Eskom	Matimba Power Station Emissions report	Matimba Power Station

Title: **Matimba Power Station October 2022 emissions report**

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Compiled by	Functional Responsibility	Authorized by
KH Ramahlare	**MC Mamabolo**	**Obakeng Mabotja**
Environmental Officer	**Environmental Manager**	**General Manager**
Date: 2022-12-05	Date: 5/12/2022	Date: 2022/12/07

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 October 2022.

During the period under review, twelve exceedances of the daily particulate matter emission limit (50mg/Nm^3) occurred. One exceedance resulted in a Section 30 incident that was reported to your office on 17 October 2022. All other 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.

Emission trends and tonnages reported in this report were calculated based on correlation curves of October 2020. As per the letters sent to your office on 09 October 2022 and 28 October 2022, the new curves are in the process of being reviewed and implemented.

The sulphur dioxide analyser for unit 2 is defective and averaged daily emissions from the Quality Assurance Level 2 report was used for reporting purposes. Mitigation measure to repair the defective analyser are in progress.

For the month of October Matimba Power Station used a total of 1425,838 tons of fuel oil, exceeding the monthly limit of 1200 tons. The increased usage was due to multiple light-ups of unit 3 after an outage.

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	982 544
	Fuel Oil	Tons/month	1 200	1425,838
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate**
	Energy	MW	4000	2289,417

Matimba Power Station exceeded the monthly fuel oil usage limit of 1200 Tons per month. The exceedance was due to multiple light-ups for unit 3 after a general overall outage. Total fuel oil usage for October 2022 was 1425.838 Tons.

2.2 Abatement technology

Table 2: Abatement Equipment Control Technology Utilised

Associated Unit	Technology Type	Minimum utilisation (%)	Efficiency (%)
Unit 1	Electrostatic Precipitator	100%	99,91%
Unit 2	Electrostatic Precipitator	100%	99,88%
Unit 3	Electrostatic Precipitator	100%	Unit Off-line
Unit 4	Electrostatic Precipitator	100%	99,89%
Unit 5	Electrostatic Precipitator	100%	99,88%
Unit 6	Electrostatic Precipitator	100%	99,90%
Associated Unit	**Technology Type**	**Minimum utilisation (%)**	**Actual Utilisation (%)**
Unit 1	SO_3 Plant	100%	98
Unit 2	SO_3 Plant	100%	99
Unit 3	SO_3 Plant	100%	Unit Off-line
Unit 4	SO_3 Plant	100%	94
Unit 5	SO_3 Plant	100%	98
Unit 6	SO_3 Plant	100%	99

Flue gas conditioning plant availability was below the required 100% for units 1, 2, 4, 5 and 6 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%	1.31%
	Ash Content	40%	34,98%

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

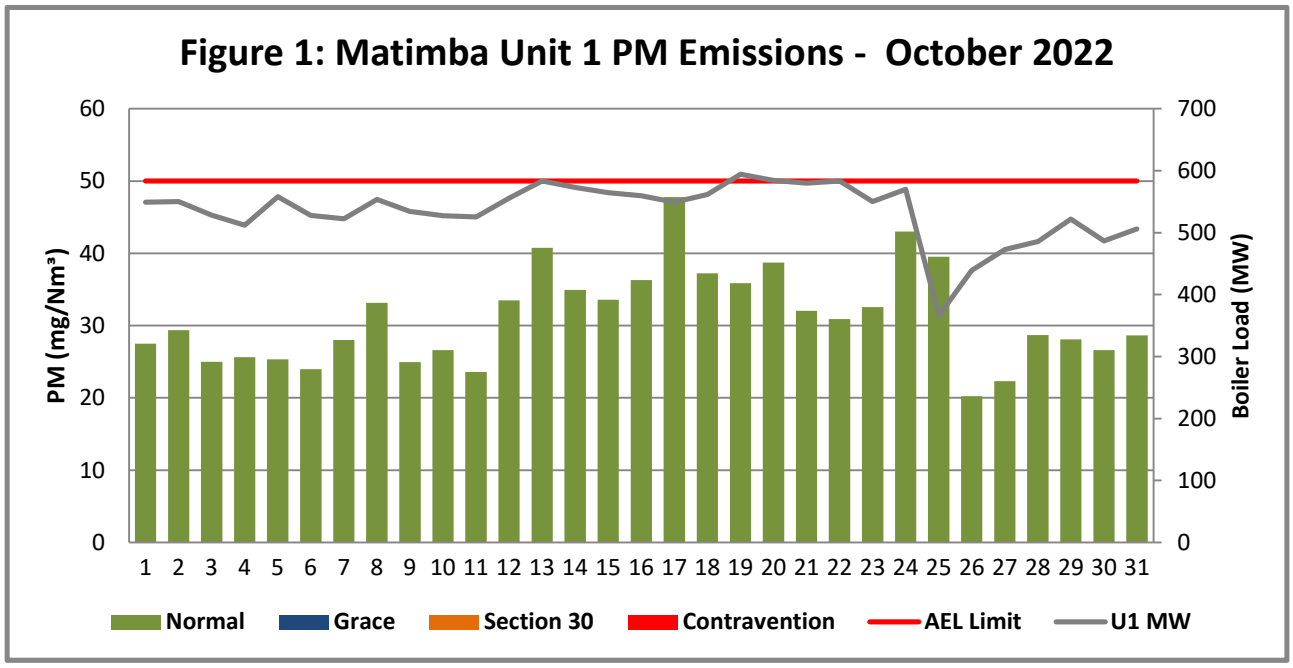

Figure 1: Particulate matter daily average emissions against emission limit for unit 1 for the month of October 2022

Interpretation:

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

Unit 2 Particulate Emissions

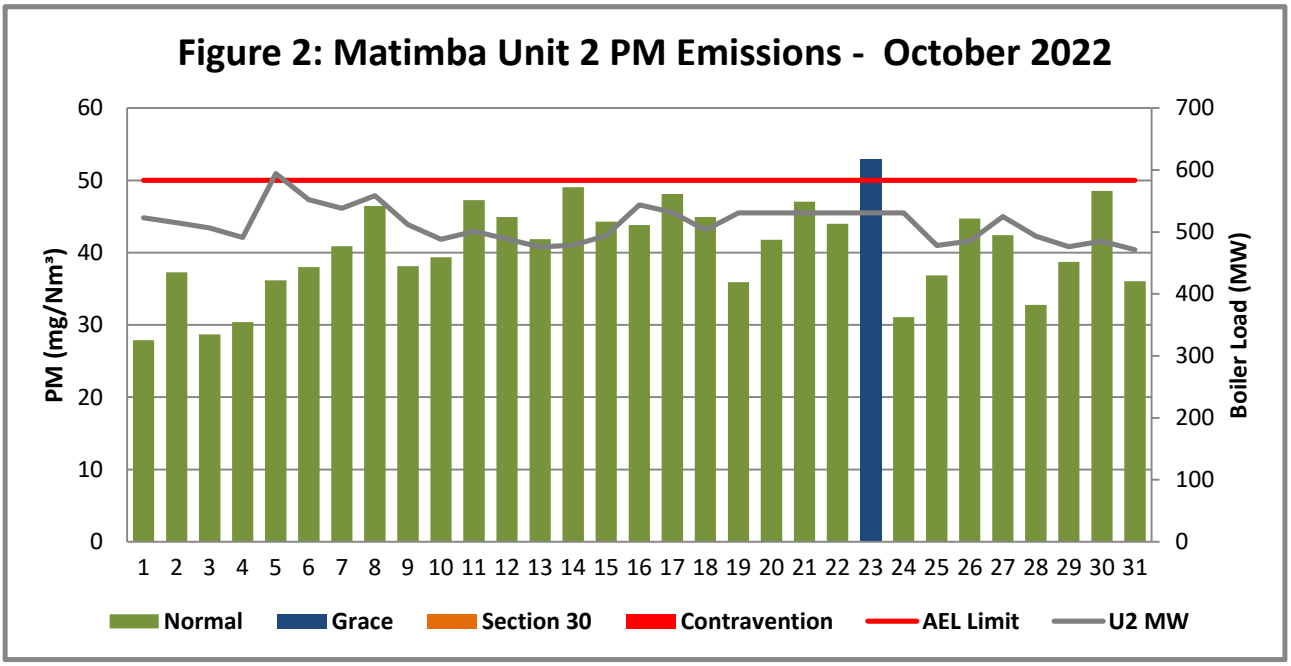

Figure 2: Particulate matter daily average emissions against emission limit for unit 2 for the month of October 2022

Interpretation:

Unit 2 exceeded the particulate matter emission daily limit of 50 mg/Nm^3 on 23 October 2022.The exceedance was due to defects on the ash handling plant leading to ash build-up within the flue gas stream reducing the efficiency of the electrostatic precipitator fields. Exceedance remain within the 48 hours grace period.

Unit 3 Particulate Emissions

Interpretation:

Unit 3 has been off load on outage from 13 August 2022.

Unit 4 Particulate Emissions

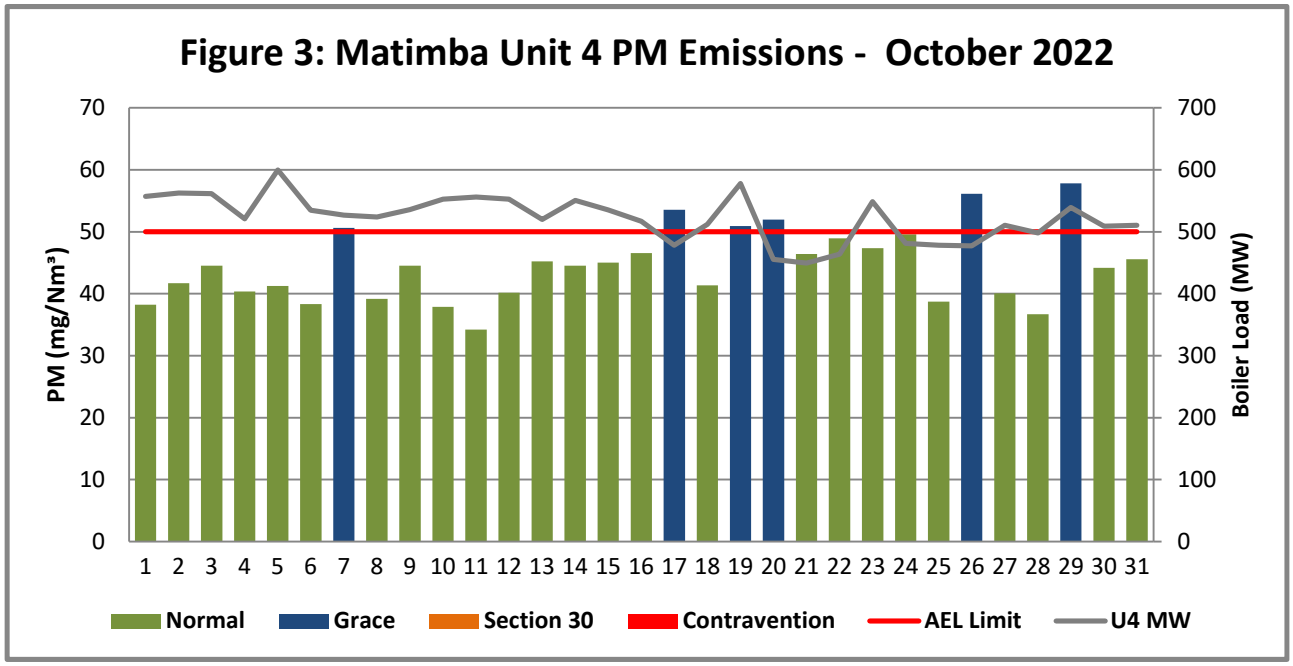

Figure 3: Particulate matter daily average emissions against emission limit for unit 4 for the month of October 2022

Interpretation:

Unit 4 Particulate matter exceeded the daily limit of 50 mg/Nm^3 on 07, 17, 19, 20, 26 and 29 October 2022. The exceedances on 07, 17, and 29 October were due to defects on the ash handling plant leading to ash build-up within the flue gas stream reducing the efficiency of the electrostatic precipitator fields. The exceedance on 19, 20, and 26 were due to unavailability of the flue gas conditioning plant. Respective plants defects were repaired, and emissions returned to normal. The exceedances remained within the 48-hour grace period.

Unit 5 Particulate Emissions

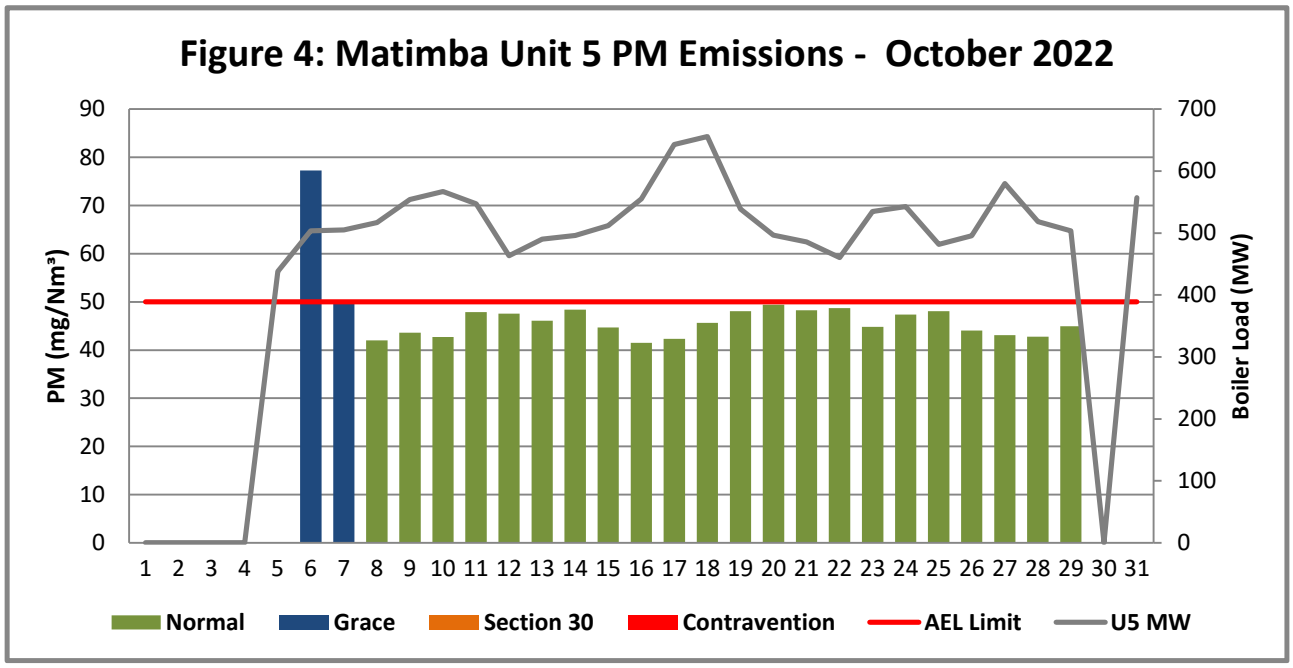

Figure 4: Particulate matter daily average emissions against emission limit for unit 5 for the month of October 2022

Interpretation:

Unit 5 exceeded the daily particulate matter limit of 50mg/Nm^3 on 6 and 7 October 2022. The exceedance was due to defects on the ash handling plant leading to ash build-up within the flue gas stream reducing the efficiency of the electrostatic precipitator fields. Exceedance remain within the 48 hours grace period.

Unit 6 Particulate Emissions

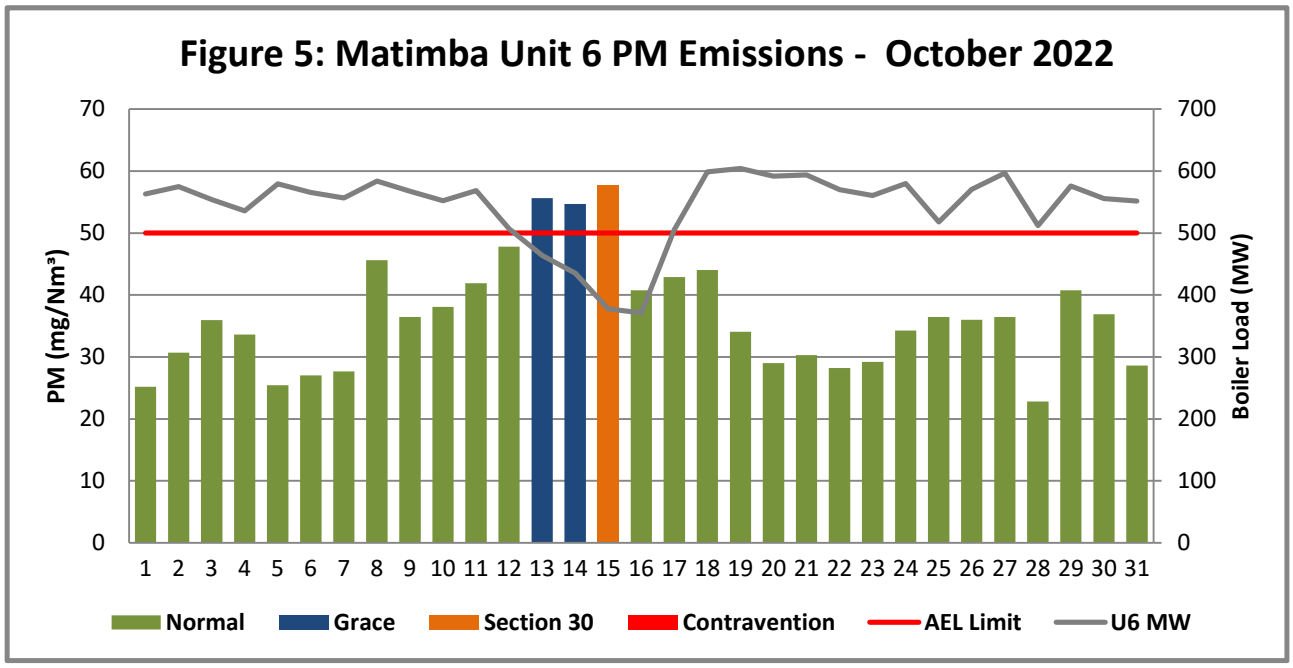

Figure 5: Particulate matter daily average emissions against emission limit for unit 6 for the month of October 2022

Interpretation:

Unit 6 exceeded the daily particulate matter emission limit of 50mg/Nm^3 from 13 to 15 October 2022. The exceedances were due to an equipment failure of the ash conveyancing plant creating an ash backlog within the flue gas cleaning system reducing the efficiency of the electrostatic precipitator plant. The defects on the ash conveyancing plant are primarily due to the lack of space available for ashing at the ash dumping facility. The 48 hours grace period was exceeded, and the Section 30 incident was reported to your office on 17 October 2022. Production loss was incurred, the ash conveyance system was repaired, and the emission returned to below the limit on the 16 October 2022.

2.4.2 Gaseous Emissions

Unit 1 SO_2 Emissions

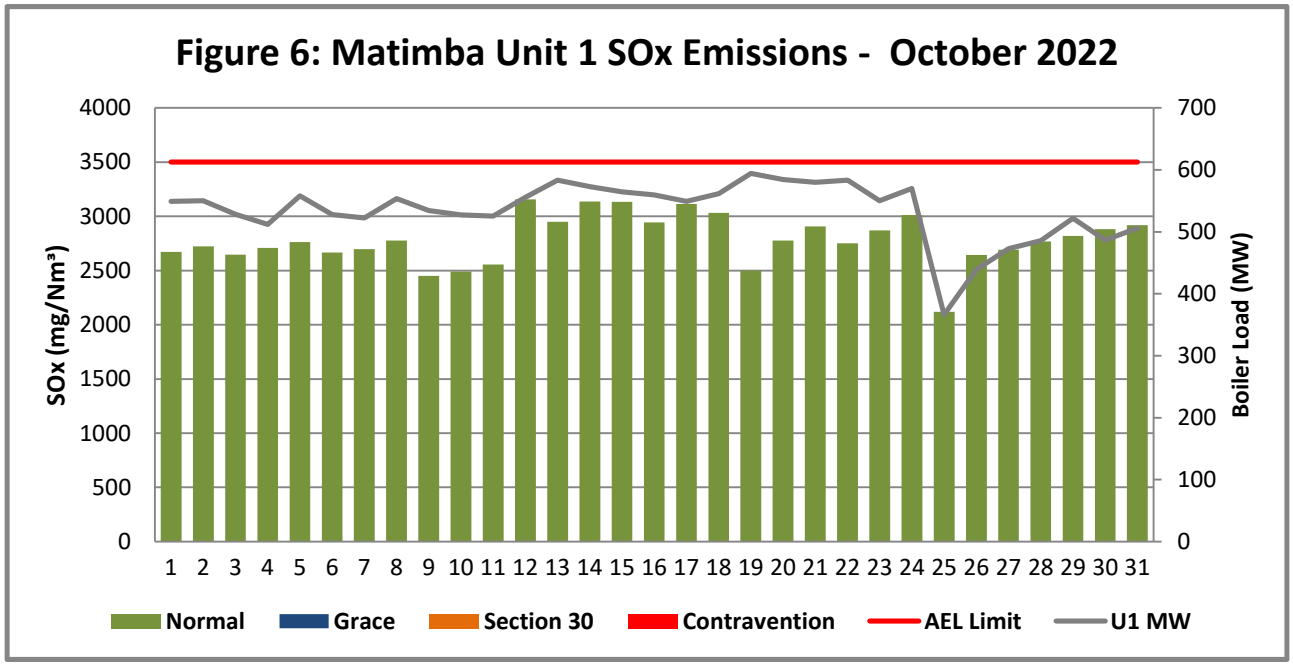

Figure 6: SO2 daily average emissions against emission limit for unit 1 for the month of October 2022

Interpretation:

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

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Unit 2 SO_2 Emissions

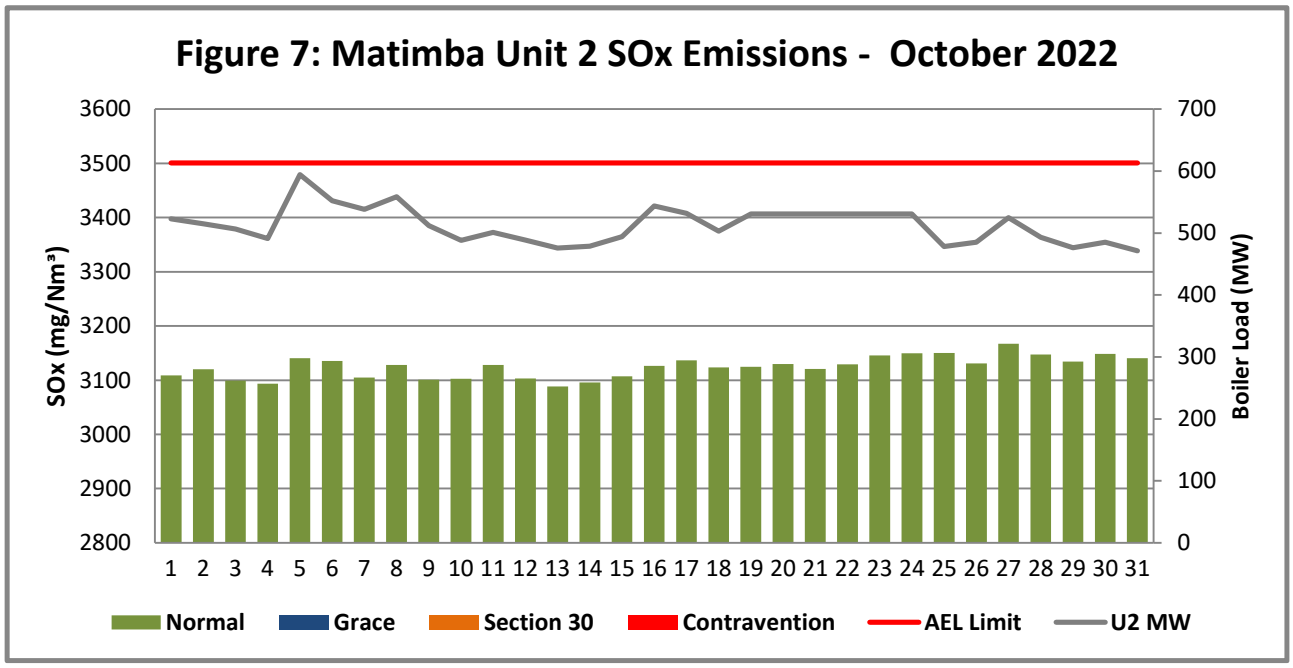

Figure 7: SO2 daily average emissions against emission limit for unit 2 for the month of October 2022

Interpretation:

Averaged AMS values from the 2020 QAL 2 report was used to report unit 2 SOx and Oxygen emissions due to unreliable readings received from the analyser since 1 October 2022. Investigation findings concluded that the analyser is experiencing significant drift. Corrective actions were put in place to repair the analyser including the movement of the Oxygen ports to make readings more reliable.

Unit 3 SO_2 Emissions

Interpretation:

Unit 3 has been off load on outage from 13 August 2022.

Unit 4 SO_2 Emissions

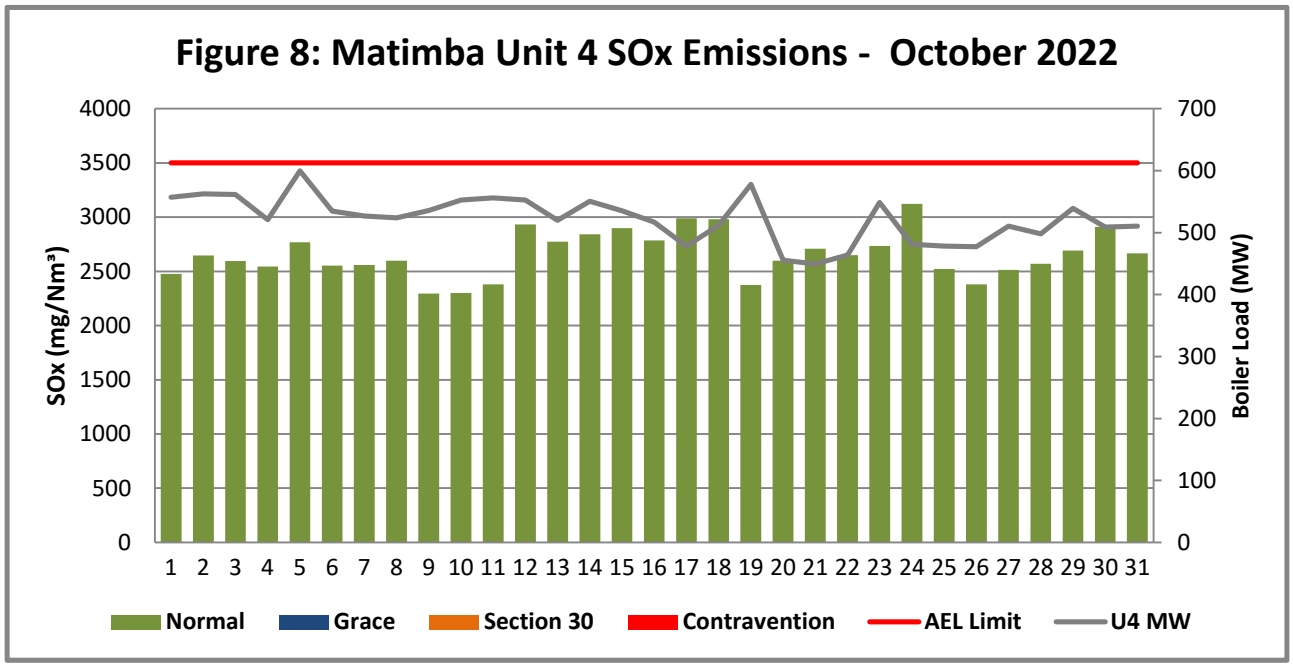

Figure 8: SO2 daily average emissions against emission limit for unit 4 for the month of October 2022

Interpretation:

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

Unit 5 SO_2 Emissions

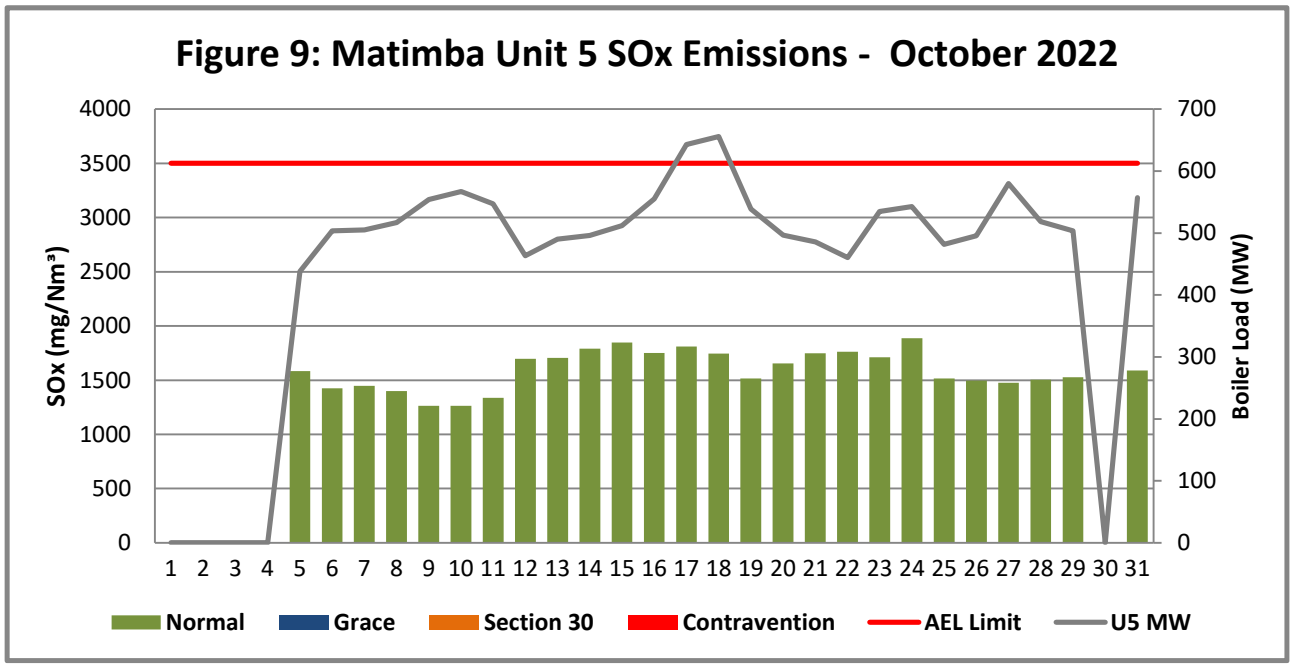

Figure 9: SO2 daily average emissions against emission limit for unit 5 for the month of October 2022

Interpretation:

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

Unit 6 SO_2 Emissions

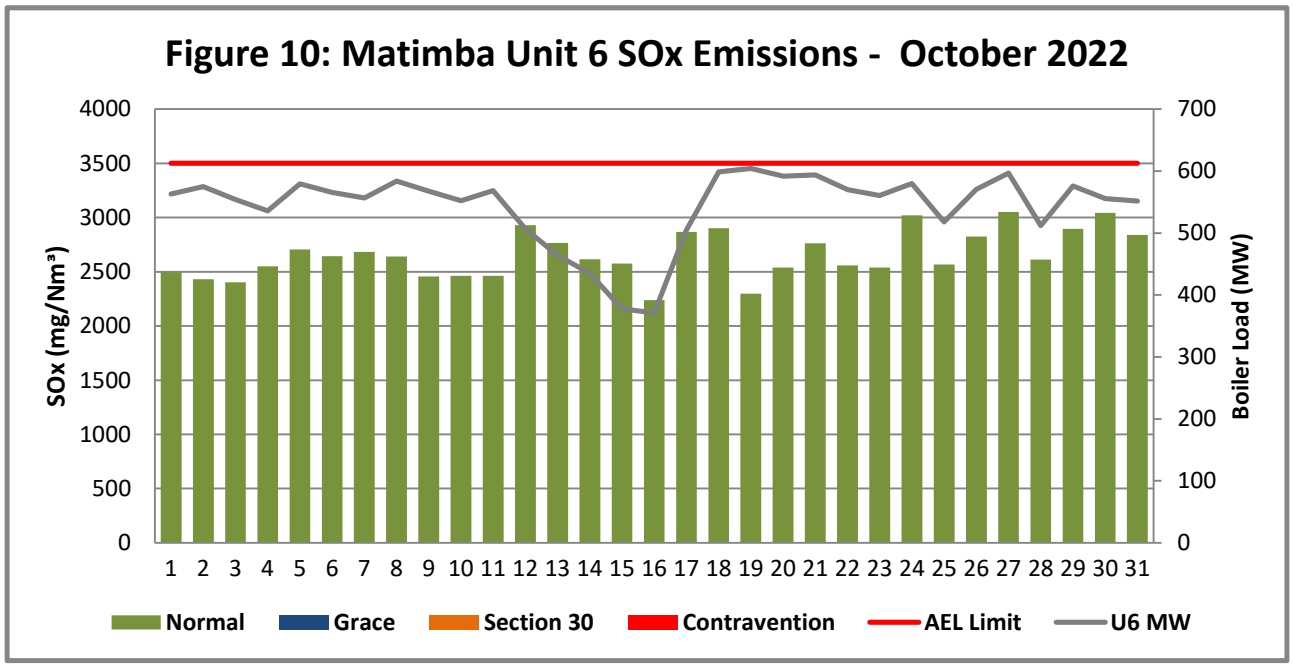

Figure 10: SO2 daily average emissions against emission limit for unit 6 for the month of October 2022

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

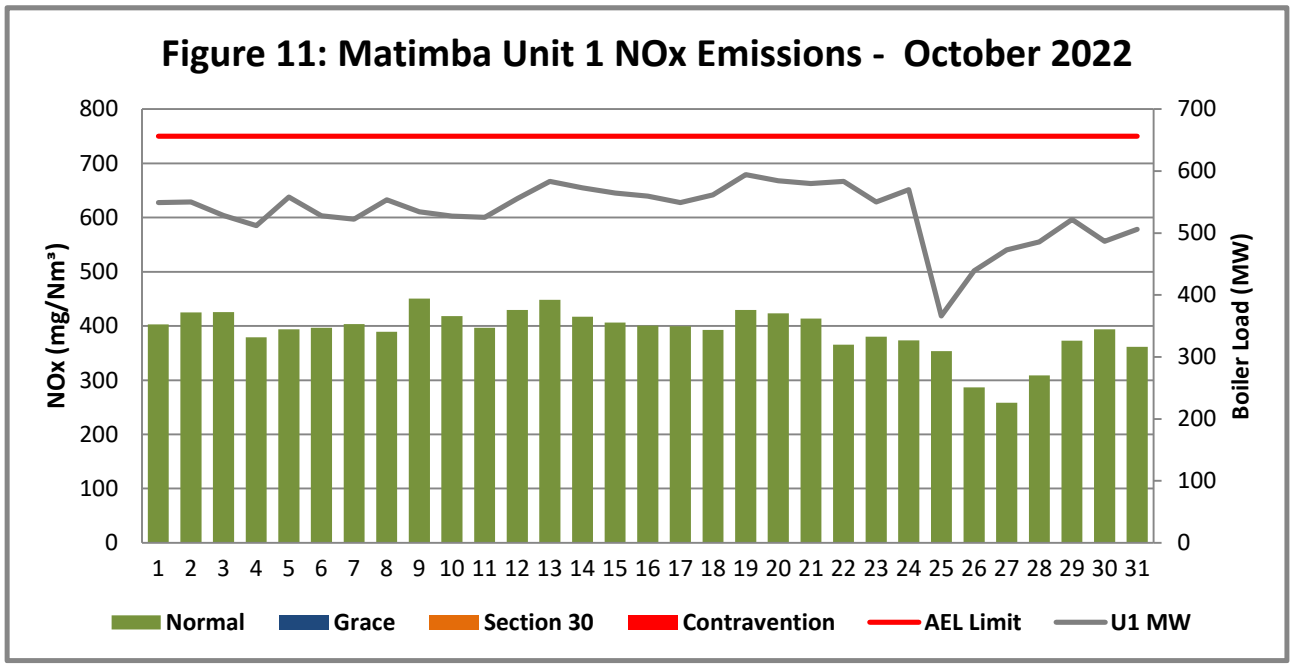

Figure 11: NOx daily average emissions against emission limit for unit 1 for the month of October 2022

Interpretation:

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

Unit 2 NO_x Emissions

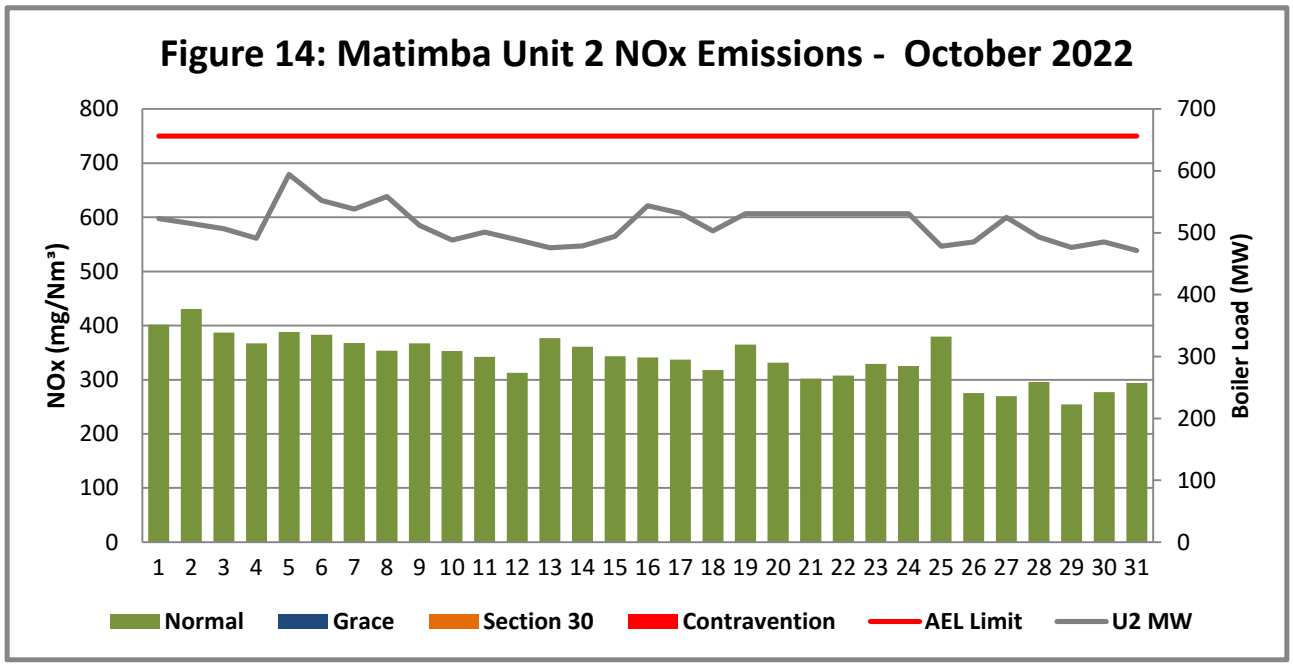

Figure 12: NOx daily average emissions against emission limit for unit 2 for the month of October 2022

Interpretation:

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

Unit 3 NO_x Emissions

Interpretation:

Unit 3 has been off load on outage from 13 August 2022.

Unit 4 NO_x Emissions

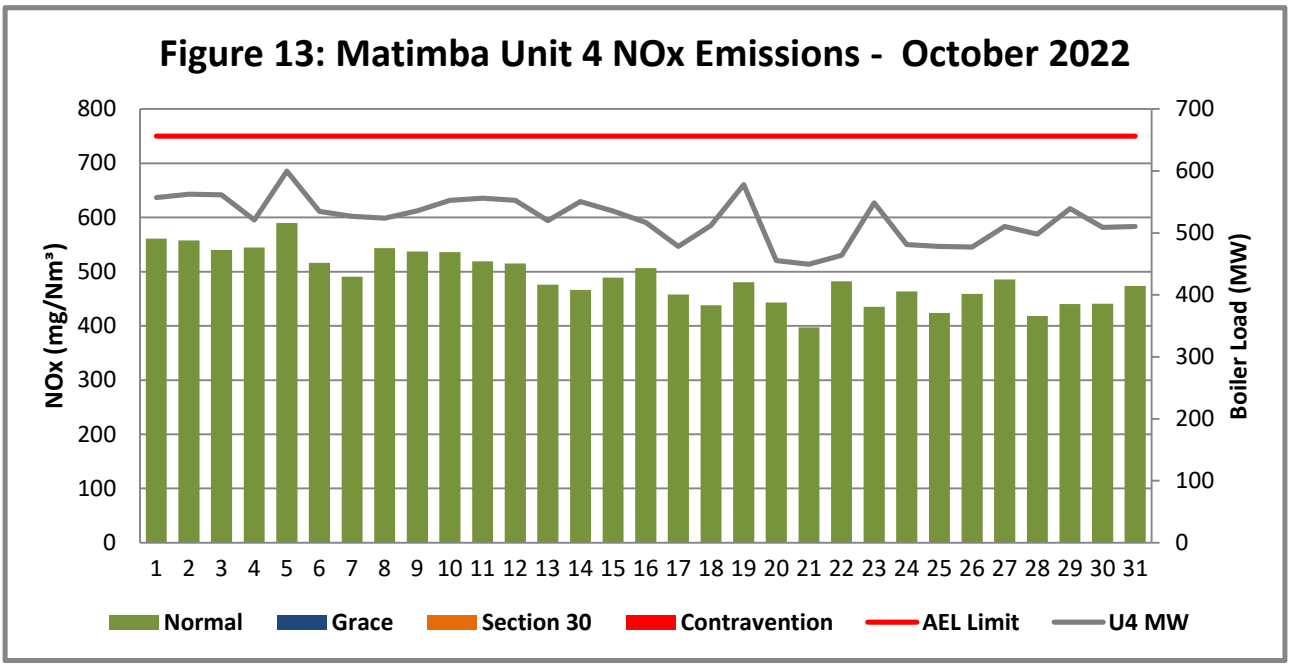

Figure 13: NOx daily average emissions against emission limit for unit 4 for the month of October 2022

Interpretation:

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

Unit 5 NO_x Emissions

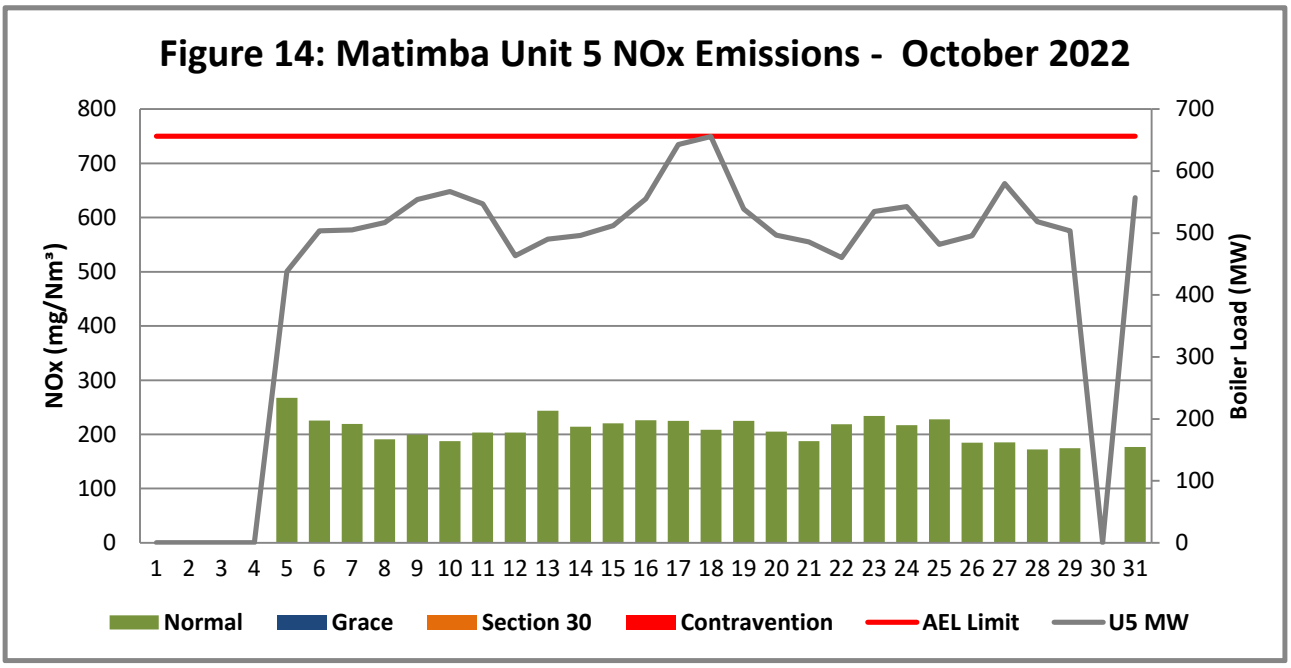

Figure 14: NOx daily average emissions against emission limit for unit 5 for the month of October 2022

Interpretation:

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

Unit 6 NO_x Emissions

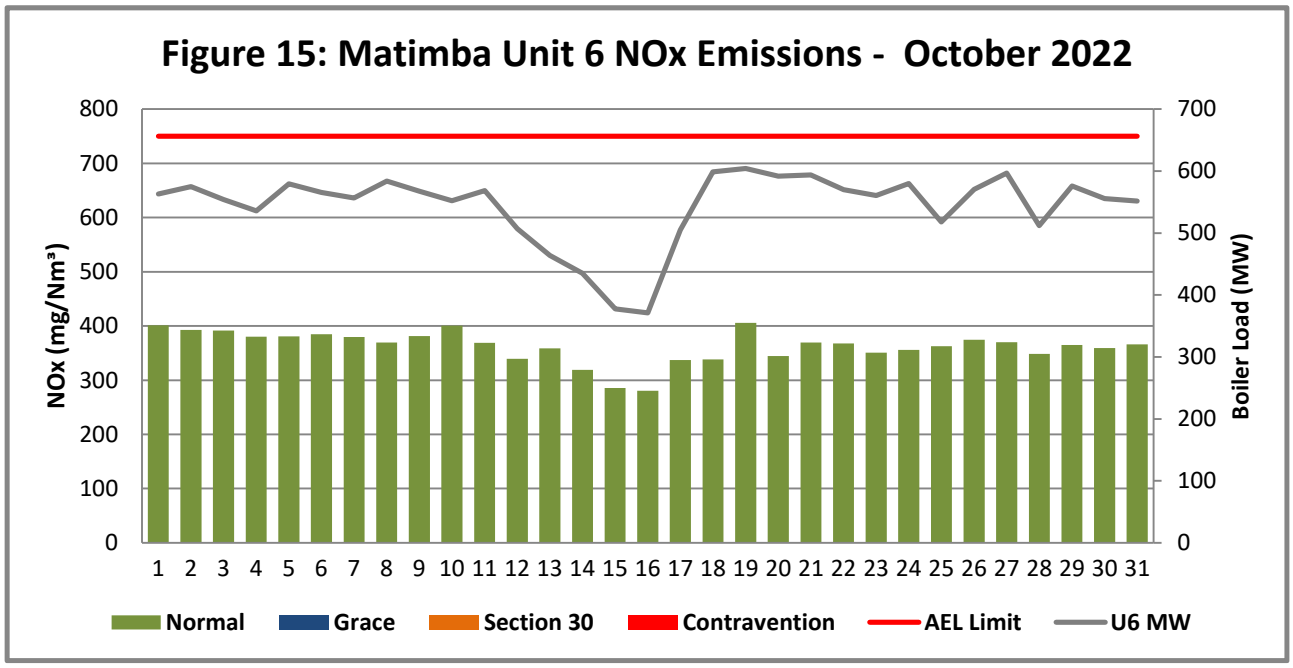

Figure 15: NOx daily average emissions against emission limit for unit 6 for the month of October 2022

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:	Tuesday, 15 November 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:	**October**	
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:	***1432,899***	
Molecular weight of the fuel oil:	166,00	Lb/lb-mole
METEROLOGICAL DATA FOR THE MONTH	**Data**	**Unit**
Daily average ambient temperature	26,19	°C
Daily maximum ambient temperature	33,65	°C
Daily minimum ambient temperature	19,11	°C
Daily ambient temperature range	14,54	°C
Daily total insolation factor	5,81	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:	0,04	kg/month
TOTAL LOSSES (Total TVOC Emissions for the month):	**0,64**	**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.

The total fuel oil throughput for October 2022 was 1432,899 Tons, however, only 1425,838 tons of the total throughput was used during the combustion process. The remaining 7,061 Tons of fuel oil was lost due to a spillage that occurred during the unit 3 start-up within the fuel oil storage containment area. The spillage was contained within the pollution control infrastructure and cleaned immediately. Spilled oil was disposed of as hazardous waste.

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 October 2022

Date	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
2022/10/01	13122	12354	0	13255	0	13390
2022/10/02	13180	12168	0	13432	0	13661
2022/10/03	12663	11989	0	13468	0	13195
2022/10/04	12274	11580	0	12437	0	12781
2022/10/05	13373	14031	0	14331	3565	13791
2022/10/06	12647	13060	0	12788	11906	13458
2022/10/07	12513	12712	0	12647	12086	13245
2022/10/08	13255	13247	0	12442	12218	13883
2022/10/09	12823	12118	0	12835	13192	13540
2022/10/10	12606	11530	0	13186	13461	13106
2022/10/11	12562	11896	0	13288	13012	13534
2022/10/12	13313	11596	0	13224	11083	12119
2022/10/13	13963	11287	0	12463	11633	11047
2022/10/14	13742	11388	0	13136	11808	10339
2022/10/15	13564	11734	0	12816	12176	8976
2022/10/16	13363	12910	0	12357	13164	8814
2022/10/17	13204	12631	0	11460	15268	11931
2022/10/18	13410	11962	0	12167	15594	14229
2022/10/19	14232	12584	0	13867	12884	14364
2022/10/20	13991	12628	0	10903	11820	14071
2022/10/21	13888	11906	0	10745	11581	14129
2022/10/22	13983	11987	0	11108	10963	13608
2022/10/23	13253	12234	0	13090	12696	13335
2022/10/24	13579	12026	0	11529	12916	13882
2022/10/25	8248	11300	0	11385	11496	12334
2022/10/26	10491	11461	0	11438	11759	13589
2022/10/27	11316	12423	0	12186	13787	14290
2022/10/28	11626	11646	0	11894	12328	12155
2022/10/29	12499	11251	0	12889	11398	13722
2022/10/30	11663	11462	0	12143	0	13252
2022/10/31	12101	11130	0	12215	12372	13151

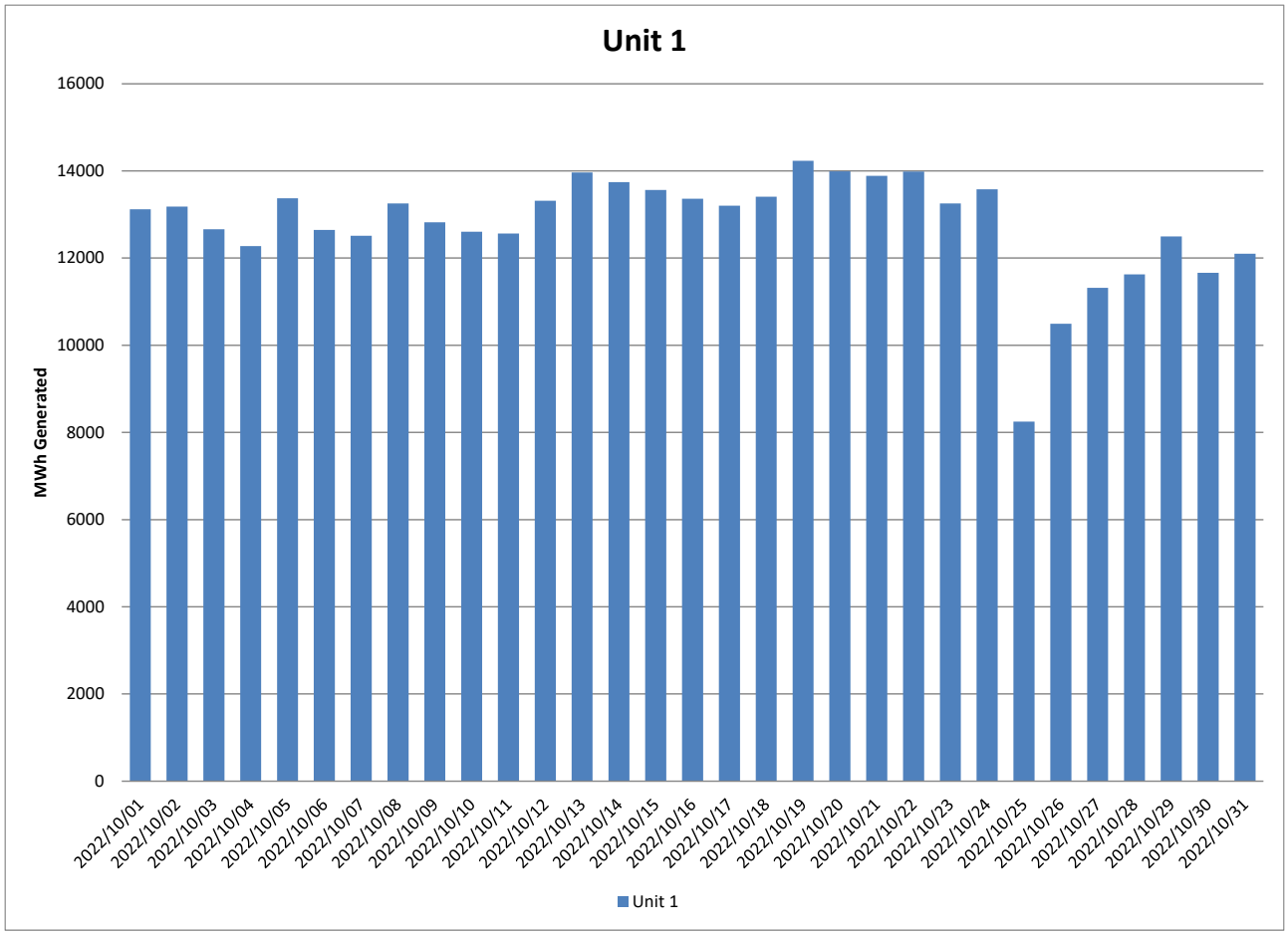

Figure 16: Unit 1 daily generated power in MWh for the month of October 2022

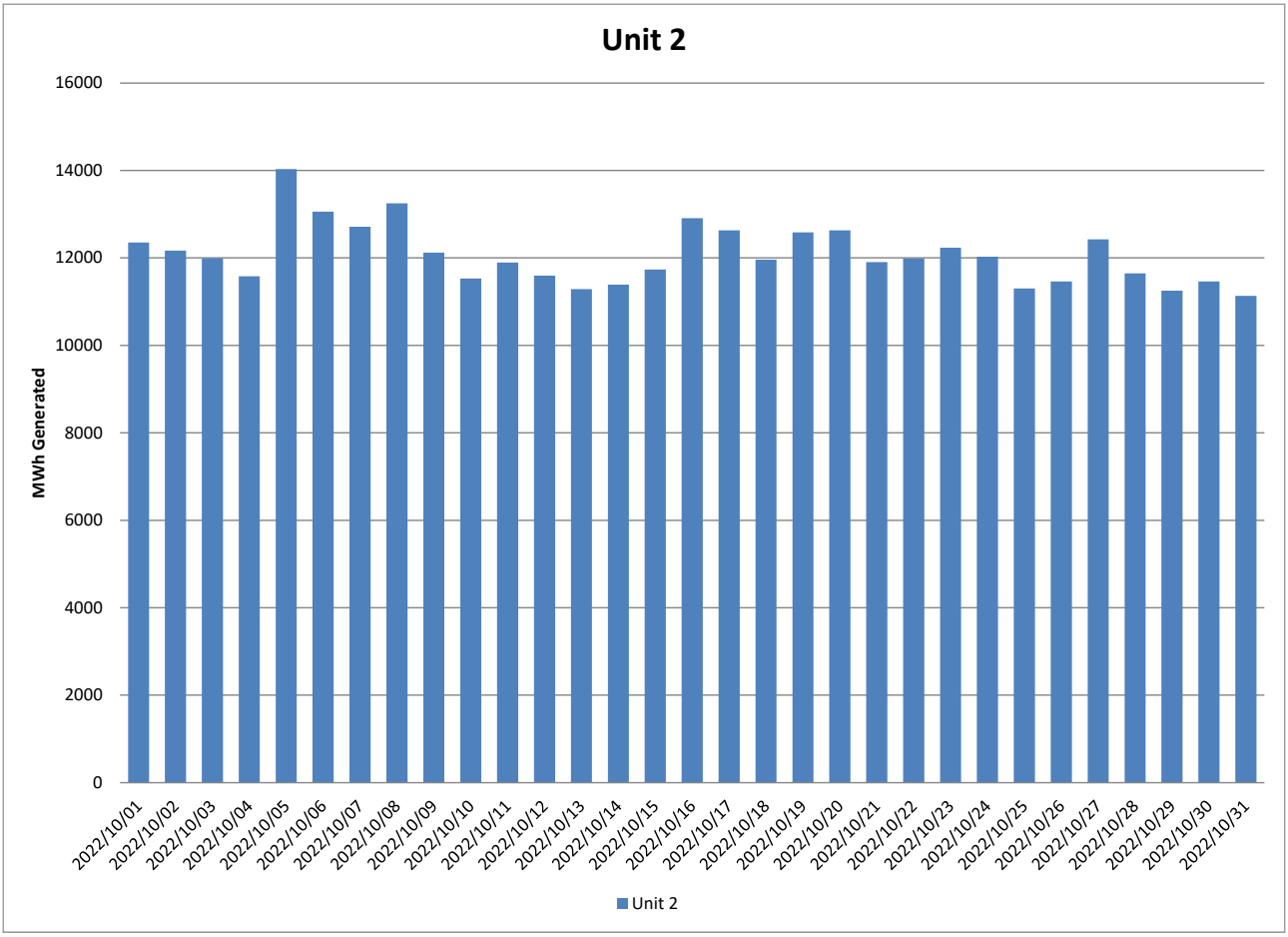

Figure 17: Unit 2 daily generated power in MWh for the month of October 2022

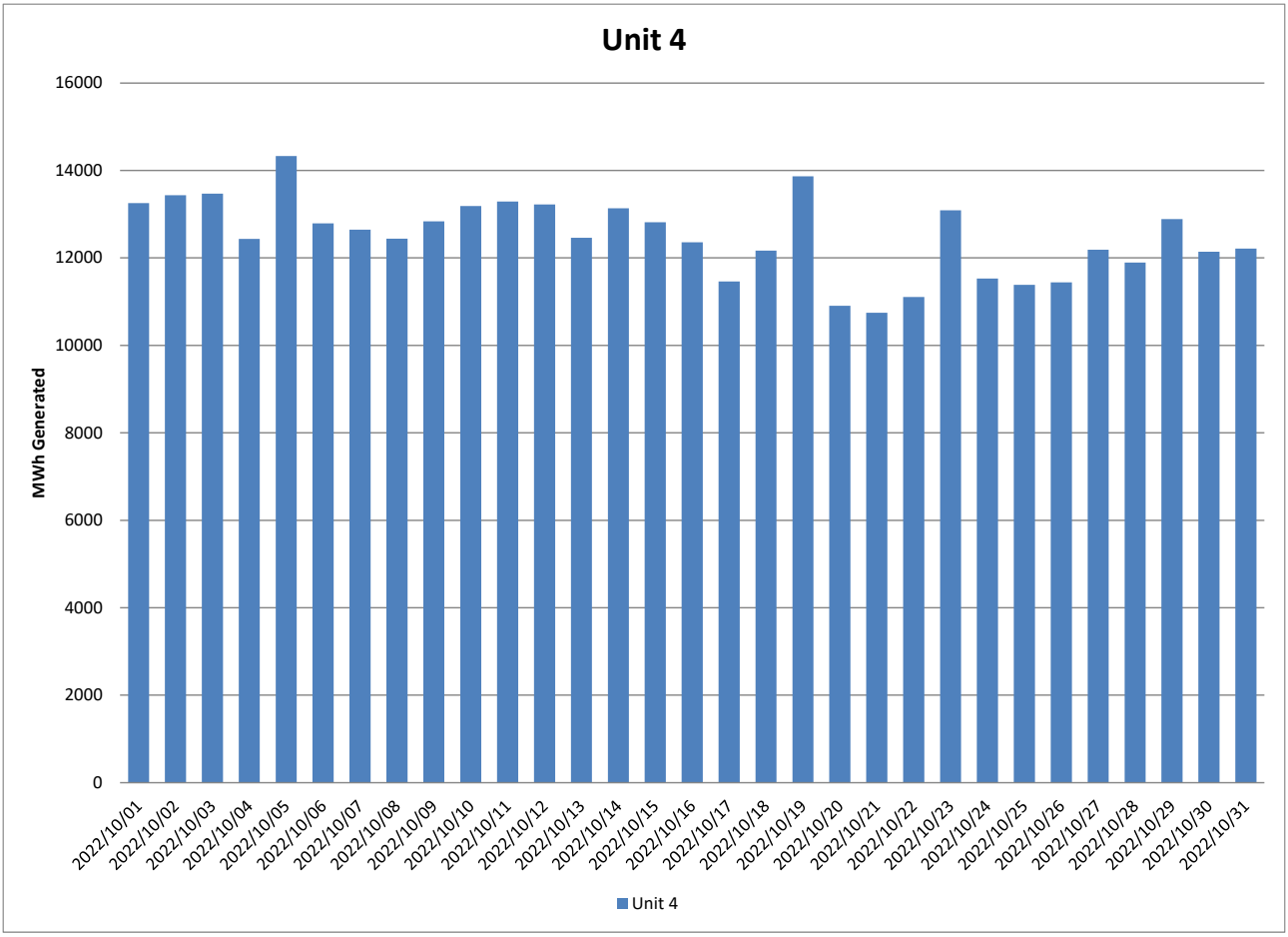

Figure 18: Unit 4 daily generated power in MWh for the month of October 2022

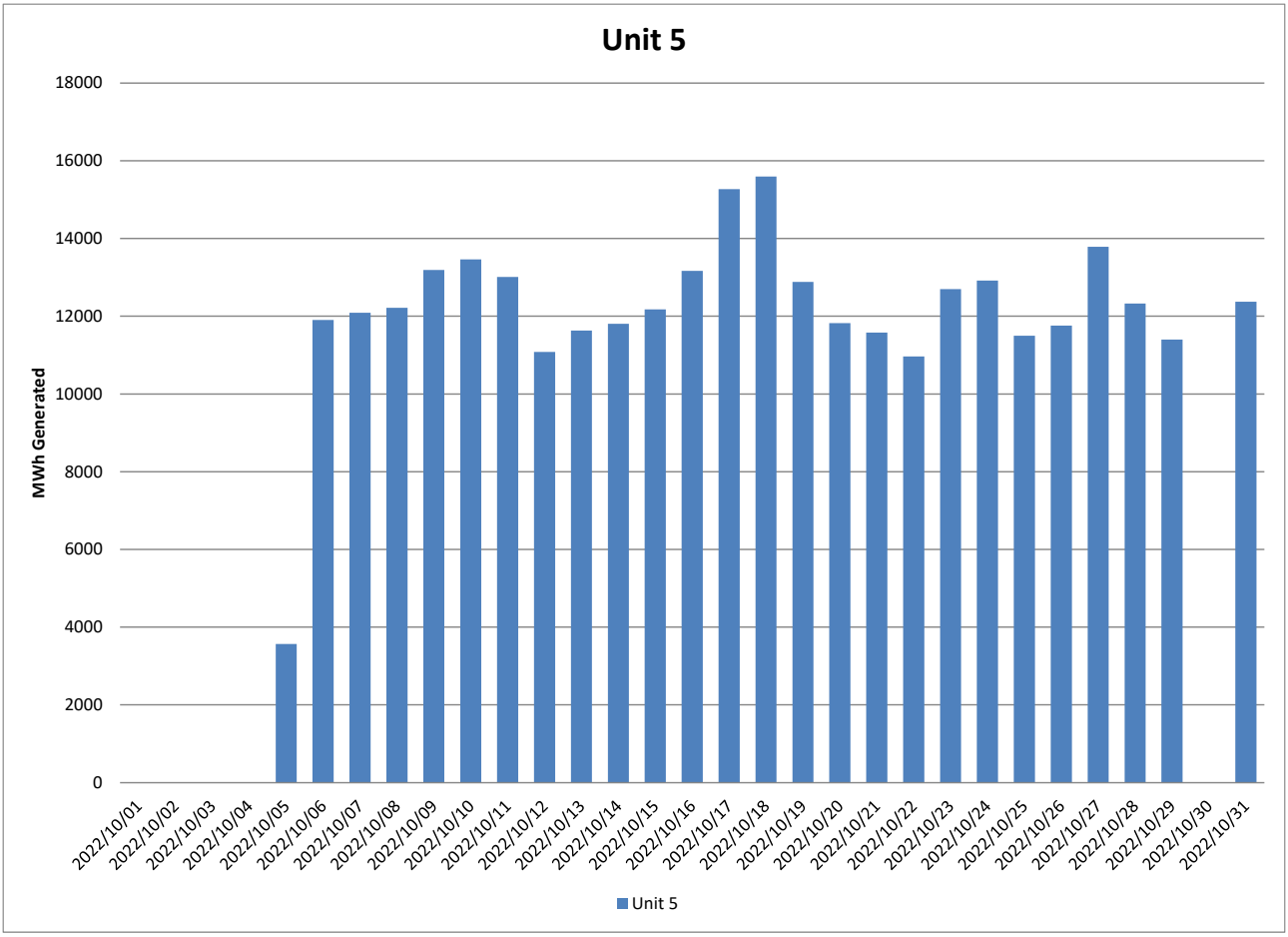

Figure 19: Unit 5 daily generated power in MWh for the month of October 2022

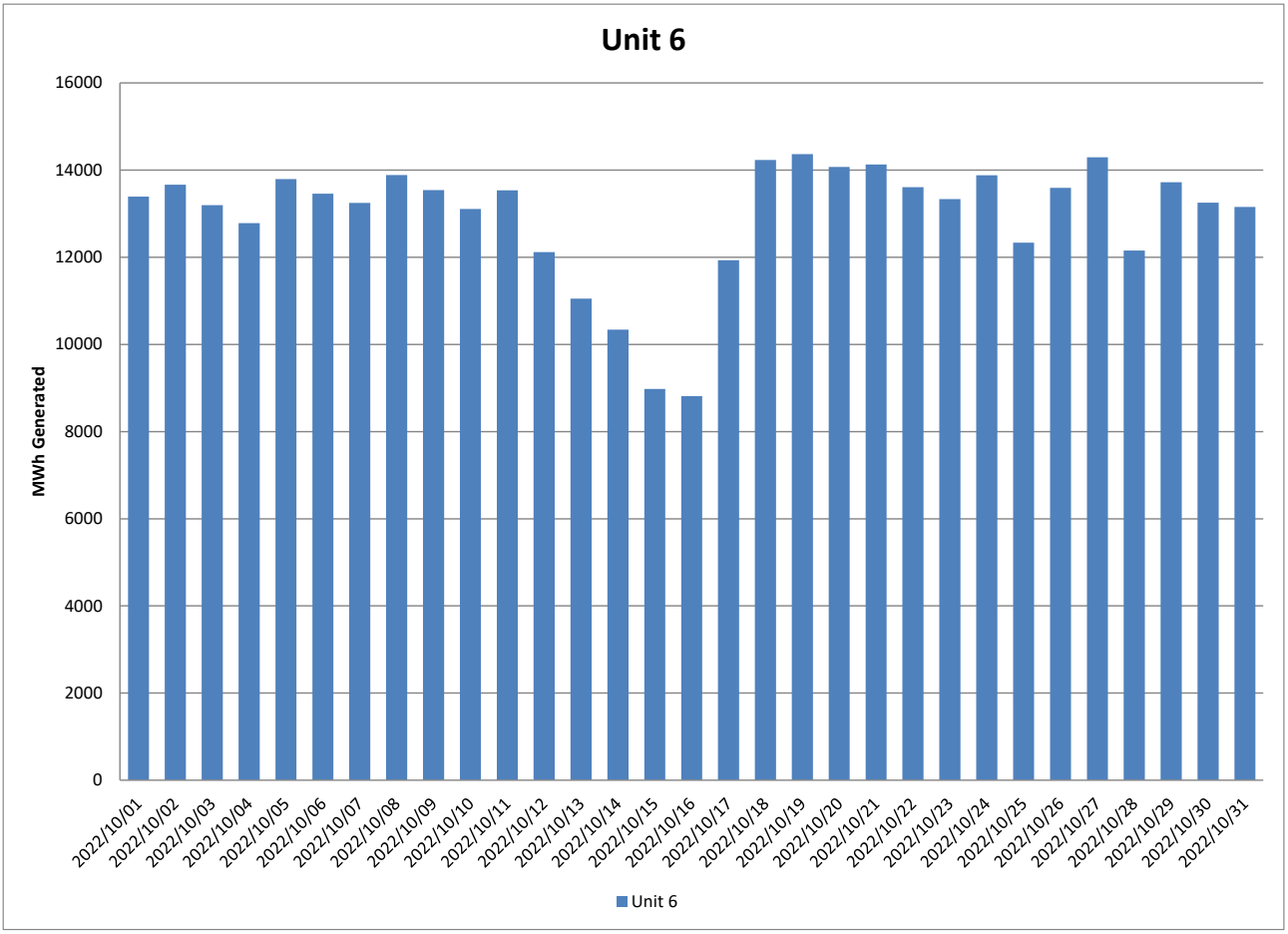

Figure 20: Unit 6 daily generated power in MWh for the month of October 2022

2.6 Pollutant Tonnages

The emitted pollutant tonnages for October 2022 are provided in table 6. CO_2 values for units 2, 4 and 5 were calculated per balance, from O_2 values, due to analyser providing unreliable data. Averaged values for CO_2 were used for Unit 1 on 25-26 October 2022 due to unreliable data from analysers. Averaged quality assurance level 2 test values for O_2 were used for Unit 1 and 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. Unit 3 has been on Outage since August 2022.

Table 6: Pollutant tonnages for the month of October 2022

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	60,0	4 659,3	654,4
Unit 2	74,9	9 134,7	994,0
Unit 3	0,0	0,0	0,0
Unit 4	69,4	5 040,2	933,6
Unit 5	62,9	3 097,0	403,6
Unit 6	71,2	5 870,1	802,9
SUM	338,4	27 801,3	3 788,6

2.7 Reference values

Table 7: Reference values for data provided, October 2022

Compound / Parameter	Units of Measure	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Oxygen	%	8,69	7,64		7,30	6,59	8,06
Moisture	%	4,55	4,09		3,16	4,32	2,85
Velocity	m/s	22,7	34,6		22,9	26,5	27,4
Temperature	^oC	149,0	126,5		134,6	123,4	124,9
Pressure	mBar	933,8	935,6		916,3	929,6	914,2

2.8 Continuous Emission Monitors

2.8.1 Reliability

The emitted pollutant tonnages for October 2022 are provided in table 6. CO_2 values for units 2, 4 and 5 were calculated per balance, from O_2 values, due to analyser providing unreliable data. Averaged values for CO_2 were used for Unit 1 on 25-26 October 2022 due to unreliable data from analysers. Averaged quality assurance level 2 test values for O_2 were used for Unit 1 and 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. Unit 3 has been on Outage since August 2022.

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

Associated Unit/Stack	PM	SO_2	NO
Unit 1	100,0	100,0	98,7
Unit 2	100,0	0,0	89,8
Unit 3	Unit Off	Unit Off	Unit Off
Unit 4	100,0	100,0	100,0
Unit 5	100,0	100,0	96,9
Unit 6	100,0	99,6	99,6

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

- Unit on outage

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

Correlation curves for Unit 1, Unit 5, and Unit 6 are currently outstanding. Quality assurance level 2 curves are outstanding for unit 1, unit 3, unit 4, unit 5 and unit 6. The new tests have been completed however, due to errors and disputes identified in the test reports during the review process updated curves have not yet been implemented. The disputes and corrections are being addressed by Matimba and the service provider and new curves will be implemented as soon as they are confirmed to be correct.

2.9 Units Start-up information

Table 10: Start-up information

Unit	1	
Fires in	2022/10/25	04h46
Synchronization with Grid	2022/10/25	06h24
Emissions below limit	2022/10/25	06h24
Fires in to synchronization	1,63	HOURS
Synchronization to < Emission limit	0	HOURS

Unit	5	
Fires in	2022/10/05	10h49
Synchronization with Grid	2022/10/05	15h51
Emissions below limit	2022/10/06	04h10
Fires in to synchronization	5.03	HOURS
Synchronization to < Emission limit	12.32	HOURS

Unit	5	
Fires in	2022/10/30	19h52
Synchronization with Grid	2022/10/31	01h34
Emissions below limit	2022/10/31	03h35
Fires in to synchronization	5.7	HOURS
Synchronization to < Emission limit	2,02	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	420,4	422,0167	0	422,0167	422,0167	422,0167
Emergency Hours declared including hours after stand down	422,4	424,0167	0	424,0167	424,0167	424,0167
Days over the Limit during Emergency Generation	0	1	0	5	0	3

Unit 2 exceeded the 50mg/Nm^3 limit for one day during emergency generation, on 23 October 2022. Unit 4 exceeded the 50mg/Nm^3 limit for five days during emergency generation, on 17, 19, 20, 26 and 29 October 2022. Unit 6 exceeded the 50mg/Nm^3 limit for three days during emergency generation, on 13, 14 and 15 October 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. The report will be send through as soon as it is available.

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

- Unit on outage

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.
- 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 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 meters 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 meters consist of 3 flues

3. Attachments

Marapong Monthly Report_October 2022

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

GENERAL MANAGER: MATIMBA POWER STATION