Eskom	Matimba Power Station Emissions report	Matimba Power Station

Title:	**Matimba Power Station December 2022 emissions report**	Document Identifier:	**RP/247/029**
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		Functional Area Applicability:	**Environment**
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Compiled by	**Functional Responsibility**	**Authorized by**
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Environmental Officer	**Environmental Manager**	**General Manager**
Date: 2023-02 03	Date: 03/02/2023	Date: 2023-02-03

Content

Figures

1. Report Summary

Matimba Power Station was issued with an Atmospheric Emission License (H16/1/13-WDM05) in September 2022. 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 December 2022.

During the period under review, 17 exceedances of the daily particulate matter emission limit (50mg/Nm^3) occurred. All exceedances remained within the 48-hour grace period. No exceedances of the monthly SO_x limit (3500mg/Nm^3) or the daily NO_x emission limit (750mg/Nm^3) occurred in the month of December 2022.

More information regarding above mentioned issues is provided in the relevant 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	1 114 147
	Fuel Oil	Tons/month	1 200	767,516
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate**
	Energy	MW	4000	2538,44086

The consumption rates for the month of December 2022 were within the permitted maximum limits.

2.2 Abatement technology

Table 2: Abatement Equipment Control Technology Utilised

Associated Unit	Technology Type	Minimum utilisation (%)	Efficiency (%)
Unit 1	Electrostatic Precipitator	100%	99,84%
Unit 2	Electrostatic Precipitator	100%	99,87%
Unit 3	Electrostatic Precipitator	100%	99,92%
Unit 4	Electrostatic Precipitator	100%	99,89%
Unit 5	Electrostatic Precipitator	100%	99,87%
Unit 6	Electrostatic Precipitator	100%	99,90%
Associated Unit	**Technology Type**	**Minimum utilisation (%)**	**Actual Utilisation (%)**
Unit 1	SO_3 Plant	100%	99,51%
Unit 2	SO_3 Plant	100%	98,04%
Unit 3	SO_3 Plant	100%	97,98%
Unit 4	SO_3 Plant	100%	98,18%
Unit 5	SO_3 Plant	100%	93,78%
Unit 6	SO_3 Plant	100%	99,06%

Flue gas conditioning plant availability was below the required 100% for all six (06) units due to maintenance activities and unplanned breakdowns. Defects were addressed and plants returned to services.

2.3 Energy source characteristics

Table 3: Energy Source Material Characteristics.

	Characteristic	Stipulated Range (Unit)	Monthly Average Content
Coal burned	**Sulphur Content**	1.6%	1,26%
	Ash Content	40%	34,46%

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

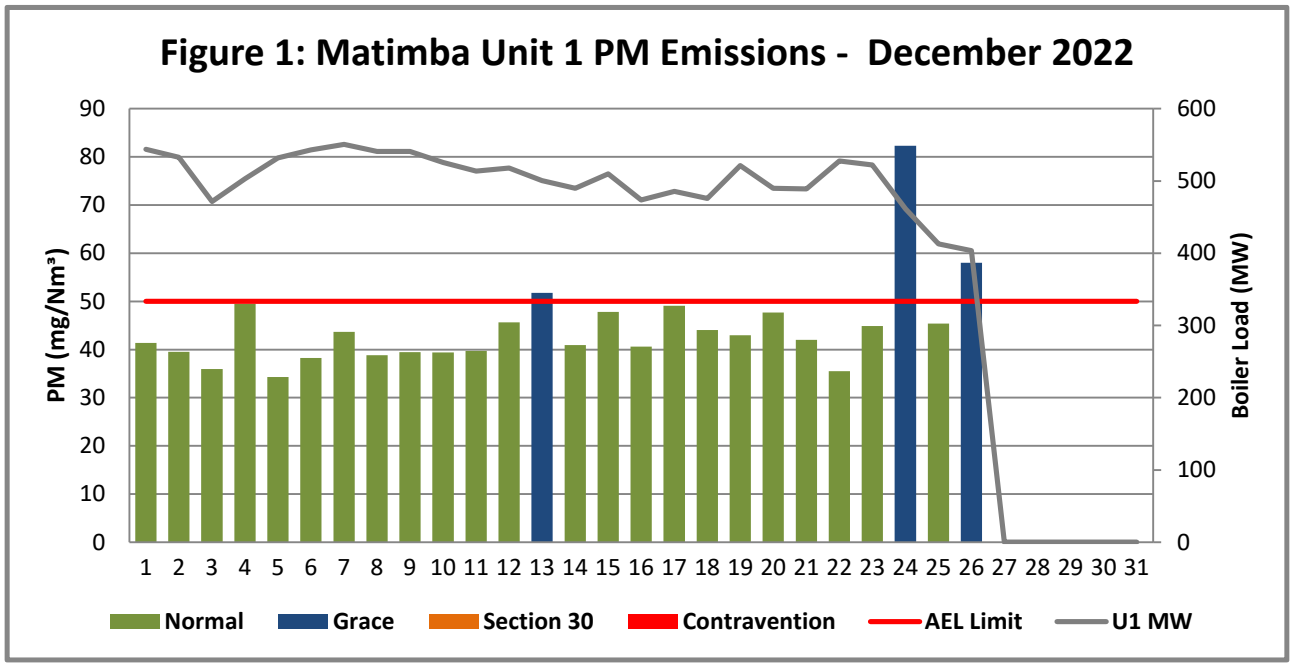

Figure 1: Particulate matter daily average emissions against emission limit for unit 1 for the month of December 2022

Interpretation:

Unit 1 exceeded the daily particulate emission limit of 50mg/Nm3 on 13 ,24 and 26 December 2022. The exceedances were due to defects on the dust handling plants leading to high hopper levels within the flue gas cleaning system and reducing the efficiency of the abatement technology (electrostatic precipitator fields). The plant was repaired, and emissions returned to below the set limit. The exceedance remained within the 48-hour grace period. The unit was taken off load on the 26 December 2022 for interim repairs outage.

Unit 2 Particulate Emissions

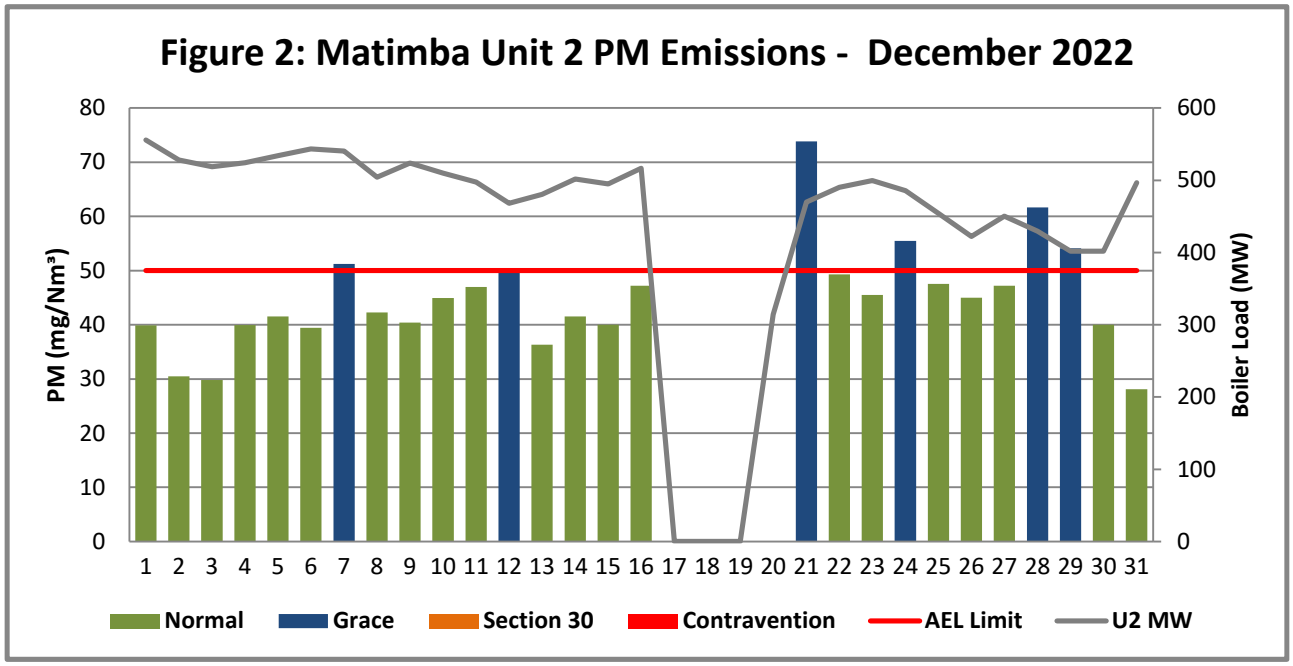

Figure 2: Particulate matter daily average emissions against emission limit for unit 2 for the month of December 2022

Interpretation:

Unit 2 exceeded the daily particulate emission limit of 50mg/Nm3 on 7 ,12, 21 ,24, 28 and 29 December 2022. The exceedances on 7 ,12, 24, 28 and 29 December were due to defects on the dust handling plants leading to high hopper levels within the flue gas cleaning system and reducing the efficiency of the abatement technology (electrostatic precipitator fields). The plant was repaired, and emissions returned to below the set limit. The exceedance on 21 December was due to the extended light-up conditions. The exceedance remained within the 48-hour grace period.

Unit 3 Particulate Emissions

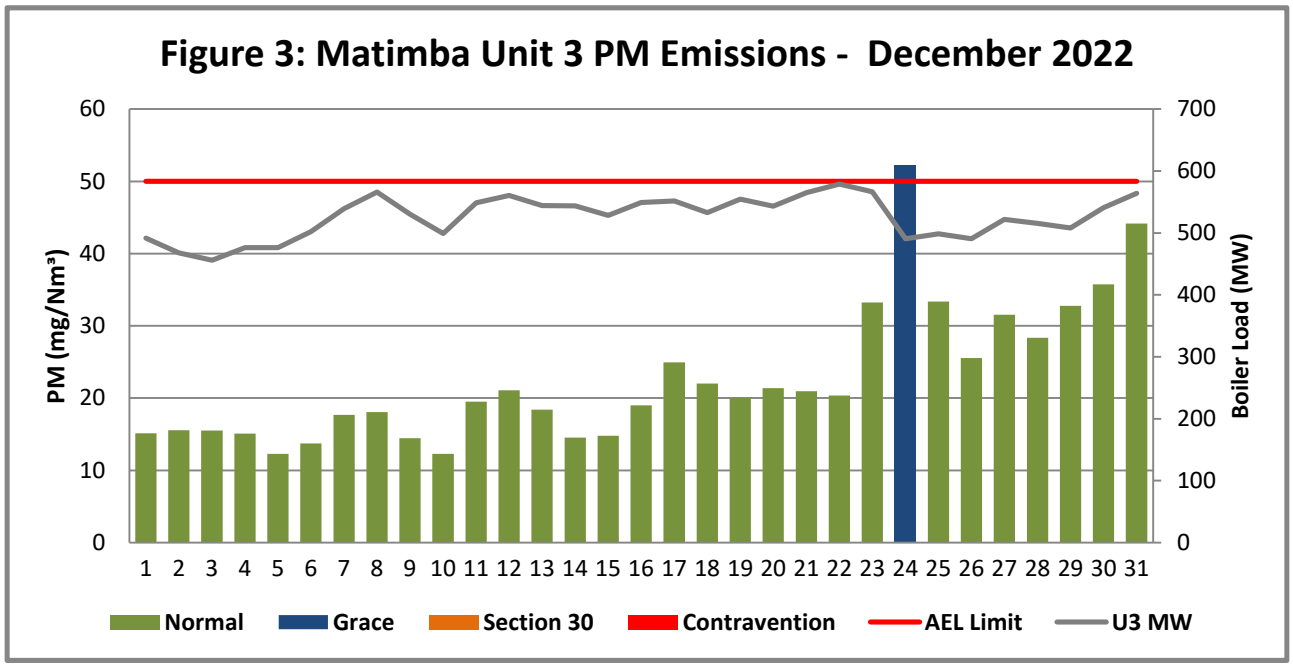

Figure 3: Particulate matter daily average emissions against emission limit for unit 3 for the month of December 2022

Interpretation:

Unit 3 Particulate matter exceeded the daily limit of 50 mg/Nm^3 on 24 December 2022. The exceedance was due to breakdowns on the ash removal system leading to ash backlog within the flue gas cleaning system and reducing the efficiency of the abatement technology (electrostatic precipitator fields). The defective plants were repaired, and the exceedances remained within the 48-hour grace period.

Unit 4 Particulate Emissions

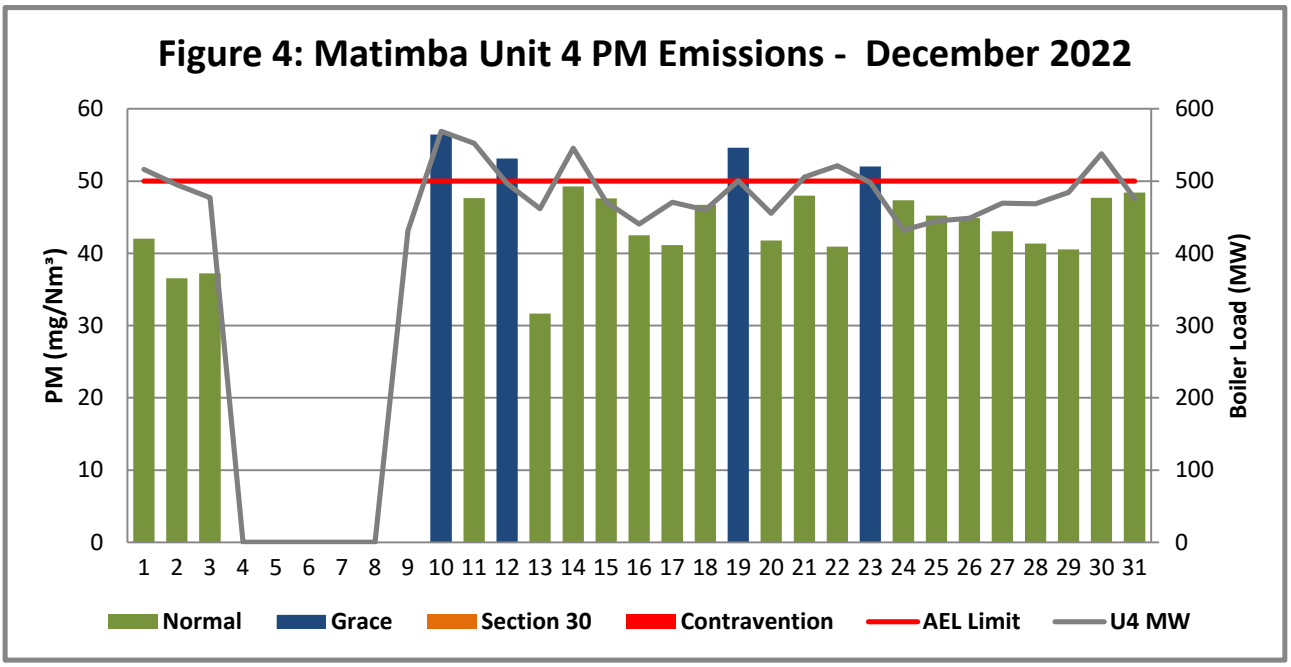

Figure 4: Particulate matter daily average emissions against emission limit for unit 4 for the month of December 2022

Interpretation:

Unit 4 Particulate matter exceeded the daily limit of 50 mg/Nm^3 on 10,12 ,19 and 23 December 2022. The unit was off load from the 4 to 10 December and the exceedance on the 10 December was due to extended light-up conditions. The exceedances on 12 ,19, 23 December 2022 were due to defects on the dust handling plants leading to high hopper levels within the flue gas cleaning system and reducing the efficiency of the abatement technology (electrostatic precipitator fields). The plant was repaired, and emissions returned to below the set limit. The defective plants were repaired, and the exceedances remained within the 48-hour grace period.

Unit 5 Particulate Emissions

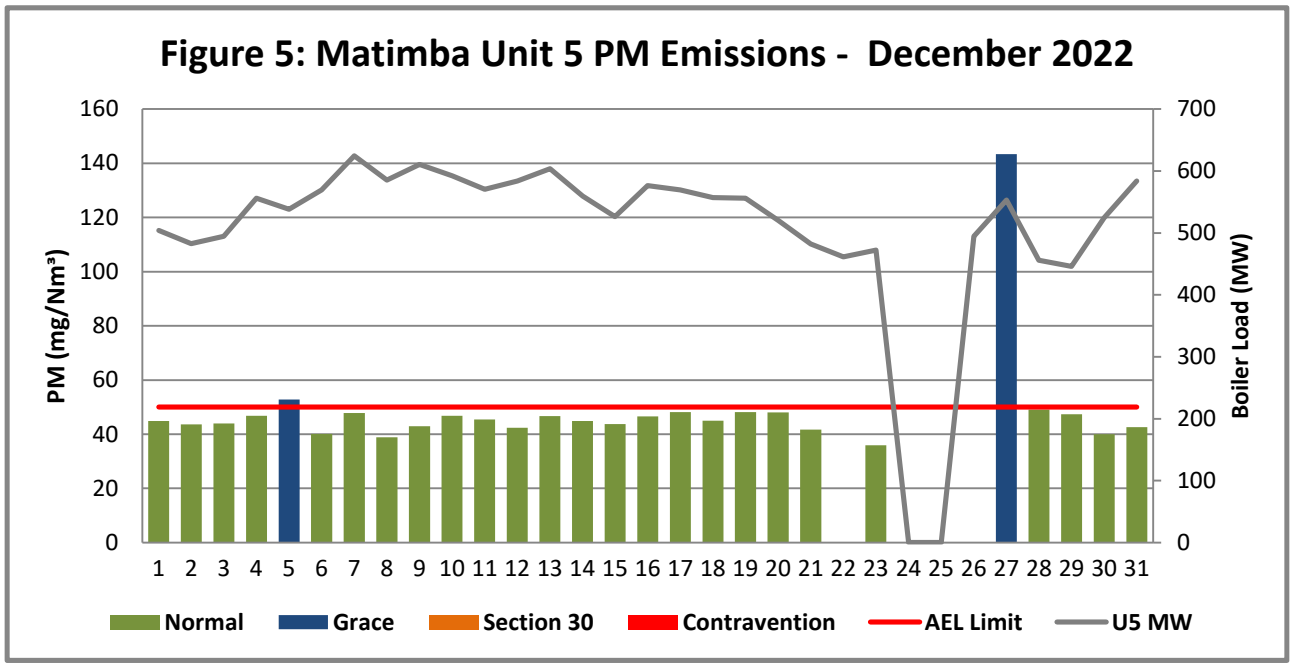

Figure 5: Particulate matter daily average emissions against emission limit for unit 5 for the month of December 2022

Interpretation:

Unit 5 exceeded the daily particulate matter limit of 50mg/Nm^3 on the 5th and 27th of December 2022. The unit experienced upset conditions on the 5th of December 2022 due to high ESP hoppers, and the exceedance on the 27th of December 2022 was a result of extended unit light-up following short outage.

Unit 6 Particulate Emissions

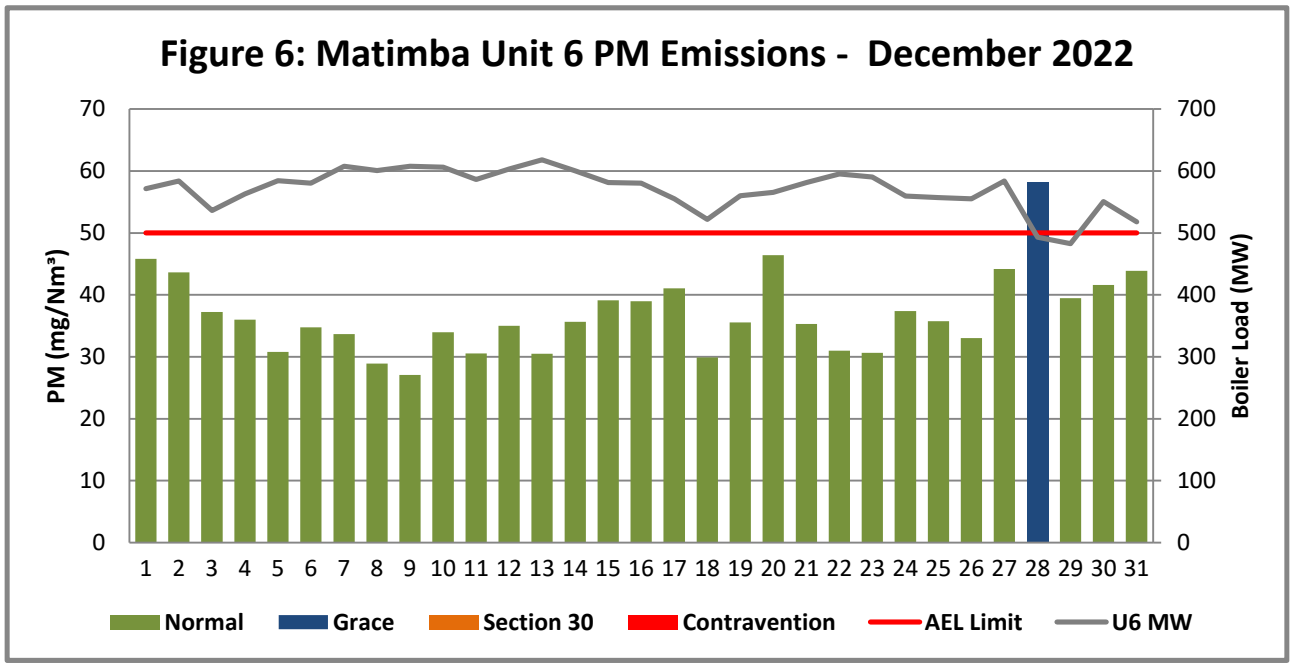

Figure 6: Particulate matter daily average emissions against emission limit for unit 6 for the month of December 2022

Interpretation:

Unit 6 emissions performance was fairly acceptable with an exception on the 28th of December 2022 were the limit was exceeded as results of upset conditions caused by high hopper levels.

2.4.2 Gaseous Emissions

Unit 1 SO_2 Emissions

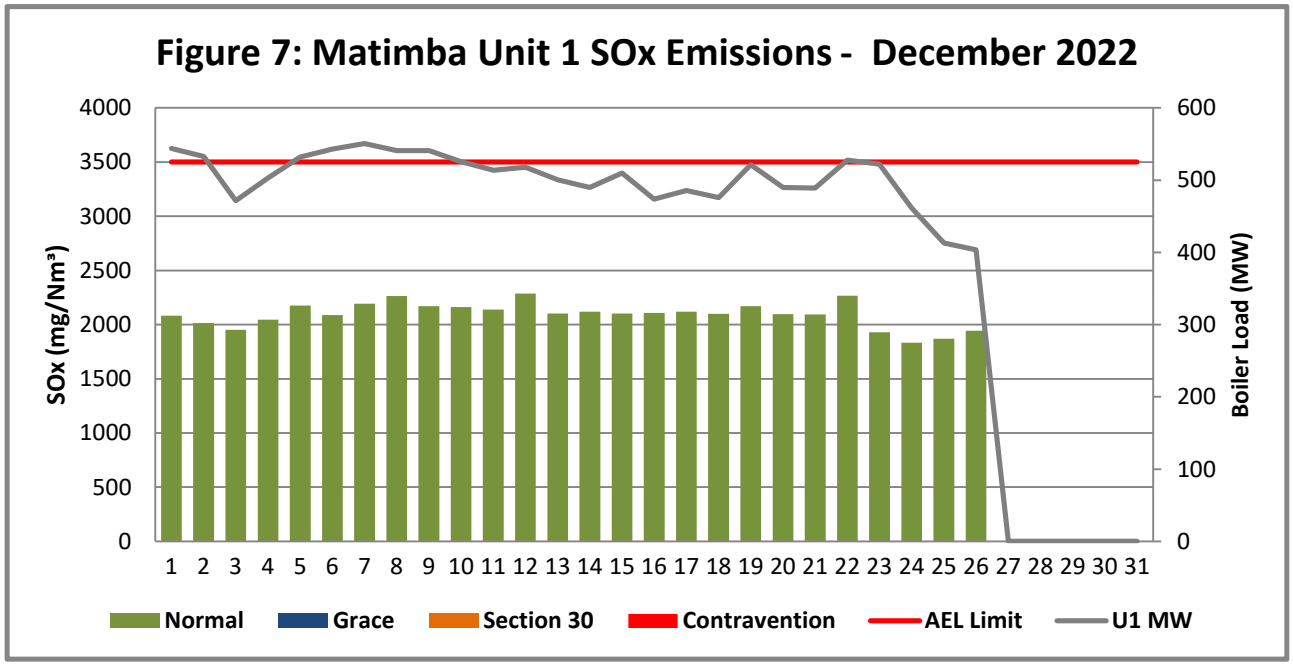

Figure 7: SO2 daily average emissions against emission limit for unit 1 for the month of December 2022

Interpretation:

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

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Unit 2 SO_2 Emissions

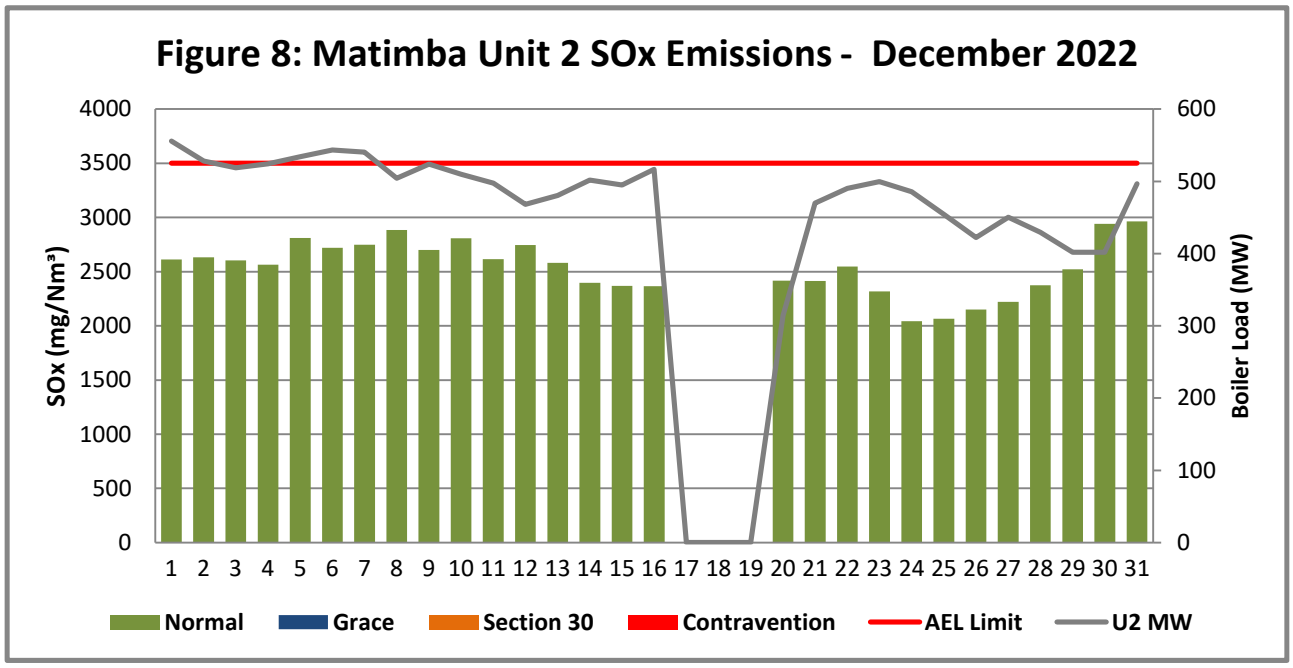

Figure 8: SO2 daily average emissions against emission limit for unit 2 for the month of December 2022

Interpretation:

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

Unit 3 SO_2 Emissions

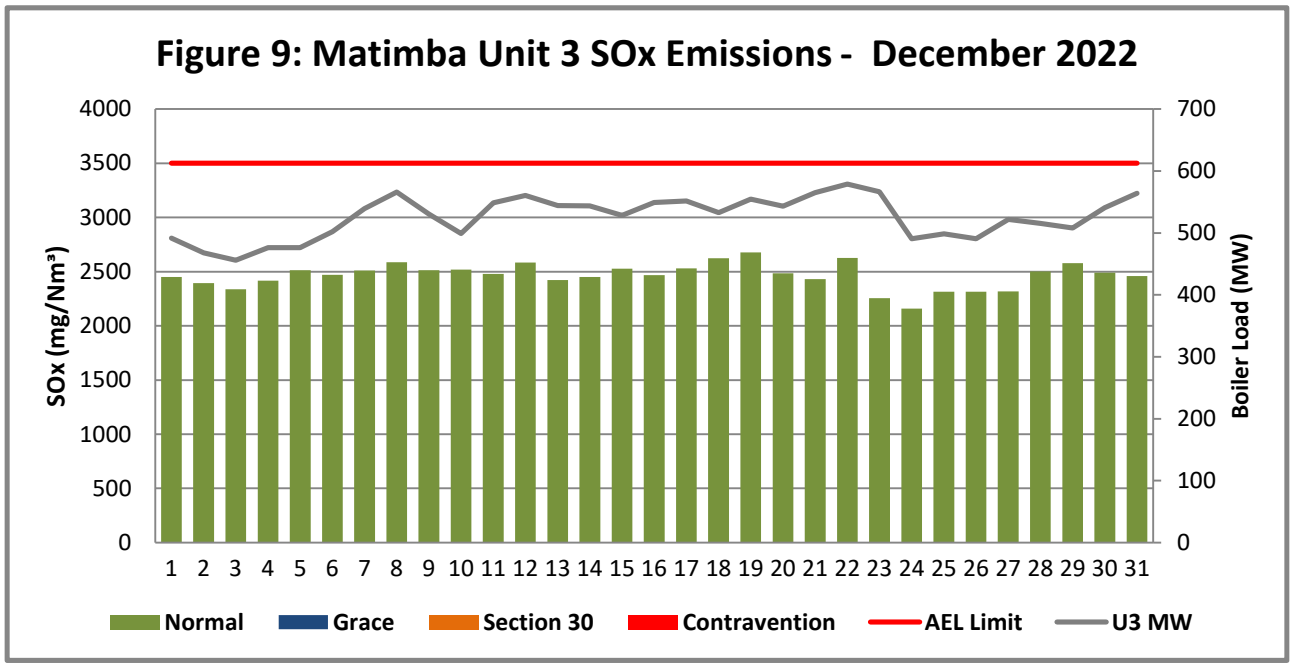

Figure 9: SO2 daily average emissions against emission limit for unit 3 for the month of December 2022

Interpretation:

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

Unit 4 SO_2 Emissions

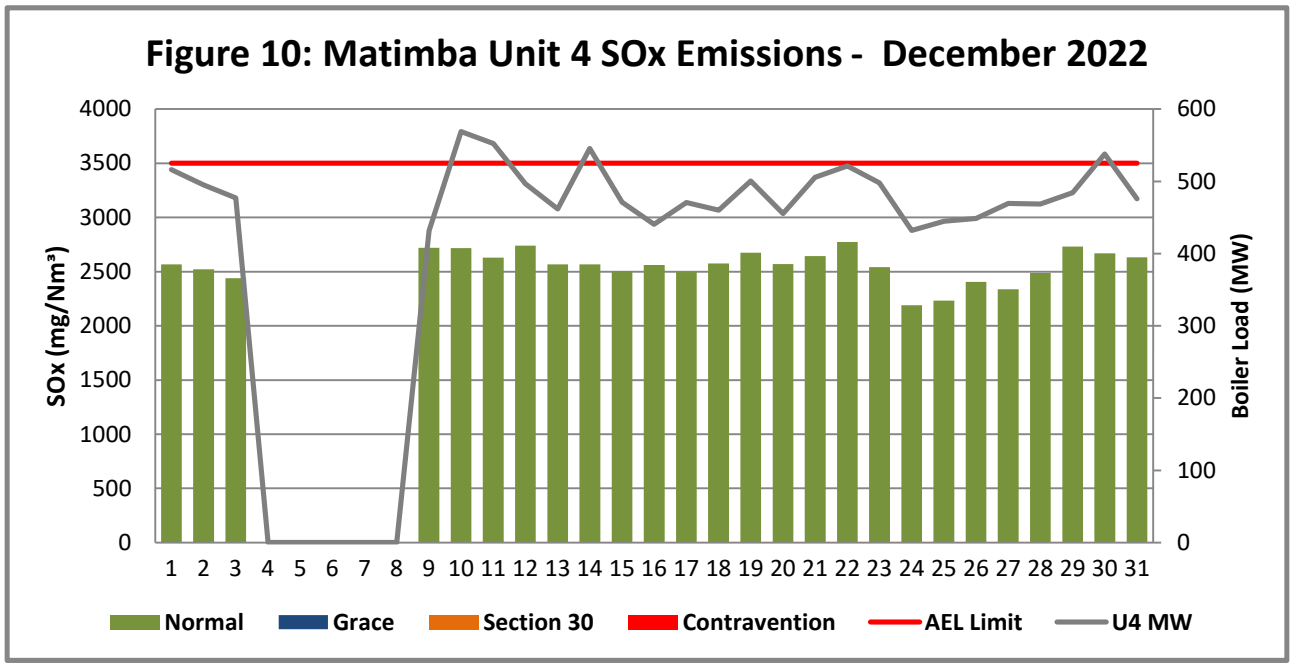

Figure 10: SO2 daily average emissions against emission limit for unit 4 for the month of December 2022

Interpretation:

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

Unit 5 SO_2 Emissions

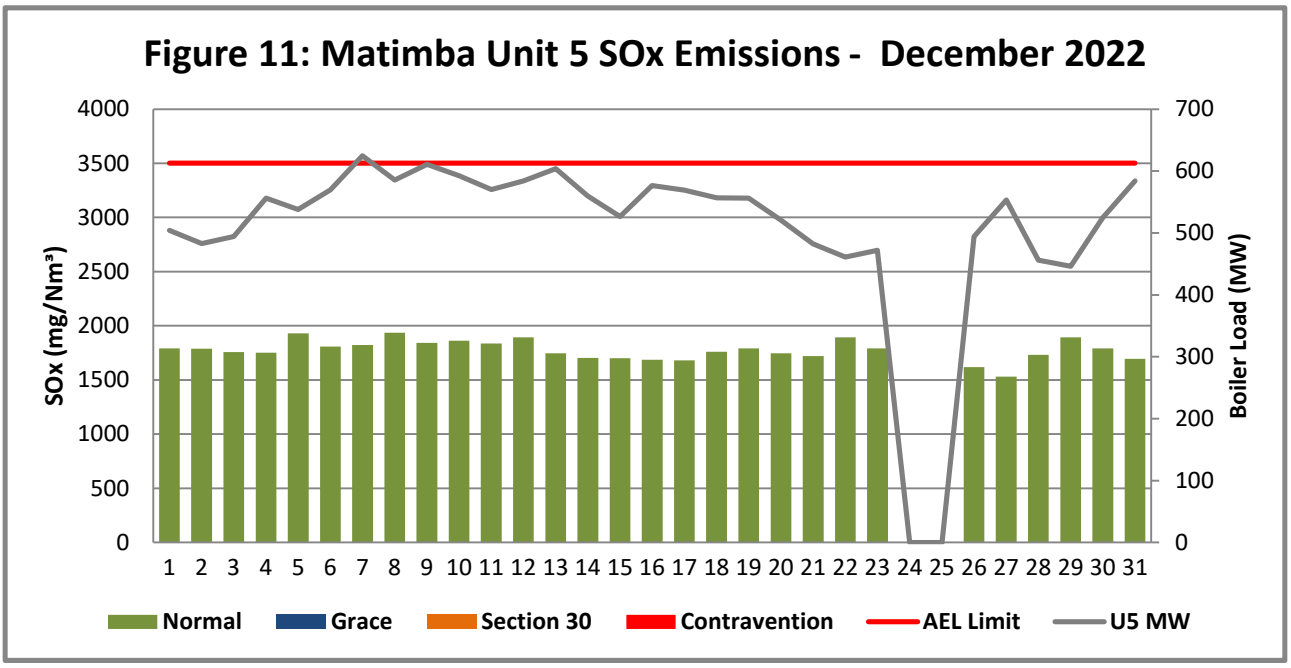

Figure 11: SO2 daily average emissions against emission limit for unit 5 for the month of December 2022

Interpretation:

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

Unit 6 SO_2 Emissions

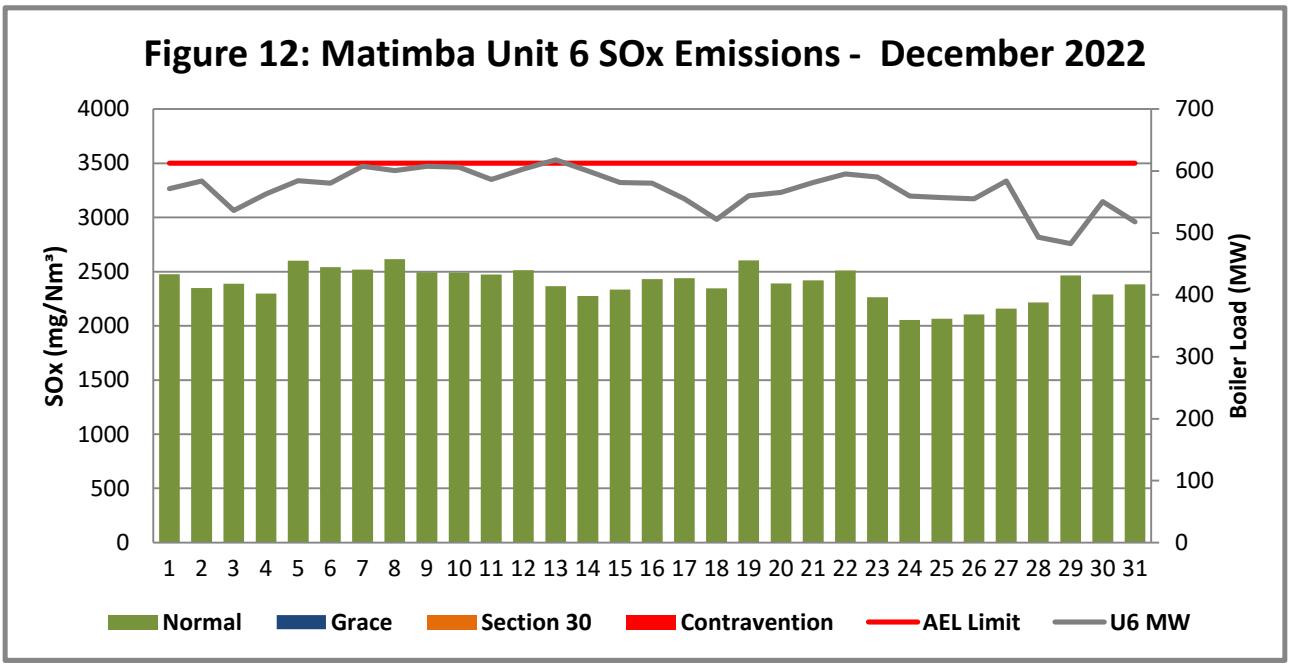

Figure 12: SO2 daily average emissions against emission limit for unit 6 for the month of December 2022

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

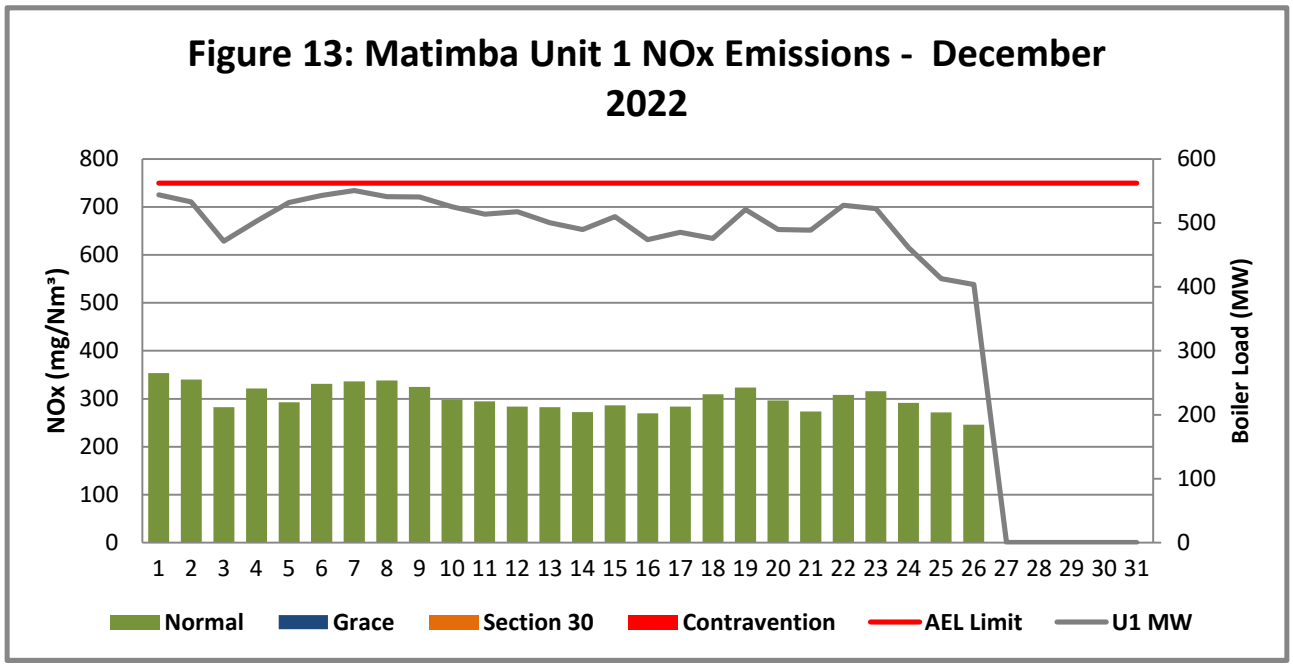

Figure 13: Figure 14: NOx daily average emissions against emission limit for unit 1 for the month of December 2022

Interpretation:

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

Unit 2 NO_x Emissions

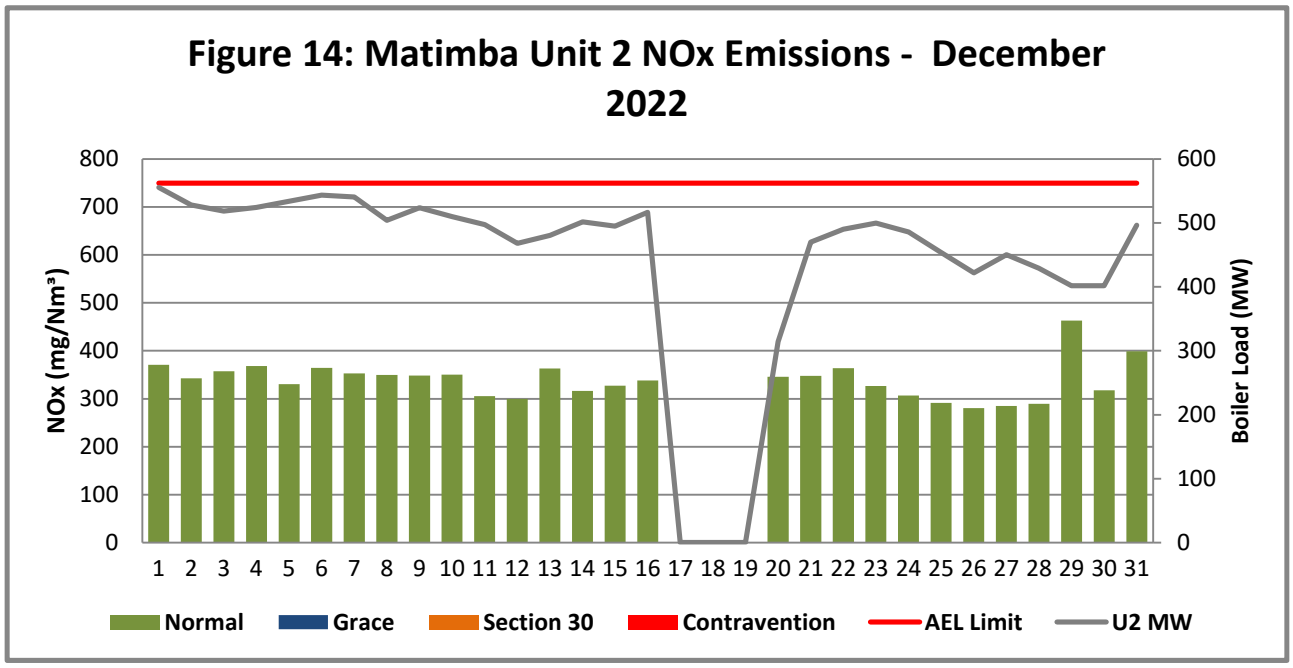

Figure 15: NOx daily average emissions against emission limit for unit 2 for the month of December 2022

Interpretation:

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

Unit 3 NO_x Emissions

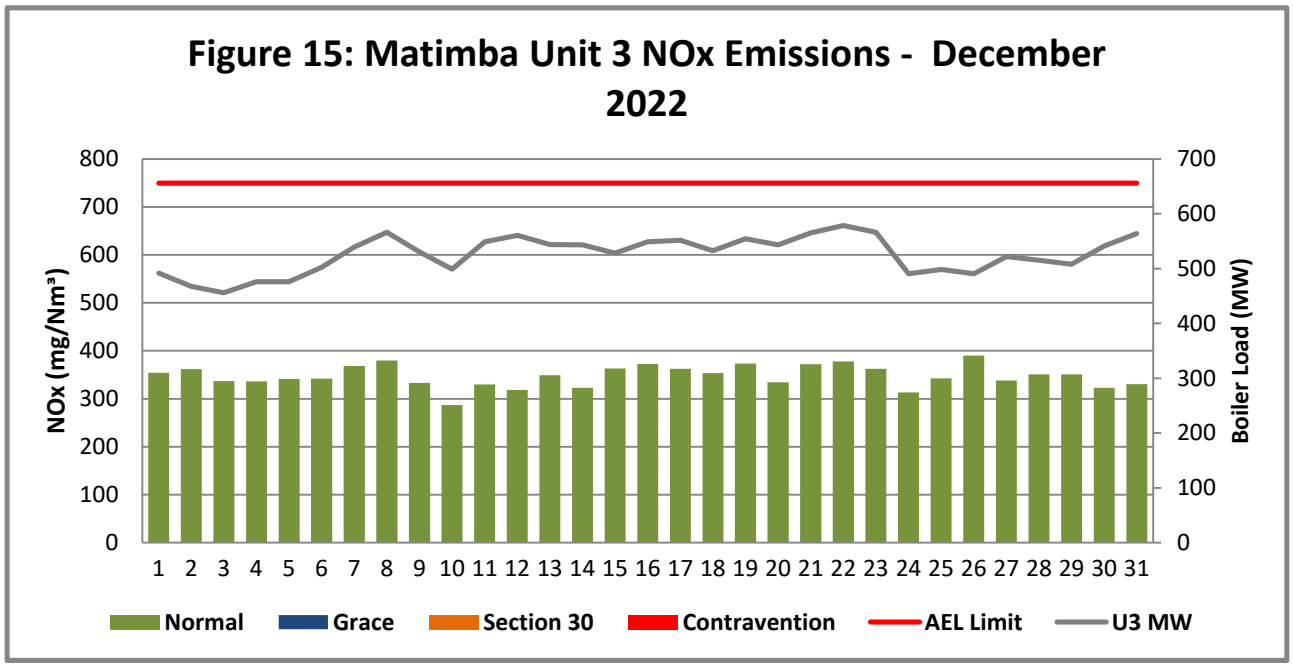

Figure 16: NOx daily average emissions against emission limit for unit 3 for the month of December 2022

Interpretation:

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

Unit 4 NO_x Emissions

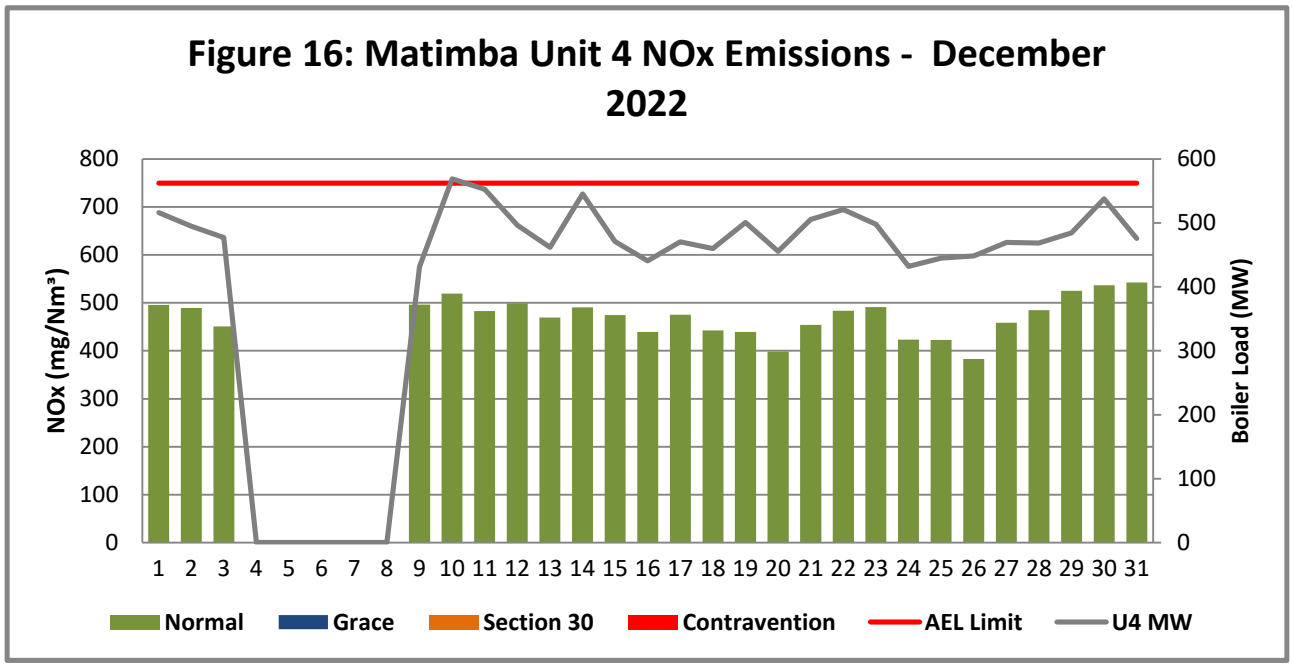

Figure 17: NOx daily average emissions against emission limit for unit 4 for the month of December 2022

Interpretation:

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

Unit 5 NO_x Emissions

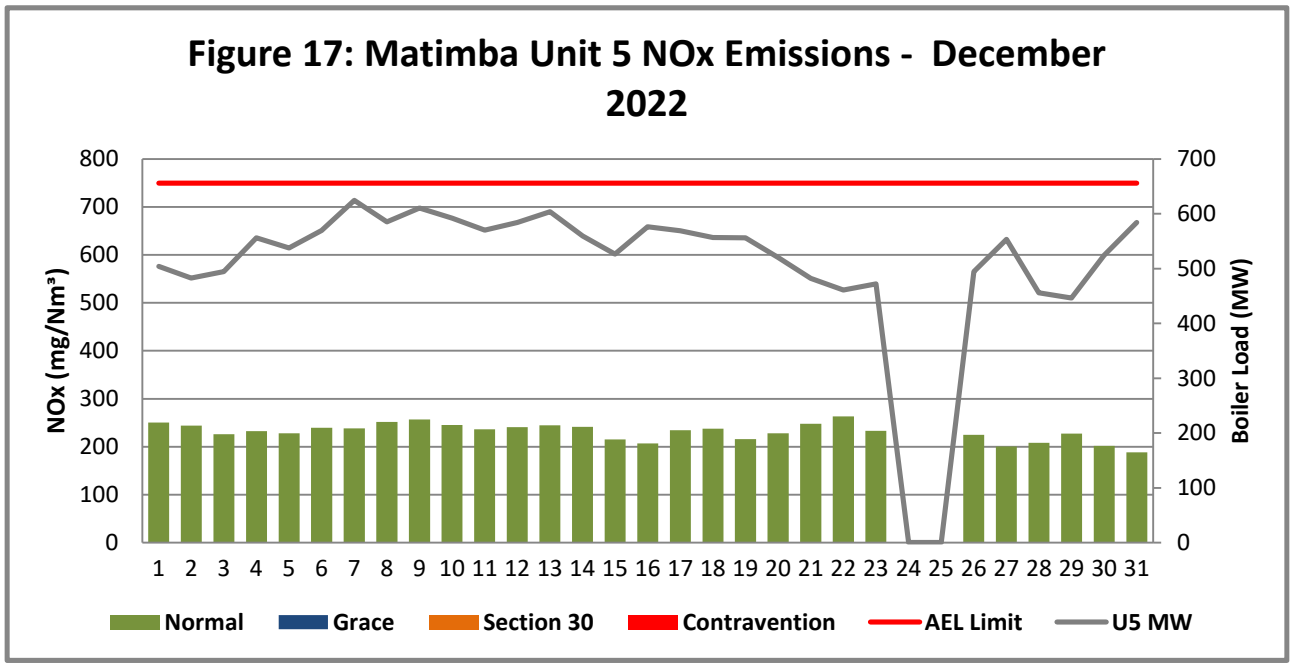

Figure 18: NOx daily average emissions against emission limit for unit 5 for the month of December 2022

Interpretation:

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

Unit 6 NO_x Emissions

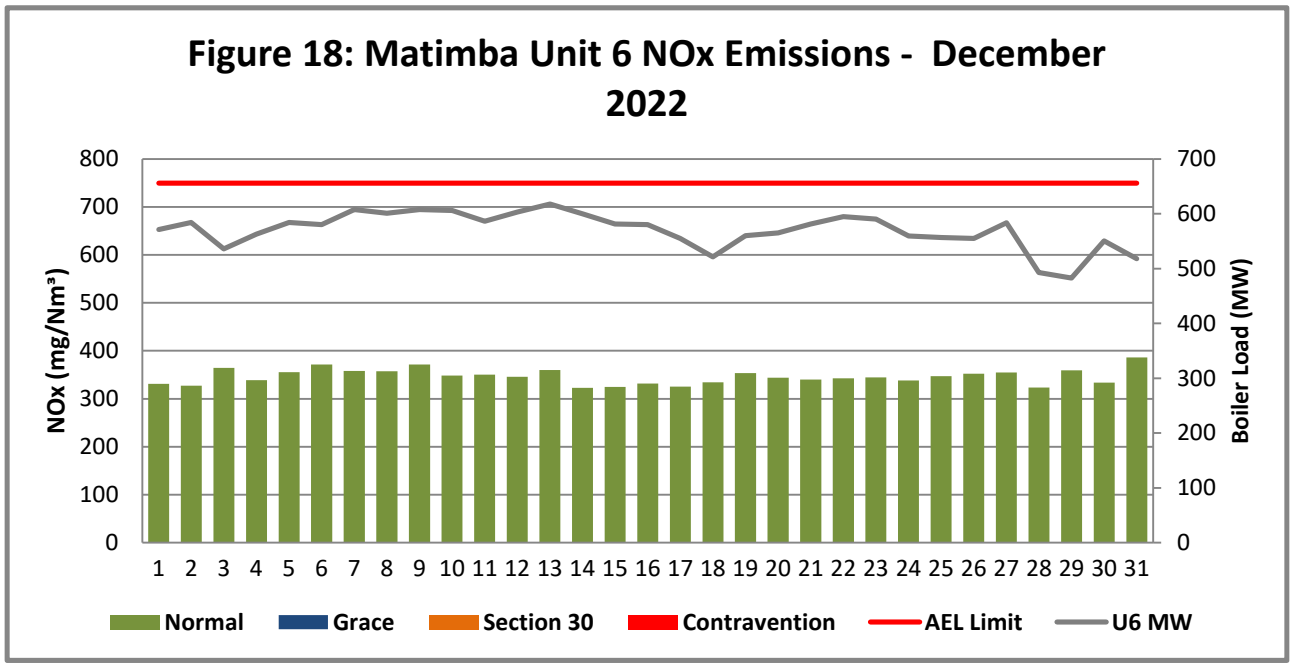

Figure 19: NOx daily average emissions against emission limit for unit 6 for the month of December 2022

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:	Monday, 23 January 2023
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:	**December**	
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:	***767,516***	
Molecular weight of the fuel oil:	166,00	Lb/lb-mole
METEROLOGICAL DATA FOR THE MONTH	**Data**	**Unit**
Daily average ambient temperature	27,35	°C
Daily maximum ambient temperature	33,26	°C
Daily minimum ambient temperature	21,97	°C
Daily ambient temperature range	11,30	°C
Daily total insolation factor	6,12	kWh/m²/day
Tank paint colour	***Grey/medium***	NA
Tank paint solar absorbtance	0,68	NA
FINAL OUTPUT:	**Result**	**Unit**
Breathing losses:	0,57	kg/month
Working losses:	0,02	kg/month
TOTAL LOSSES (Total TVOC Emissions for the month):	**0,59**	**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 December 2022

Date	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
2022/12/01	11895	11850	10680	11230	10860	12395
2022/12/02	11652	11244	10118	10752	10382	12705
2022/12/03	10285	11016	9860	8188	10658	11658
2022/12/04	11015	11178	10344	0	11997	12260
2022/12/05	11613	11353	10312	0	11634	12723
2022/12/06	11922	11578	10936	0	12267	12614
2022/12/07	12048	11545	11727	0	13539	13176
2022/12/08	11862	10712	12353	0	12661	13010
2022/12/09	11863	11135	11552	5333	13192	13157
2022/12/10	11502	10836	10847	12347	12828	13145
2022/12/11	11230	10572	11906	12041	12303	12702
2022/12/12	11344	9941	12204	10838	12606	13066
2022/12/13	10989	10184	11838	10028	13048	13404
2022/12/14	10688	10649	11836	11855	12132	13018
2022/12/15	11186	10474	11464	10266	11349	12593
2022/12/16	10344	6443	11945	9559	12479	12571
2022/12/17	10614	0	12018	10188	12328	11999
2022/12/18	10338	0	11590	10039	12037	11253
2022/12/19	11423	0	12094	10907	12058	12117
2022/12/20	10705	457	11832	9893	11250	12201
2022/12/21	10704	9915	12327	11008	4928	12581
2022/12/22	11538	10405	12578	11335	9324	12883
2022/12/23	11415	10629	12362	10873	3044	12783
2022/12/24	10121	10337	10682	9387	0	12101
2022/12/25	8966	9629	10818	9677	0	12046
2022/12/26	3861	8937	10639	9783	9140	11992
2022/12/27	0	9559	11377	10191	11992	12658
2022/12/28	0	9088	11227	10136	9856	10690
2022/12/29	0	8493	11044	10445	9616	10429
2022/12/30	0	8495	11775	11713	11286	11908
2022/12/31	0	10517	12304	10340	12657	11215

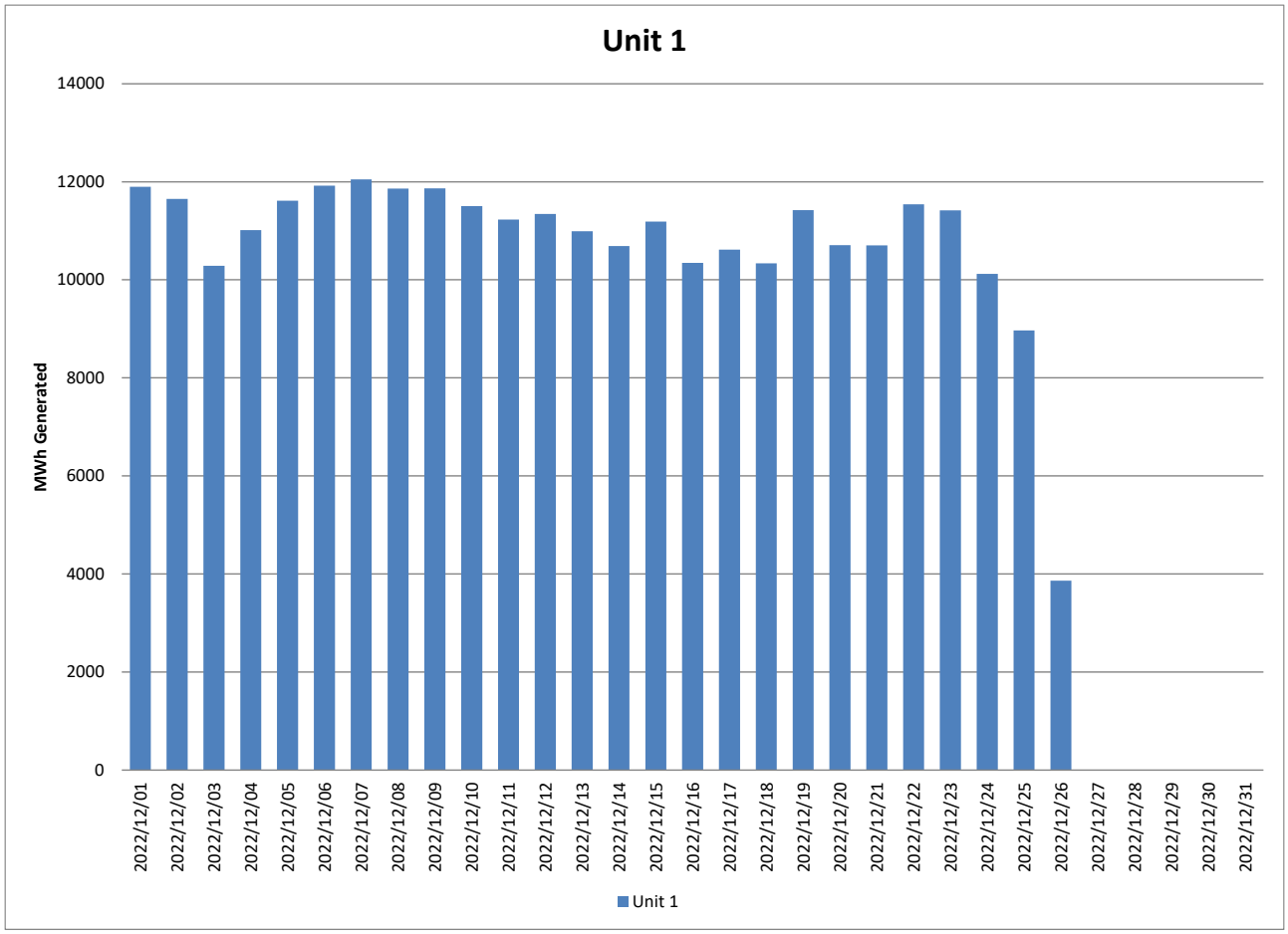

Figure 20: Unit 1 daily generated power in MWh for the month of December 2022

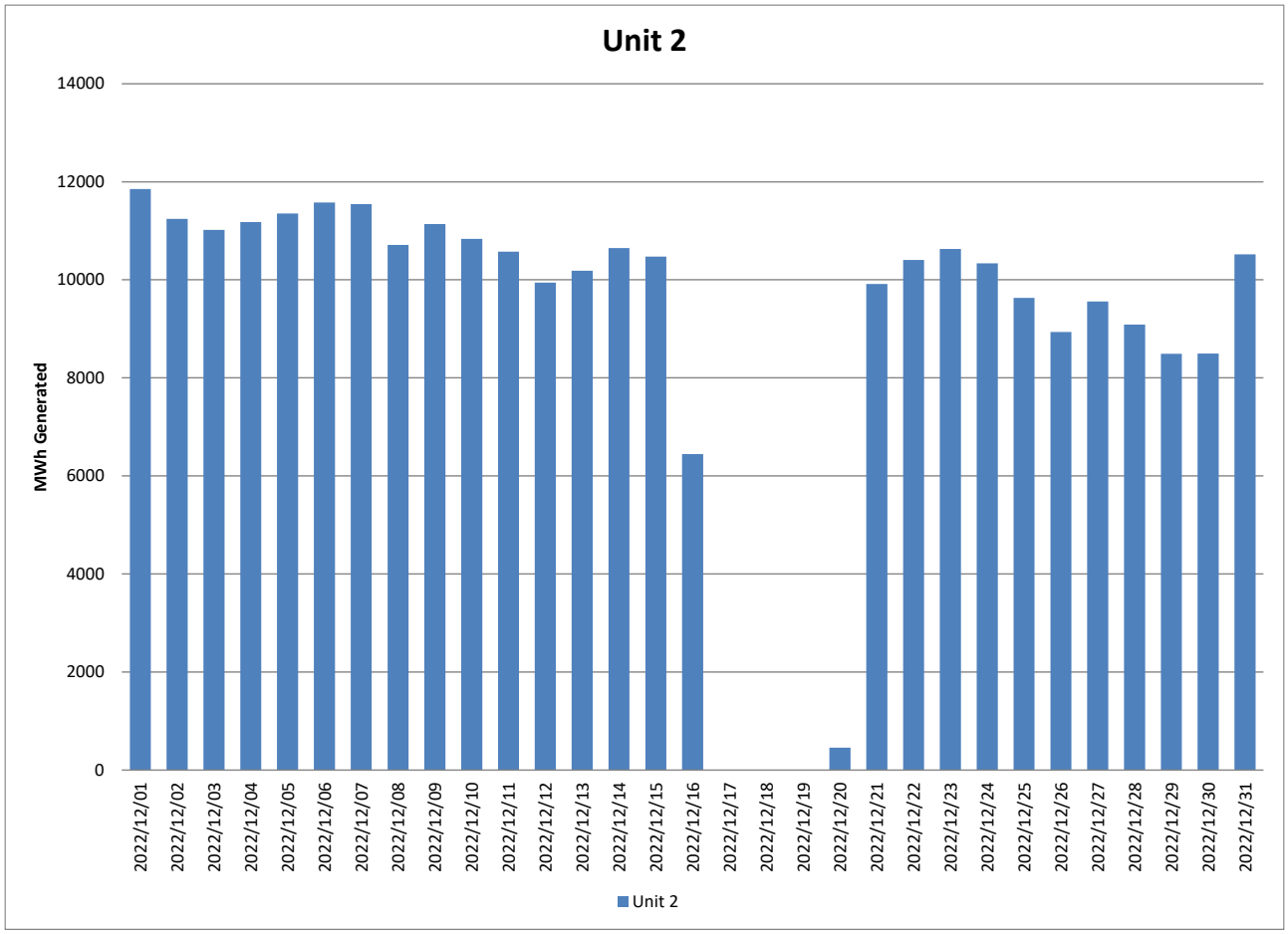

Figure 21: Unit 2 daily generated power in MWh for the month of December 2022

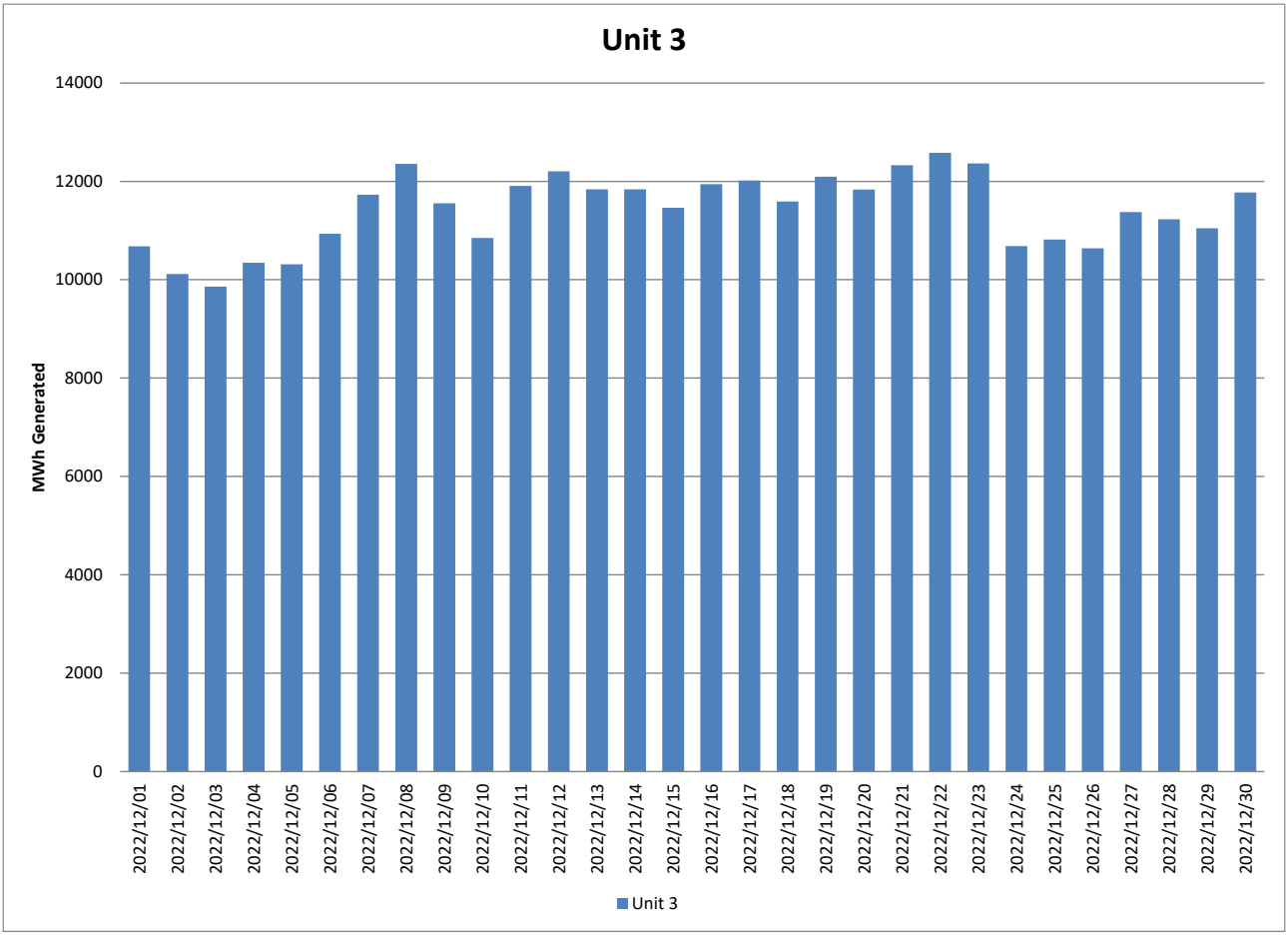

Figure 22: Unit 3 daily generated power in MWh for the month of December 2022

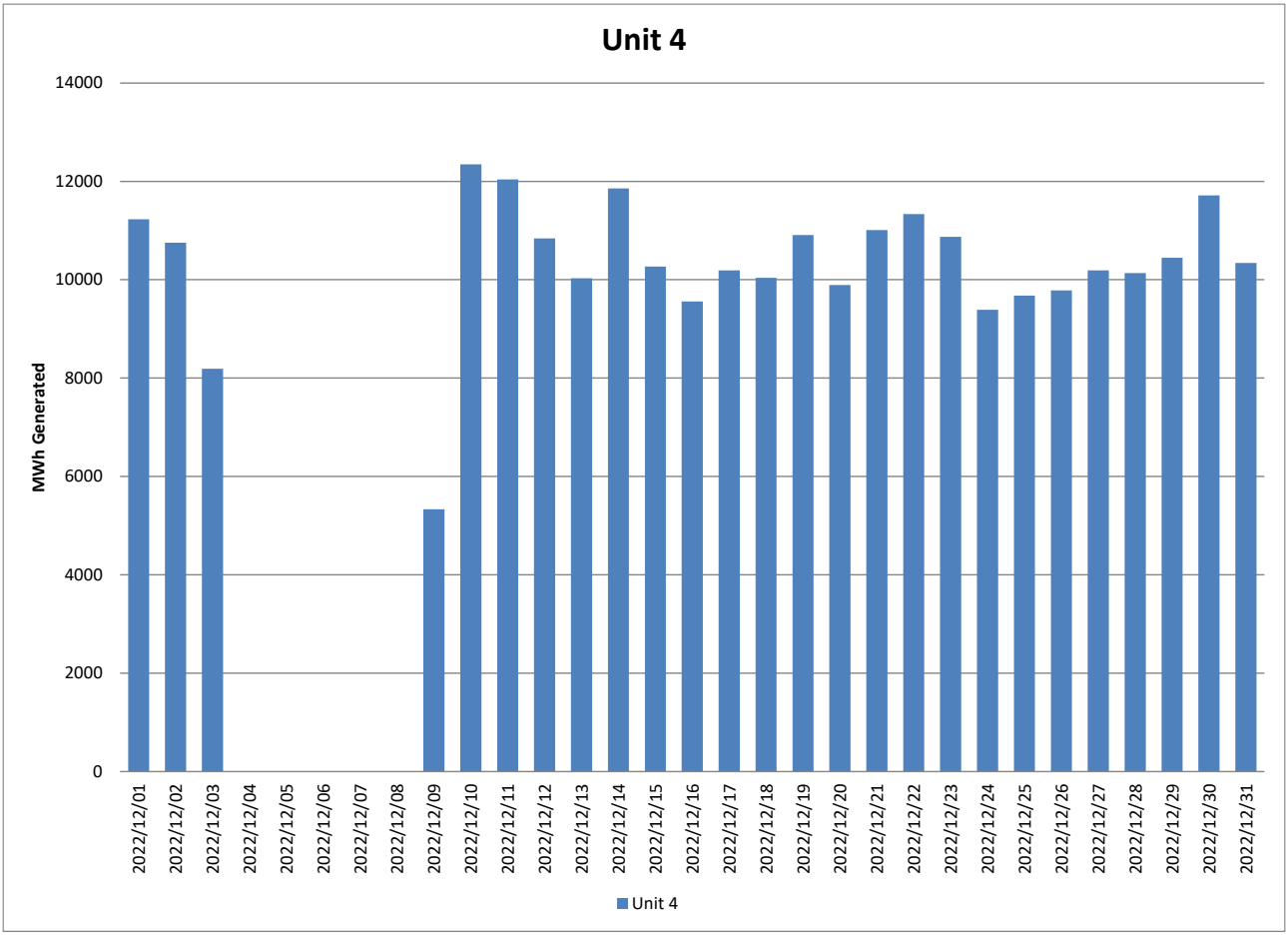

Figure 23: Unit 4 daily generated power in MWh for the month of December 2022

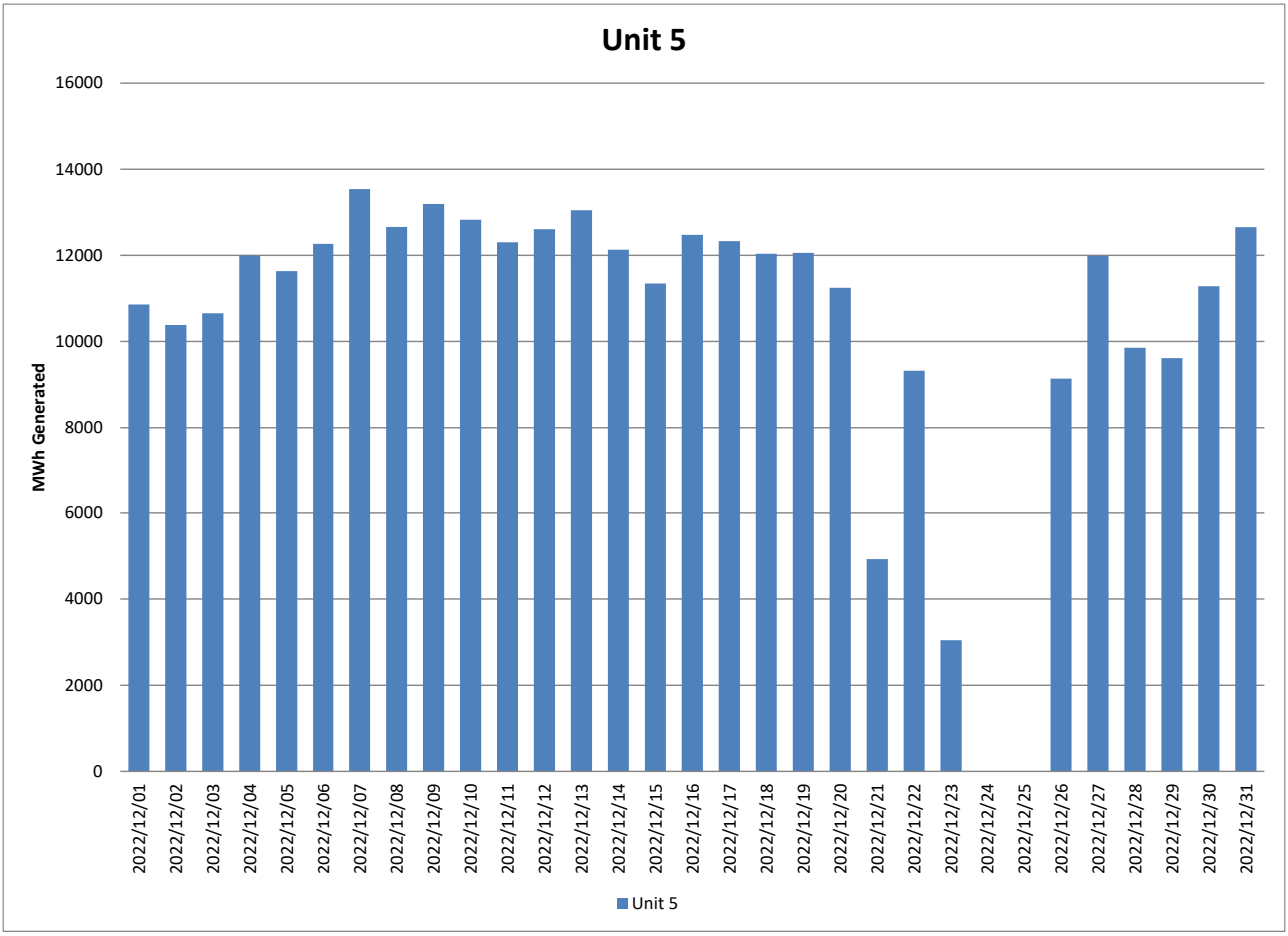

Figure 24: Unit 5 daily generated power in MWh for the month of December 2022

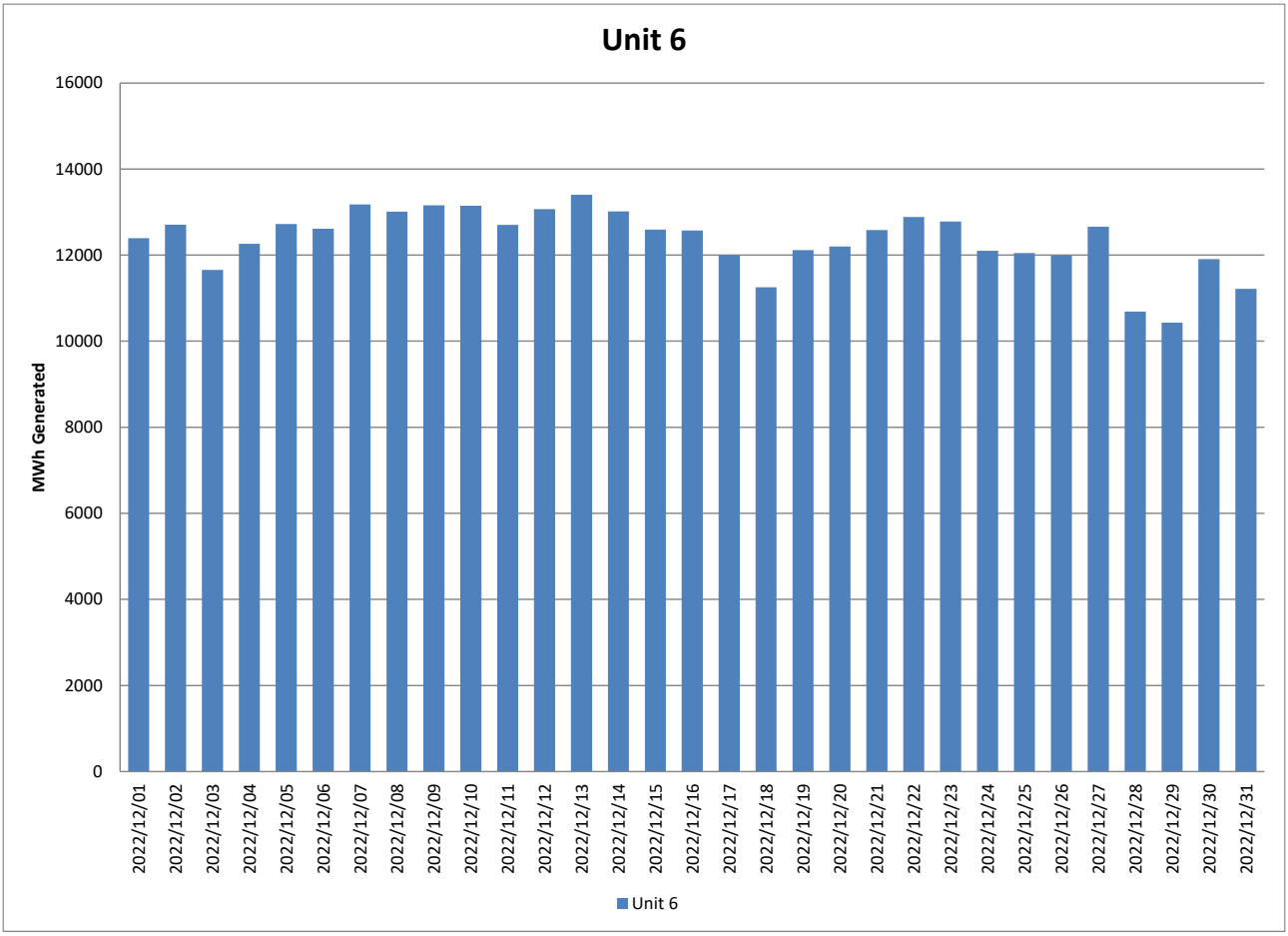

Figure 25: Unit 6 daily generated power in MWh for the month of December 2022

2.6 Pollutant Tonnages

The emitted pollutant tonnages for December 2022 are provided in table 6. CO2 values for units 2, 3 and 5 were calculated per balance, from O2 values, due to analyser providing unreliable data. Averaged quality assurance level 2 test values for O2 were used for Unit 1 to 6 due to the analysers being providing unreliable data. Matimba is currently in the process of implementing recommended changes on gaseous emission analysers to improve the reliability of the data.

Table 6: Pollutant tonnages for the month of December 2022

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	78,8	4 114,1	594,5
Unit 2	68,0	6 083,8	809,4
Unit 3	46,2	6 144,8	865,9
Unit 4	49,2	3 889,8	718,2
Unit 5	74,6	3 713,0	482,6
Unit 6	79,3	6 071,5	881,7
SUM	396,1	30 017,1	4 352,3

2.7 Reference values

Table 7: Reference values for data provided, December 2022

Compound / Parameter	Units of Measure	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Oxygen	%	5,08	8,20	4,71	7,28	7,28	6,93
Moisture	%	4,86	4,38	6,11	3,68	5,21	2,86
Velocity	m/s	24,4	33,9	25,4	22,5	27,2	29,0
Temperature	^{o}C	138,8	122,3	128,6	132,3	121,4	124,1
Pressure	mBar	931,4	935,1	914,8	906,1	931,9	914,1

2.8 Continuous Emission Monitors

2.8.1 Reliability

Continuous emission monitors were available for more than 80% of the reporting period. The emitted pollutant tonnages for December 2022 are provided in table 6. CO2 values for units 2, 3 and 5 were calculated per balance, from O2 values, due to analyser providing unreliable data. Averaged quality assurance level 2 test values for O2 were used for Unit 1 to 6 due to the analysers being providing unreliable data. Matimba is currently in the process of implementing recommended changes on gaseous emission analysers to improve the reliability of the data.

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

Associated Unit/Stack	PM	SO_2	NO
Unit 1	100,0	99,8	99,8
Unit 2	100,0	95,4	81,5
Unit 3	100,0	99,7	99,7
Unit 4	100,0	99,8	99,8
Unit 5	100,0	99,9	98,4
Unit 6	100,0	91,9	91,8

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

- 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 5

- 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 6

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

2.8.3 Sampling dates and times

Table 9: Dates of last conducted CEMS verification tests for PM, SO_2 and NOx

Name of service provider:		Stacklabs Environmental Services CC		
Address of service provider:		10 Chisel Street Boltonia Krugersdorp 1739		
Stack/ Unit	**PM**	**SO_2**	**NOx**	**CO_2**
1	2020/09/30 06h04	2020/09/09 13h00	2020/09/09 13h00	2020/09/09 13h00
2	2021/01/26 04h52	2021/01/27 13h00	2021/01/27 13h00	2021/01/27 13h00
3	2021/08/10 12h05	2020/09/24 07h00	2020/09/24 07h00	2020/09/24 07h00
4	2021/07/13 14h31	2020/09/16 02h00	2020/09/16 02h00	2020/09/16 02h00
5	2020/10/06 05h39	2020/10/08 02h30	2020/10/08 02h30	2020/10/08 02h30
6	2020/09/09 06h41	2020/09/09 13h00	2020/09/09 13h00	2020/09/09 13h00

2.9 Units Start-up information

Table 10: Start-up information

Unit	2	
Fires in	2022/12/20	13h26
Synchronization with Grid	2022/12/20	20h40
Emissions below limit	2022/01/21	10h00
Fires in to synchronization	32,2	HOURS
Synchronization to < Emission limit	13,3	HOURS

Unit	4	
Fires in	2022/12/08	23h38
Synchronization with Grid	2022/12/09	09h31
Emissions below limit	2022/01/21	10h00
Fires in to synchronization	9,8	HOURS
Synchronization to < Emission limit	0,48	HOURS

Unit	5	
Fires in	2022/12/21	11h20
Synchronization with Grid	2022/12/22	01h23
Emissions below limit	2022/12/22	01h23
Fires in to synchronization	14,05	HOURS
Synchronization to < Emission limit	0	HOURS

Unit	5	
Fires in	2022/12/25	21h30
Synchronization with Grid	2022/12/26	03h07
Emissions below limit	2022/12/26	03h07
Fires in to synchronization	5,6	HOURS
Synchronization to < Emission limit	0	HOURS

2.10 Emergency generation

Table 11: Emergency generation

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Emergency Generation hours declared by national Control						
Emergency Hours declared including hours after stand down						
Days over the Limit during Emergency Generation						

During the period under review all Units were on emergency generation in force from 01 December 2022 until 31 December 2022.

2.11 Complaints register

Table 12: 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
N/A					

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

Ambient air quality monitoring report was not available at the time of publishing this report.

2.14 Electrostatic precipitator and Sulphur plant status

Unit 1

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

Unit 2

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

Unit 3

- All precipitator fields in service. Unit shut down for outage
- No abnormalities on the SO3 plant. Preventative maintenance done during the month.

Unit 4

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

Unit 5

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

Unit 6

- 2 fields out of service, will be inspected next opportunity.
- Hole in burner casing and sulphur leak causing low availability. 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 methods 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

Wikus van Rensburg 2023-02-03

GENERAL MANAGER: MATIMBA POWER STATION