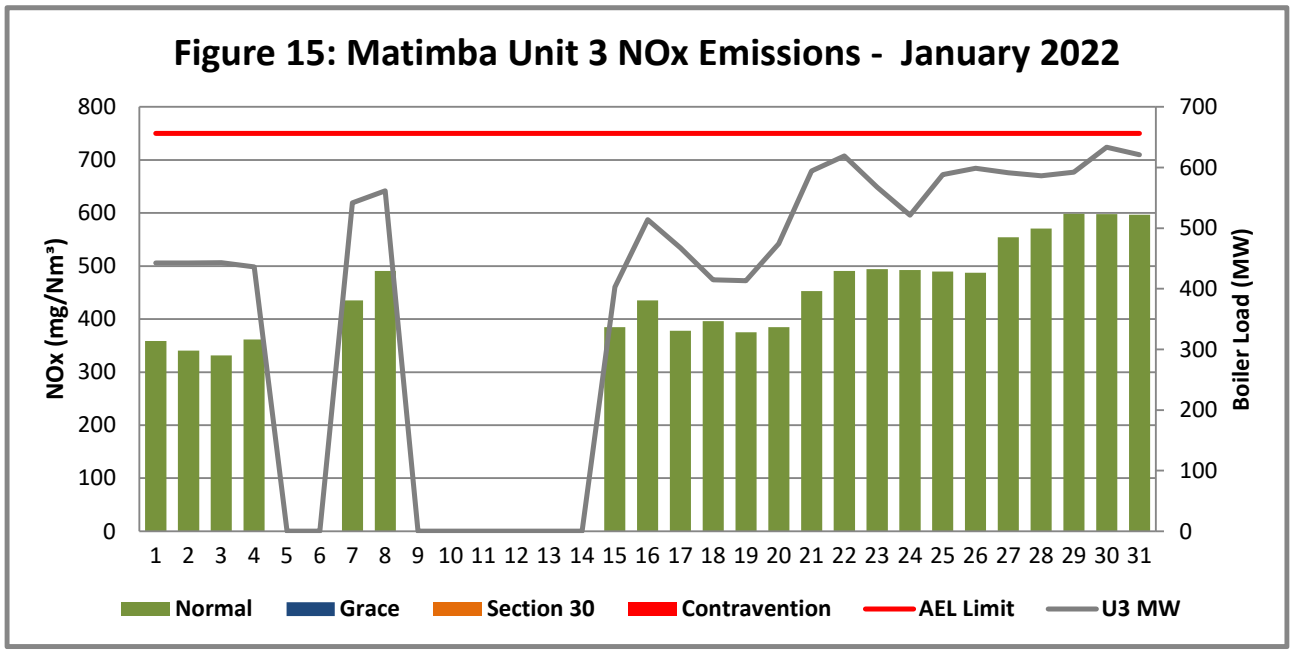

Figure 16: NOx daily average emissions against emission limit for unit 3 for the month of January 2022

Interpretation:

All daily averages below NOx emission limit of 750 mg/Nm^3.

Unit 4 NO_x Emissions

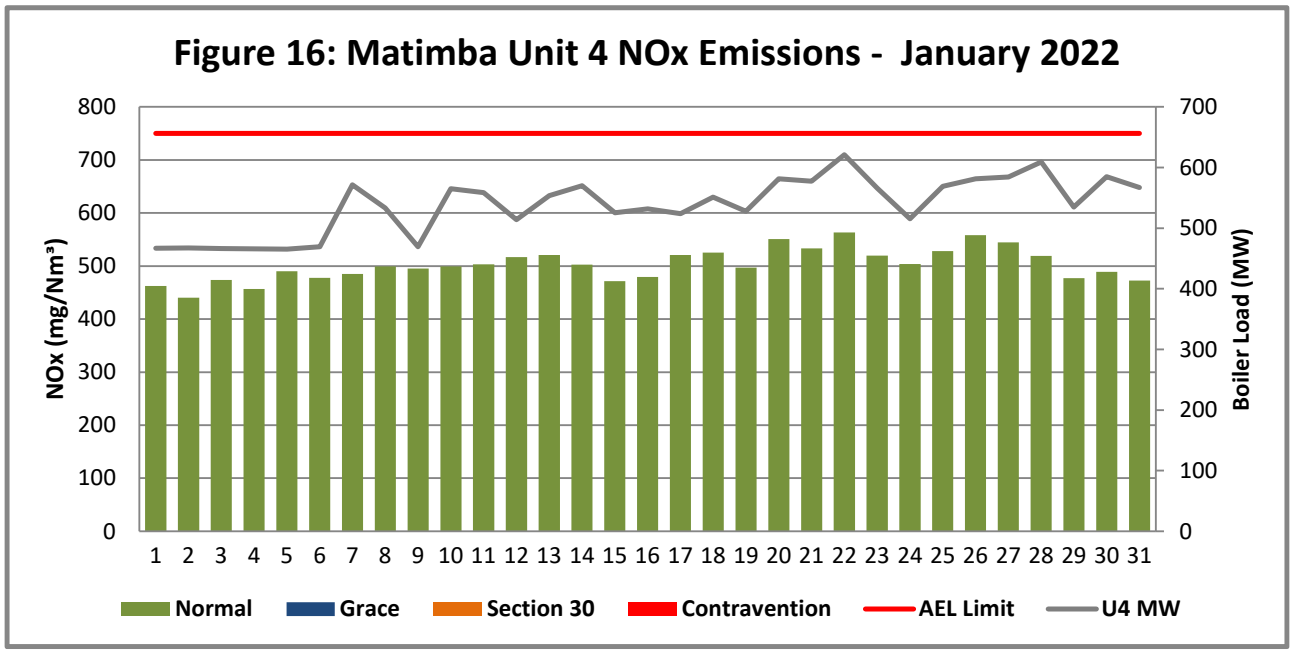

Figure 17: NOx daily average emissions against emission limit for unit 4 for the month of January 2022

Interpretation:

All daily averages below NOx emission limit of 750 mg/Nm^3.

Unit 5 NO_x Emissions

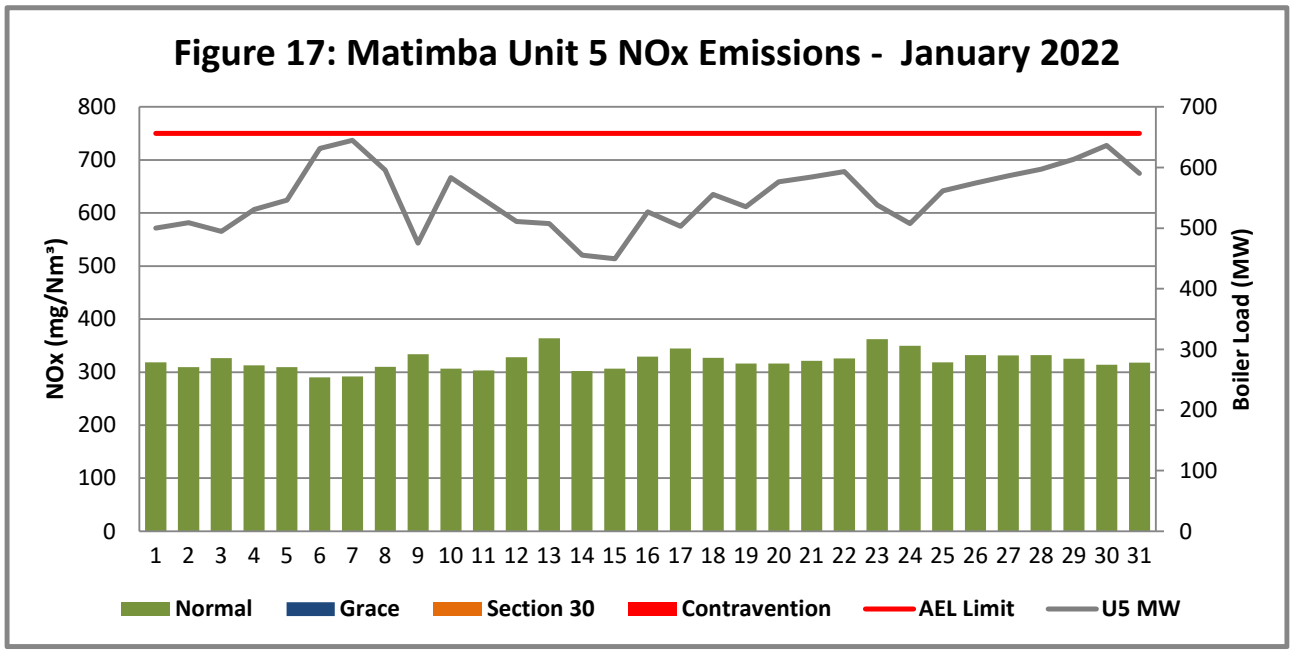

Figure 18: NOx daily average emissions against emission limit for unit 5 for the month of January 2022

Interpretation:

All daily averages below NOx emission limit of 750 mg/Nm^3.

Unit 6 NO_x Emissions

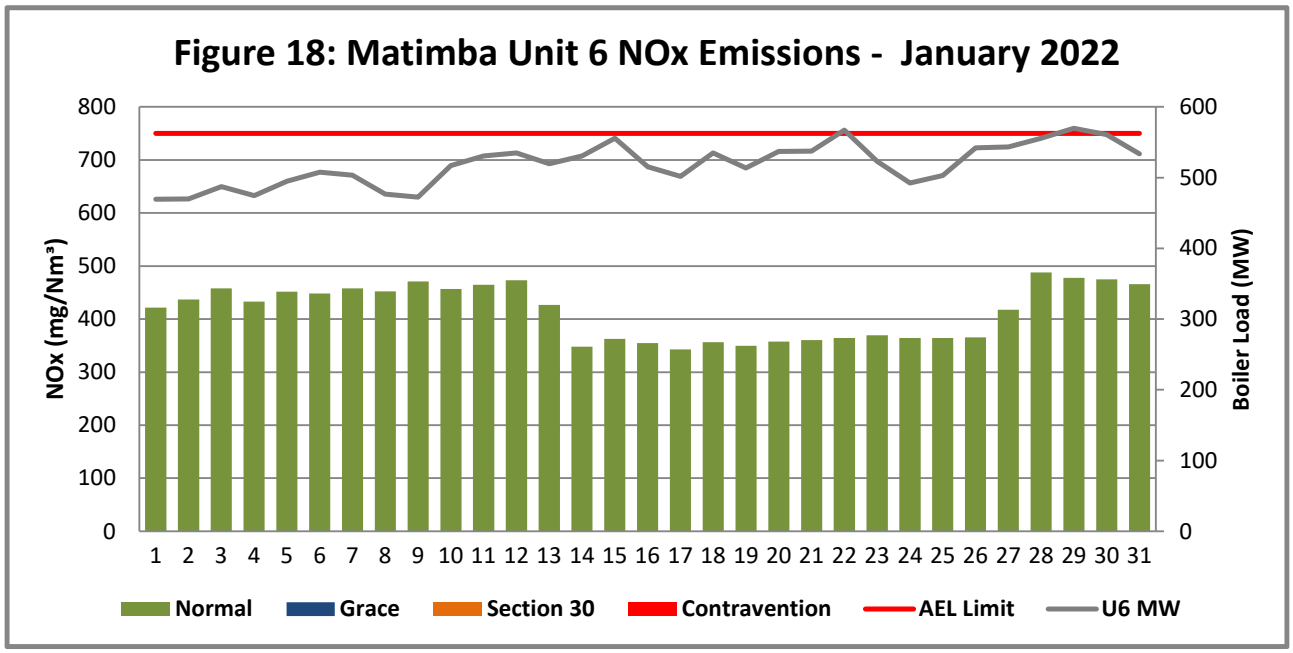

Figure 19: NOx daily average emissions against emission limit for unit 6 for the month of January 2022

Interpretation:

All daily averages below NOx emission limit of 750 mg/Nm^3.

2.4.3 Total Volatile Organic Compounds

Table 4: Total volatile compound estimates

Eskom

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

Date:	Wednesday, 23 February 2022
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:	***780,130***	
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:	0,02	kg/month
TOTAL LOSSES (Total TVOC Emissions for the month):	**0,62**	**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.

2.4.4 Greenhouse gas (CO_2) emissions

CO_2 emissions are reported in terms of the Greenhouse gas reporting regulations (GN 43712, GNR. 994/2020) and are not included in the monthly AEL compliance report.

2.5 Daily power generated

Table 5: Daily power generated per unit in MWh for the month of January 2022

Date	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
2022/01/01	11115	11165	10572	11171	11935	11173
2022/01/02	11032	11161	10565	11184	12112	11181
2022/01/03	11673	11146	10573	11157	11740	11570
2022/01/04	11492	11140	7088	11145	12596	11293
2022/01/05	11302	11140	0	11129	12988	11754
2022/01/06	11915	11098	0	11205	15008	12061
2022/01/07	12573	11139	9728	13647	15337	11973
2022/01/08	11942	11142	6157	12782	14204	11319
2022/01/09	11815	10812	0	11229	11317	11224
2022/01/10	12462	13630	0	13500	13870	12283
2022/01/11	12062	13829	0	13330	13015	12611
2022/01/12	11927	12463	0	12266	12113	12697
2022/01/13	12928	13511	0	13215	12117	12342
2022/01/14	13234	14559	0	13624	10850	12615
2022/01/15	12498	14501	4744	12599	10664	13208
2022/01/16	12504	12829	12306	12691	12561	12277
2022/01/17	12219	12236	11147	12534	11968	11921
2022/01/18	13312	13247	9927	13174	13210	12711
2022/01/19	7470	13597	9845	12584	12688	12185
2022/01/20	13524	12974	11302	13880	13708	12790
2022/01/21	14299	10915	14130	13808	13893	12743
2022/01/22	9431	10693	14811	14863	14133	13530
2022/01/23	13044	13505	13565	13545	12822	12484
2022/01/24	11135	12427	12421	12292	12048	11683
2022/01/25	13324	13565	14046	13589	13356	11985
2022/01/26	12700	13478	14280	13841	13641	12913
2022/01/27	13086	14069	14152	13931	13940	12946
2022/01/28	1632	14523	13961	14522	14208	13252
2022/01/29	0	15081	14128	8531	14584	13591
2022/01/30	0	13207	15130	13917	15136	13389
2022/01/31	0	14705	14837	13503	14054	12730

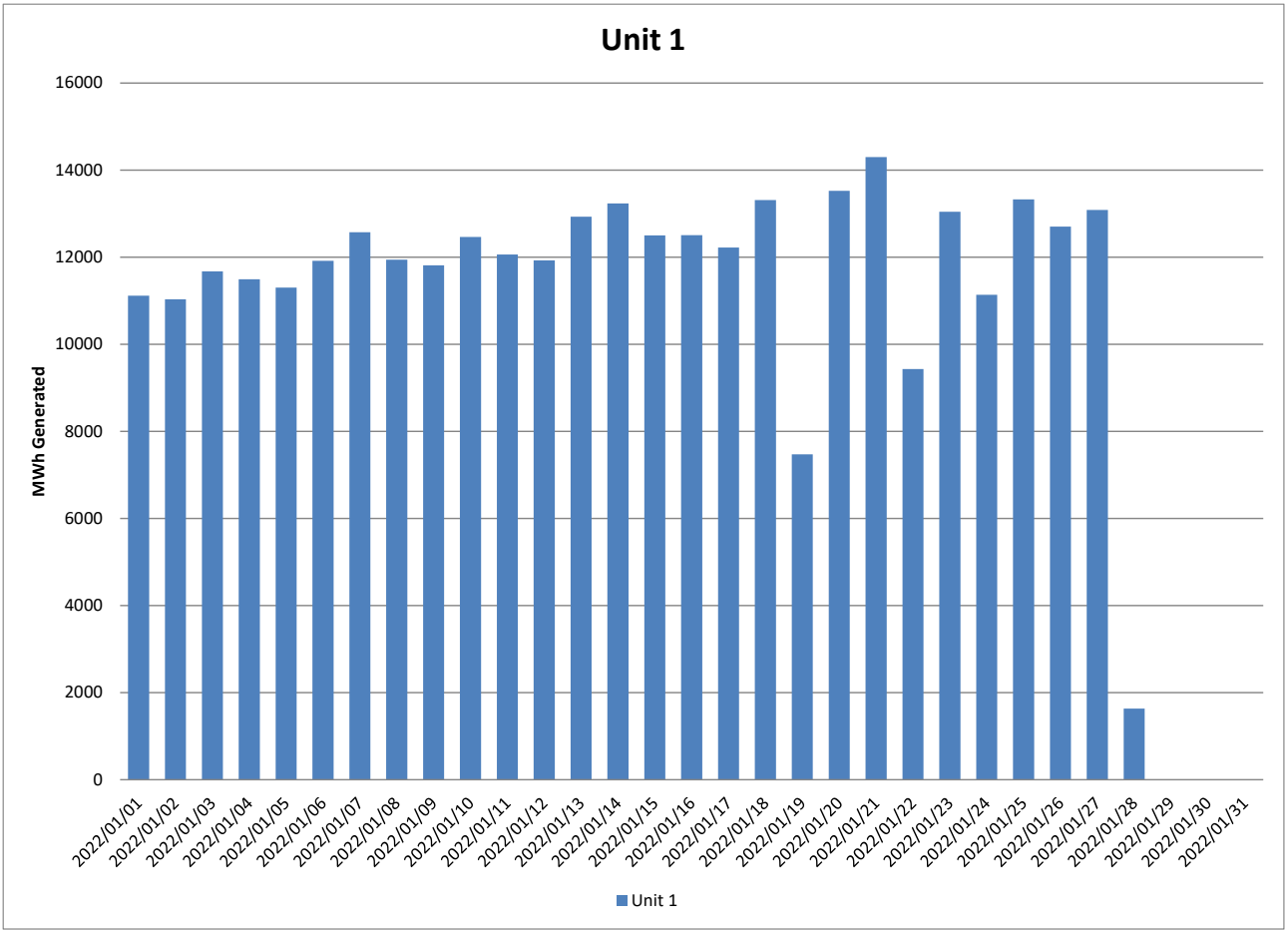

Figure 20: Unit 1 daily generated power in MWh for the month of January 2022

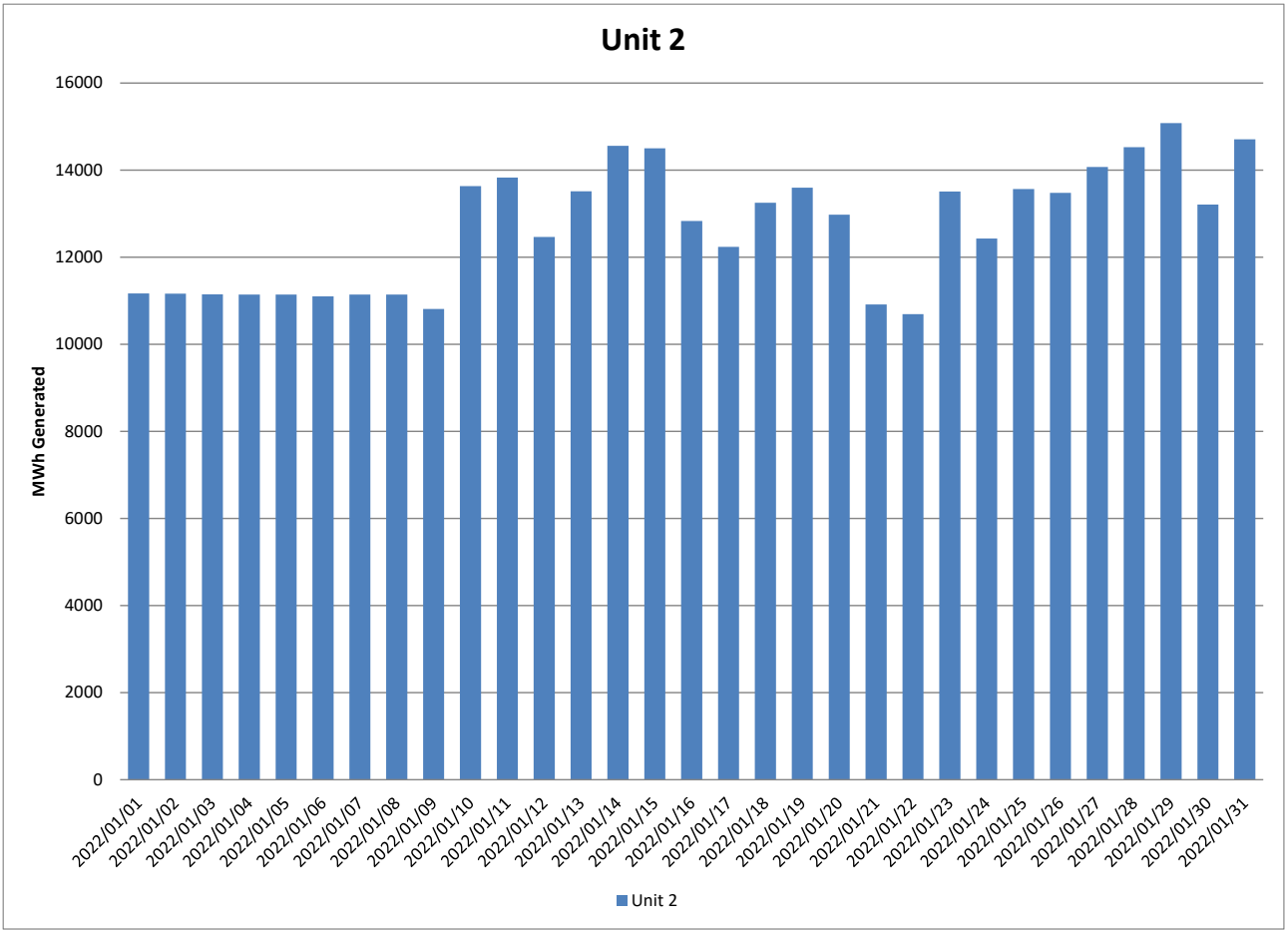

Figure 21: Unit 2 daily generated power in MWh for the month of January 2022

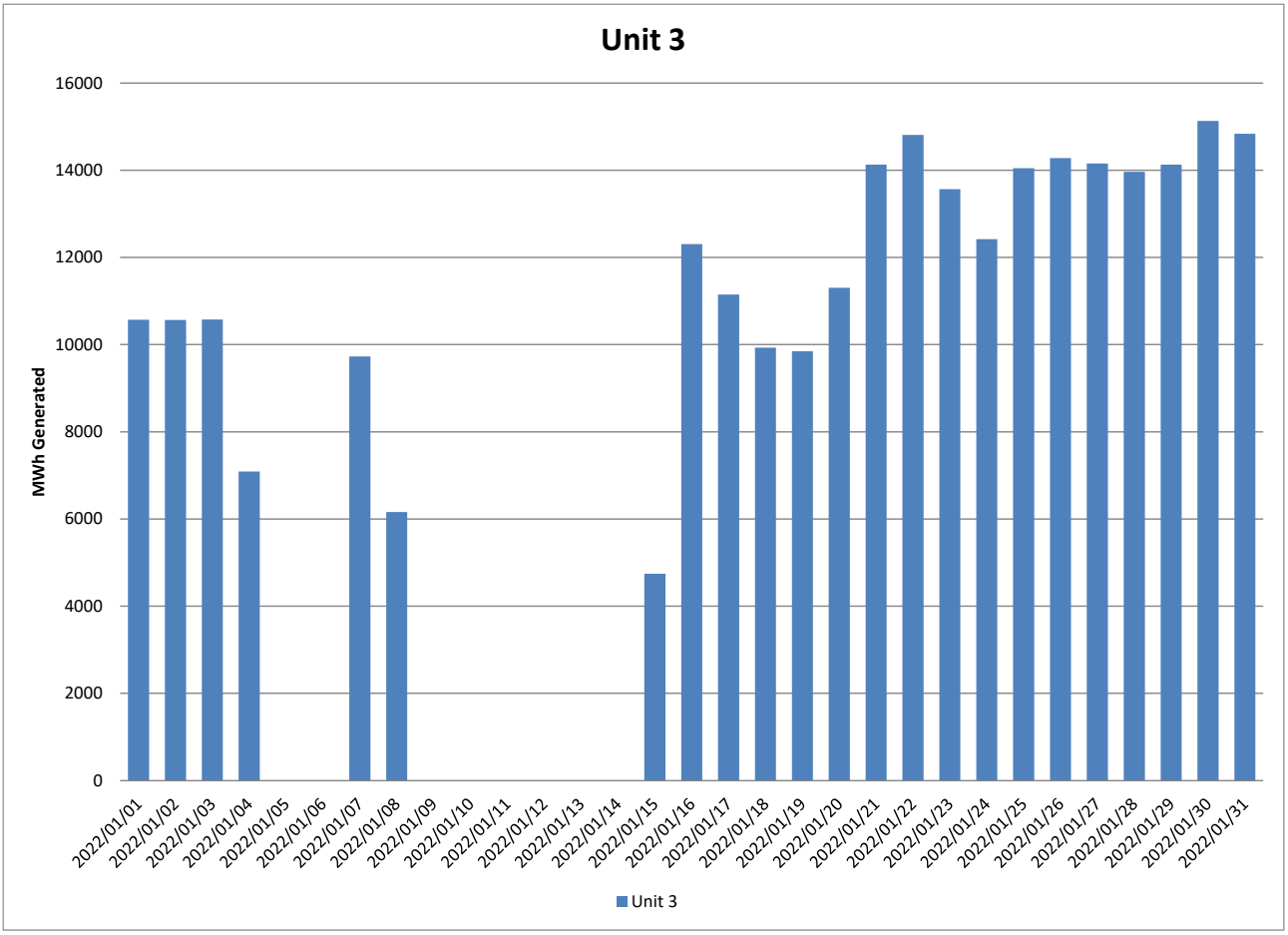

Figure 22: Unit 3 daily generated power in MWh for the month of January 2022

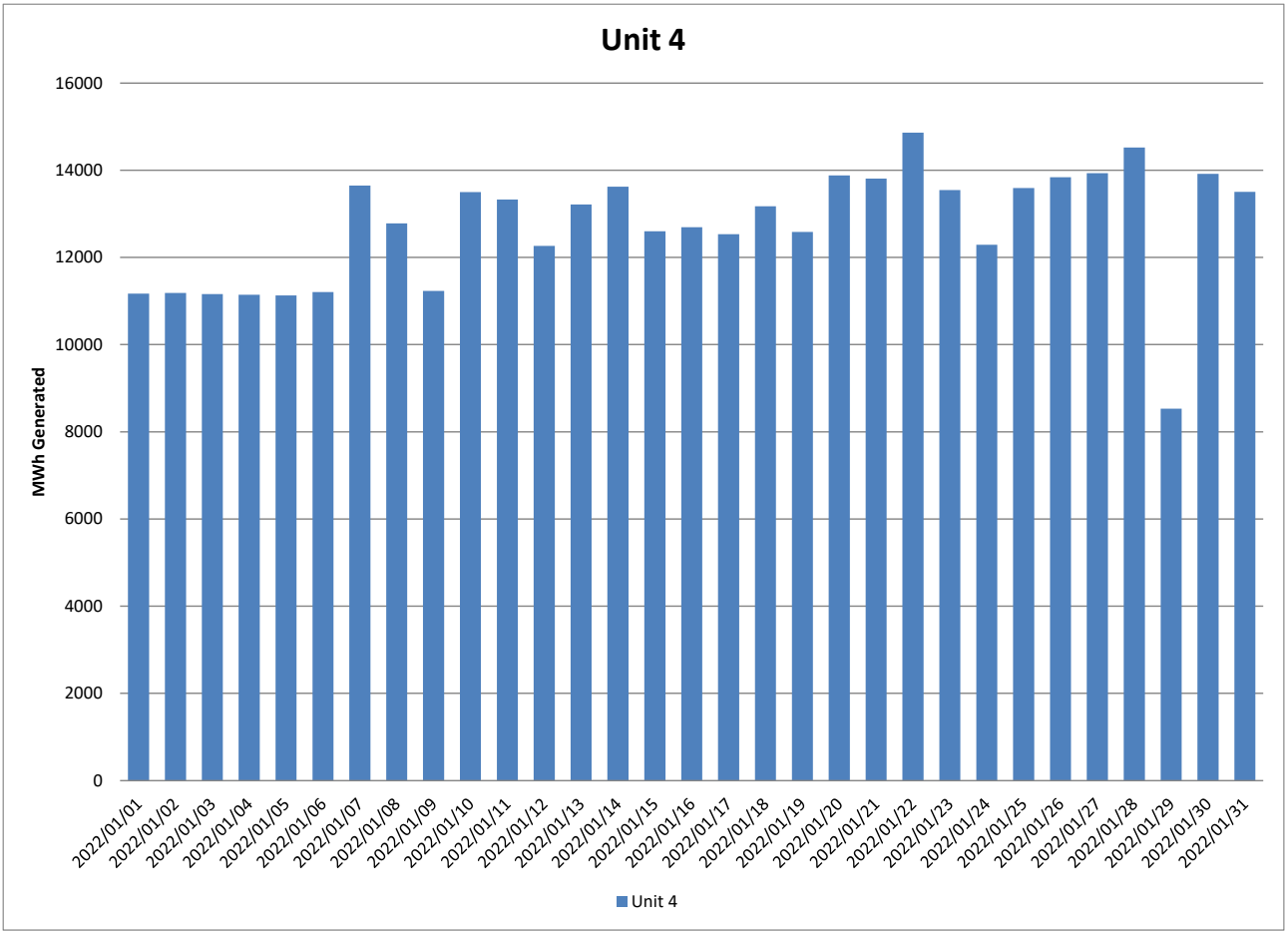

Figure 23: Unit 4 daily generated power in MWh for the month of January 2022

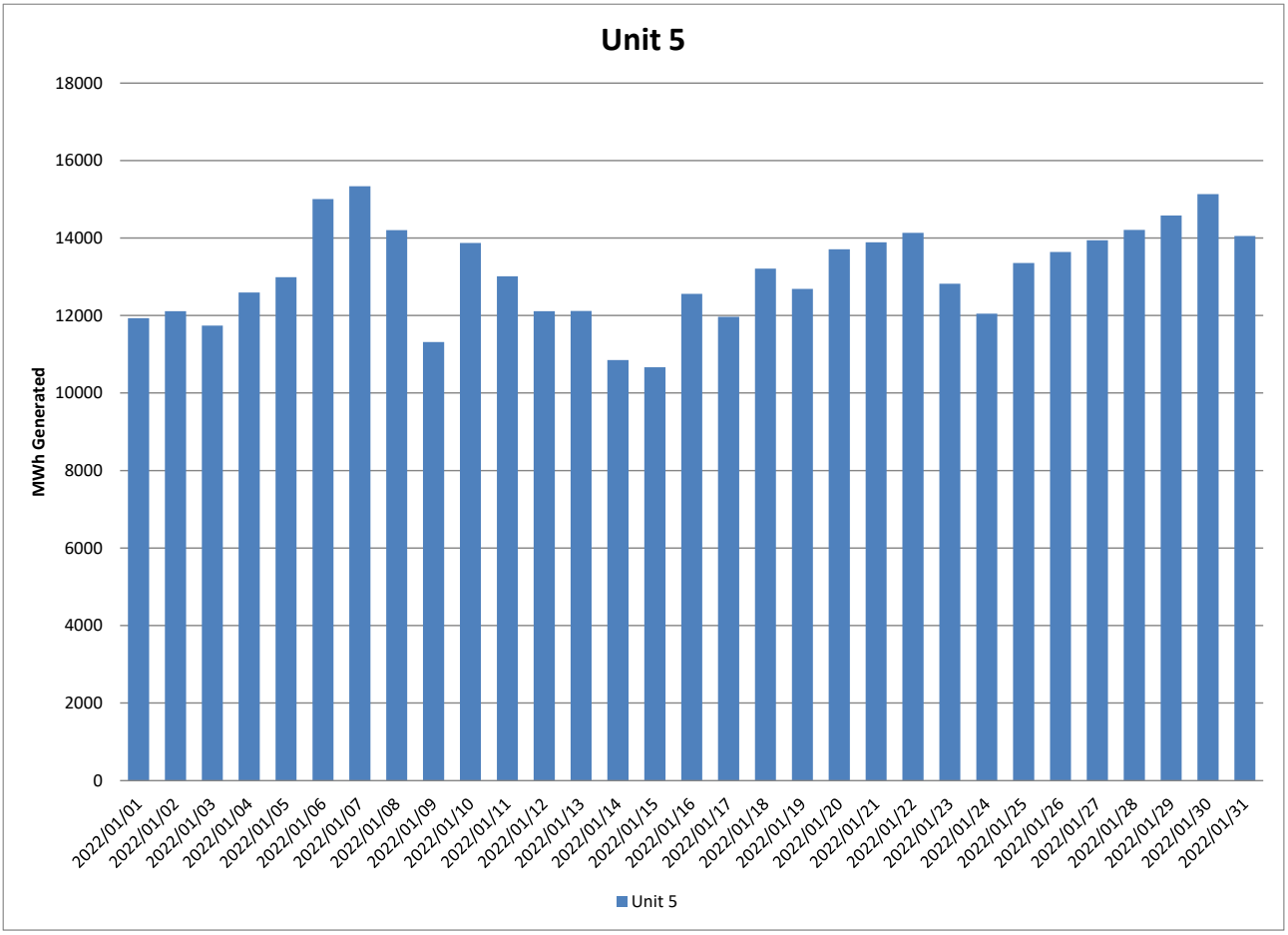

Figure 24: Unit 5 daily generated power in MWh for the month of January 2022

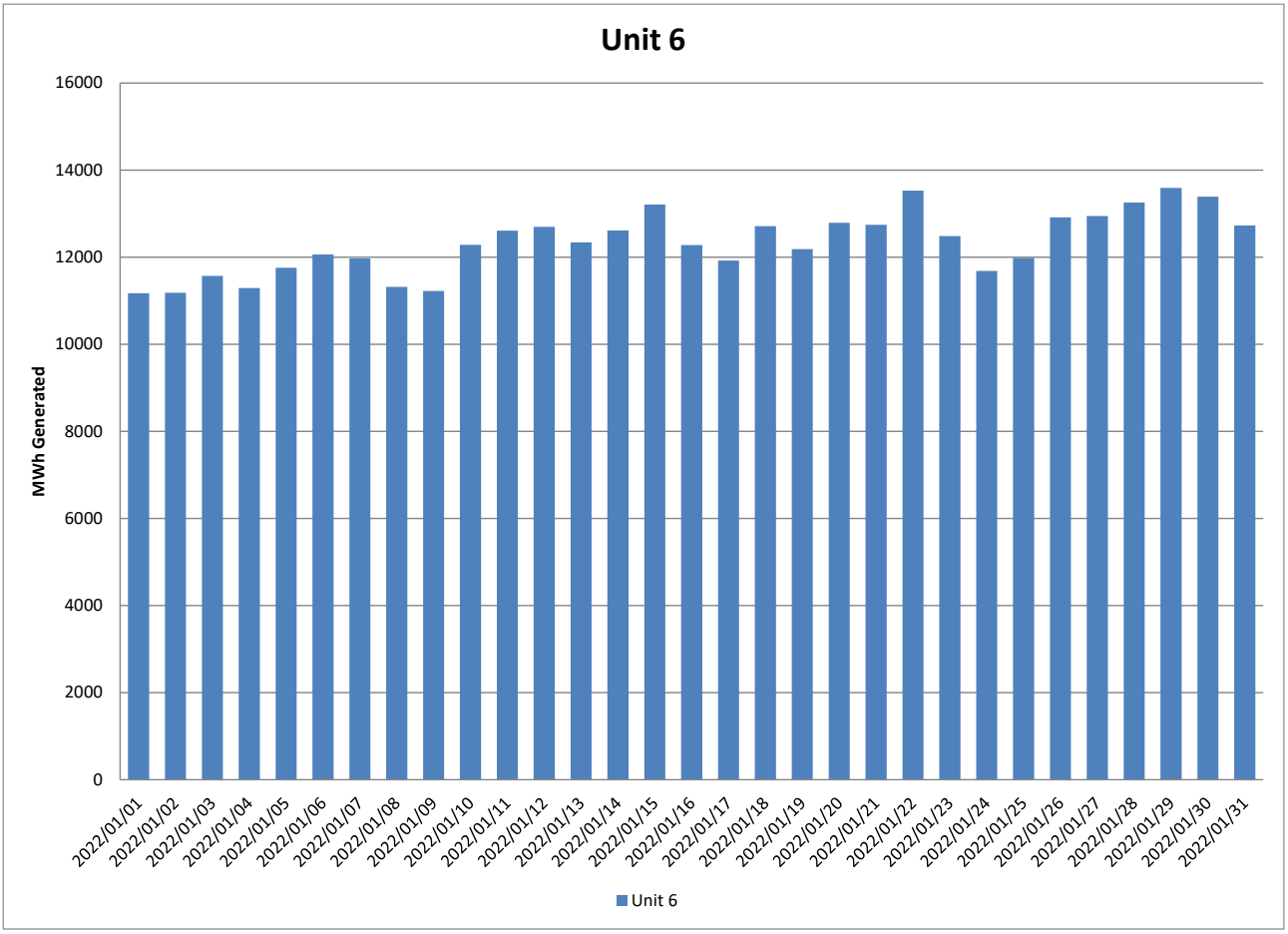

Figure 25: Unit 6 daily generated power in MWh for the month of January 2022

2.6 Pollutant Tonnages

The emitted pollutant tonnages for January 2022 are provided in table 6. Averaged Quality Assurance level 2 (QAL 2) values were used for CO_2 and oxygen data for Unit 1. Averaged CO_2 data for Unit 2 and Unit 1 was used for 01-15 January 2021 due to data in that period being unreliable. and Unit 6. CO_2 Values for unit 4 and 5 was calculated as per balance based on the O_2 values. These values were used due to the monitor providing unreliable values. Matimba is currently in the process of implementing recommended changes on this monitor in order to improve the reliability of the data.

Table 6: Pollutant tonnages for the month of January 2022

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	59,2	3 738,8	601,4
Unit 2	67,8	6 196,7	1 210,1
Unit 3	42,8	3 852,7	726,4
Unit 4	66,0	5 152,6	1 067,3
Unit 5	66,6	4 017,4	664,9
Unit 6	61,1	5 455,5	933,3
SUM	363,6	28 413,7	5 203,3

2.7 Reference values

Table 7: Reference values for data provided, January 2022

Compound / Parameter	Units of Measure	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Oxygen	%	8,77	7,80	7,68	6,20	7,95	7,14
Moisture	%	5,33	4,62	5,24	3,71	5,40	3,21
Velocity	m/s	23,9	26,3	28,3	24,9	25,6	27,6
Temperature	^{o}C	138,0	131,8	129,6	132,4	124,8	144,7
Pressure	mBar	933,6	967,0	914,1	878,4	932,4	921,3

2.8 Continuous Emission Monitors

2.8.1 Reliability

CO_2 monitor reliability for units 1, 2, 3, 4, 5 and 6 performed below the required 80% reliability as per the AEL. The monitors for these units were 100% available for January 2022 however the data received were removed and replaced with calculated values and averaged values due to values received from the monitors not being reliable.

Averaged Quality Assurance level 2 (QAL 2) values were used for CO_2 and oxygen data for Unit 1. Averaged CO_2 data for Unit 2 and Unit 1 was used for 01-15 January 2021 due to data in that period being unreliable. and Unit 6. CO_2 Values for unit 4 and 5 was calculated as per balance based on the O_2 values.

Table 8: Average percentage (%) availability of monitors for the month of January 2022.

Associated Unit/Stack	PM	SO_2	NO	CO_2
Unit 1	100,0	99,8	99,7	0,0
Unit 2	100,0	99,9	98,3	54,3
Unit 3	100,0	100,0	100,0	69,4
Unit 4	99,9	100,0	100,0	0,0
Unit 5	100,0	100,0	100,0	0,0
Unit 6	100,0	100,0	100,0	12,9

2.8.2 Changes, downtime and repairs

Unit 1

- No adjustments done on the CEMs. Calibration of gaseous analysers is done every second week.
- No downtime or repairs done on the particulate monitors

Unit 2

- No adjustments done on the CEMs. Calibration of gaseous analysers is done every second week.
- No downtime or repairs done on the particulate monitors

Unit 3

- No adjustments done on the CEMs. Calibration of gaseous analysers is done every second week.
- No downtime or repairs done on the particulate monitors

Unit 4

- Unit 4 gaseous emission monitor was repaired on 21 January 2022.
- No downtime or repairs done on the particulate monitors

Unit 5

- Unit 5 gaseous emission monitor was repaired on 21 January 2022.
- No downtime or repairs done on the particulate monitors

Unit 6

- Unit 6 gaseous emission monitor was repaired on 21 January 2022.
- No downtime or repairs done on the particulate monitors

2.8.3 Sampling dates and times

Continuous

2.9 Units Start-up information

Table 9: Start-up information

Unit	1	
Fires in	2022-01-19	08h53
Synchronization with Grid	2022-01-19	10h49
Emissions below limit	2022-01-19	13h03
Fires in to synchronization	1,93	HOURS
Synchronization to < Emission limit	2,23	HOURS

Unit	1	
Fires in	2022-01-22	09h54
Synchronization with Grid	2022-01-22	12h25
Emissions below limit	2022-01-22	15h00
Fires in to synchronization	2,52	HOURS
Synchronization to < Emission limit	2.58	HOURS

Unit	2	
Fires in	2022-01-22	01h07
Synchronization with Grid	2022-01-22	04h24
Emissions below limit	2022-01-22	05h00
Fires in to synchronization	3,28	HOURS
Synchronization to < Emission limit	0,6	HOURS

Unit	3	
Fires in	2022-01-07	00h17
Synchronization with Grid	2022-01-07	05h57
Emissions below limit	2022-01-07	08h08
Fires in to synchronization	5,67	HOURS
Synchronization to < Emission limit	2,18	HOURS

Unit	3	
Fires in	2022-01-15	09h00
Synchronization with Grid	2022-01-15	12h02
Emissions below limit	2022-01-15	14h18
Fires in to synchronization	3,03	HOURS
Synchronization to < Emission limit	2,27	HOURS

Unit	4	
Fires in	2022-01-29	08h49
Synchronization with Grid	2022-01-29	12h01
Emissions below limit	2022-01-29	18h03
Fires in to synchronization	3,2	HOURS
Synchronization to < Emission limit	6,03	HOURS

2.10 Emergency generation

Table 10: Emergency generation

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Emergency Generation hours declared by national Control	447	514	453	505	531	468
Emergency Hours declared including hours after stand down	237	53	221	237	237	152
Days over the Limit during Emergency Generation	1	0	4	1	1	0

Unit 1 exceeded the 50mg/Nm^3 limit during emergency generation 1 time in January 2022. Unit 3 exceeded the 50mg/Nm^3 limit during emergency generation 4 times in January 2022. Unit 4 exceeded the 50mg/Nm^3 limit during emergency generation 1 times in January 2022. Unit 5 exceeded the 50mg/Nm^3 limit during emergency generation 1 time in January 2022. Full details for exceedances are provided in section 2.4.1.

2.11 Complaints register

Table 11: Complaints

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

2.12 Air quality improvements and social responsibility conducted

2.12.1 Air quality improvements

None

2.12.2 Social responsibility conducted

None

2.13 Ambient air quality monitoring

The ambient report for January 2022 is not available due to power failures that occurred at the monitoring station. The power failures were due to community members attempting to illegally connect to the electricity supply. The incident has been reported to the local municipality and the electricity supply has since been restored.

2.14 Electrostatic precipitator and Sulphur plant status

Unit 1

- 2 fields out of service, will be inspected next opportunity.
- No abnormalities on the SO3 plant. Preventative maintenance done during the month.

Unit 2

- All precipitator fields in service.
- No abnormalities on the SO3 plant. Preventative maintenance done during the month.

Unit 3

- All precipitator fields in service.
- Unit 3 Variable speed drive failed and was replaced.

Unit 4

- 1 field out of service, will be inspected next opportunity.
- No abnormalities on the SO3 plant. Preventative maintenance done during the month.

Unit 5

- All precipitator fields in service.
- No abnormalities on the SO3 plant. Preventative maintenance done during the month.

Unit 6

- All precipitator fields in service.
- No abnormalities on the SO3 plant. Preventative maintenance done during the month.

SO3 common plant

- No abnormalities on the sulphur storage plant.

2.15 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. S23º 40' 2.8" E027º 36' 34.8" 175m from ground level and 75m from the top.
    b. Gas:
        i. S23º 40' 2.8" E027º 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. S23º 40' 14.8" E027º 36' 47.5" 175m from ground level and 75m from the top.

b. Gas:
    i. S23º 40' 14.8" E027º 36' 47.5" 100m from ground level and 150m from the top.
c. Stack height
    i. 250 meter consist of 3 flues

3. Attachments

None

4. Report Conclusion

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

2022-03-14

GENERAL MANAGER: MATIMBA POWER STATION