Eskom	Matimba Power Station Emissions report	Matimba Power Station

Title: **Matimba Power Station October 2021 emissions report**

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Compiled by	Functional Responsibility	Authorized by
WC Mocke	**MC Mamabolo**	**JL Janse van Rensburg**
Environmental Officer	**Environmental Manager**	**General Manager**
Date: 2021/12/09	Date: 15/12/2021	Date: 2021-12-15

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1. Report Summary

Matimba Power Station was issued with an Atmospheric Emission License (12/4/12L-W4/A4) in March 2020. Condition 7.7.1 of the License requires the license holder to submit monthly reports to the Department. This report contains the required information as specified in condition 7.7.1 for October 2021.

During the period under review, Matimba experienced 22 exceedances of the daily particulate matter emission limit (50mg/Nm^3) all these exceedances remained within the 48 hour grace period. No exceedances of the monthly SO_x limit (3500mg/Nm^3) or the daily NO_x limit (750 mg/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	972 196
	Fuel Oil	Tons/month	1 200	1165,837
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate**
	Energy	GWh	4 212.6	1 765,934

The coal and fuel oil consumptions rates for the month of October 2021 were within the permitted maximum limit. An increased amount of fuel oil was used due to multiple unit trips and start-ups.

2.2 Abatement technology

Table 2: Abatement Equipment Control Technology Utilised

Associated Unit	Technology Type	Minimum utilisation (%)	Efficiency (%)
Unit 1	Electrostatic Precipitator	100%	Unit on Outage
Unit 2	Electrostatic Precipitator	100%	99,87%
Unit 3	Electrostatic Precipitator	100%	99,87%
Unit 4	Electrostatic Precipitator	100%	99,88%
Unit 5	Electrostatic Precipitator	100%	99,91%
Unit 6	Electrostatic Precipitator	100%	99,87%
Associated Unit	**Technology Type**	**Minimum utilisation (%)**	**Actual Utilisation (%)**
Unit 1	SO_3 Plant	100%	Unit on Outage
Unit 2	SO_3 Plant	100%	93,55%
Unit 3	SO_3 Plant	100%	100%
Unit 4	SO_3 Plant	100%	100%
Unit 5	SO_3 Plant	100%	100%
Unit 6	SO_3 Plant	100%	93,55%

Fluegas conditioning plant availability was below the required 100% for unit 2 and unit 6 due to unexpected breakdowns.

2.3 Energy source characteristics

Table 3: Energy Source Material Characteristics.

	Characteristic	Stipulated Range (Unit)	Monthly Average Content
Coal burned	**Sulphur Content**	0.8-1.6%	1,22%
	Ash Content	30-40%	34,813%

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

Interpretation:

Unit 1 was on outage for the whole duration of October 2021.

Unit 2 Particulate Emissions

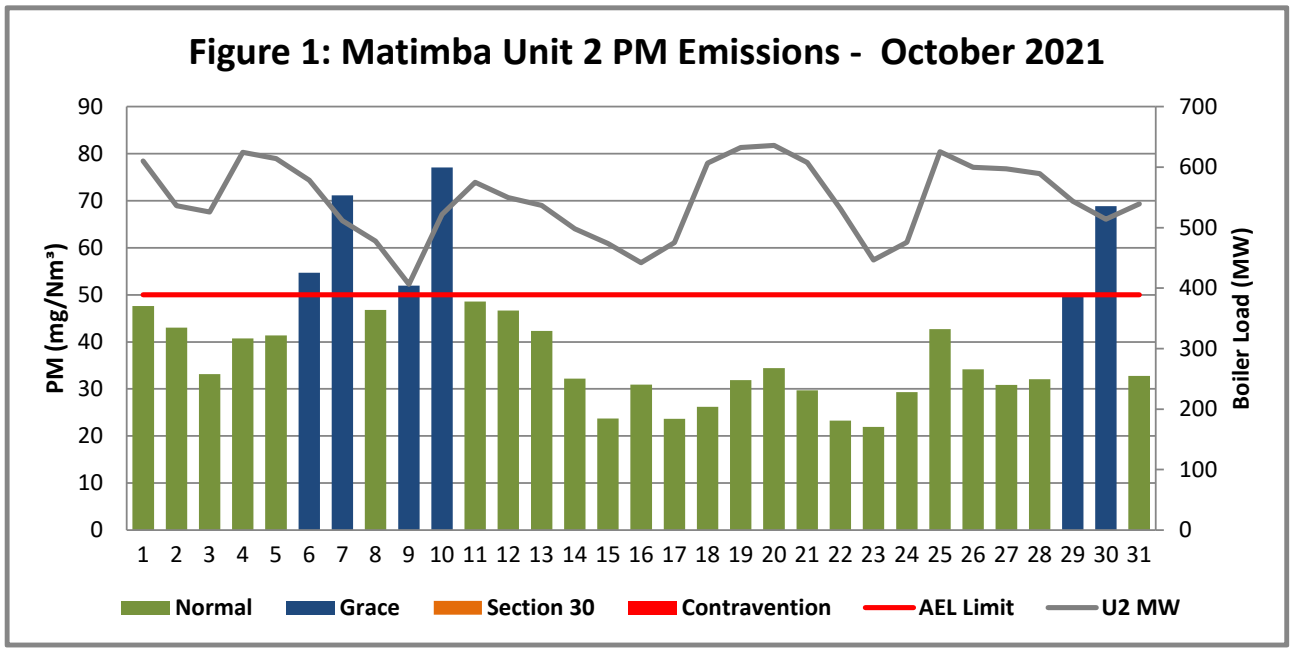

Figure 1: Particulate matter daily average emissions against emission limit for unit 2 for the month of October 2021

Interpretation:

Unit 2 exceeded the 50mg/Nm^3 emission limit on 6, 7, 9, 10, 29 and 30 October 2021. The exceedances that occurred from 6-10 October 2021 were due to unexpected failures that occurred on the dust handling plant. The exceedances that occurred on 29 and 30 October 2021 was due to maintenance activities that occurred within the dust handling plant. These breakdowns and maintenance activities caused ash build-up in the flue gas cleaning system. This reduced the efficiency of the particulate matter abatement technology. The plant was repaired and emissions returned to below the limit. All exceedances remained within the 48 hour grace period.

Unit 3 Particulate Emissions

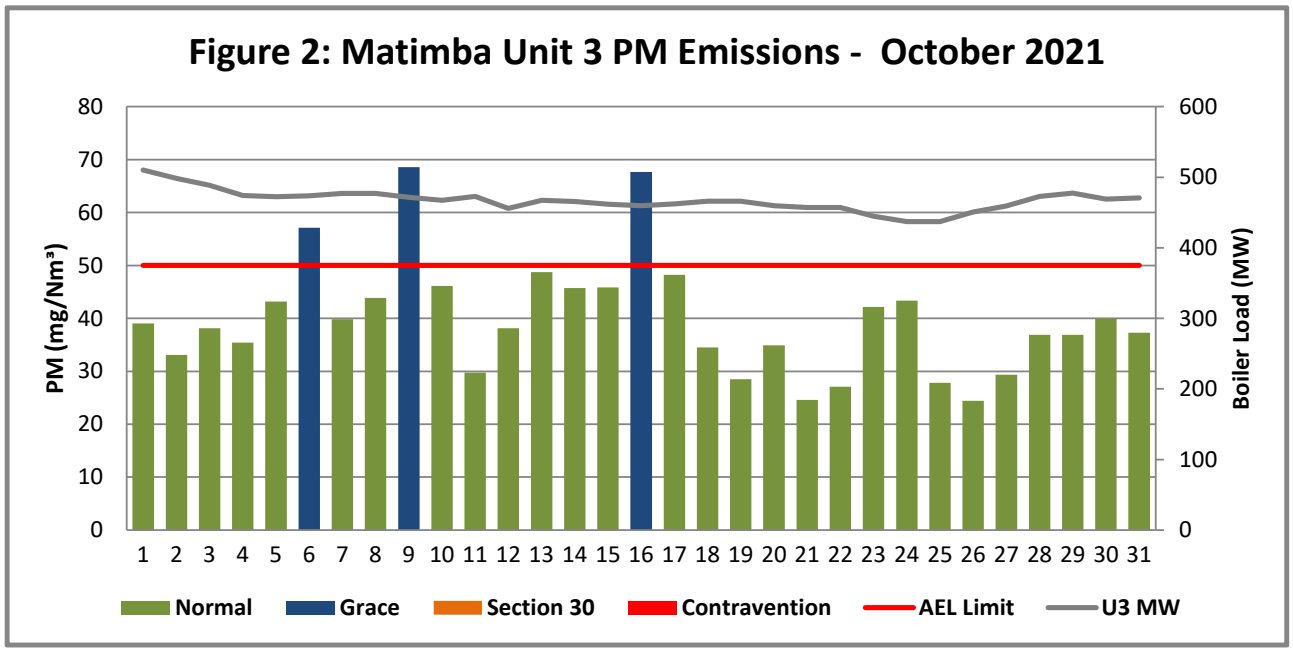

Figure 2: Particulate matter daily average emissions against emission limit for unit 3 for the month of October 2021

Interpretation:

Unit 3 exceeded the daily limit of 50mg/Nm^3 on 6, 9 and 16 October 2021. The exceedances were due to damage that was incurred on the precipitator plant from increased ash in the flue gas cleaning system. The ash build-up was due to unplanned breakdowns on the dust handling and ash conveyancing plants. The unit was shut down on 27 November 2021 in order to do necessary repairs on the precipitator plant. The exceedances did not exceed the 48 hour grace period.

Unit 4 Particulate Emissions

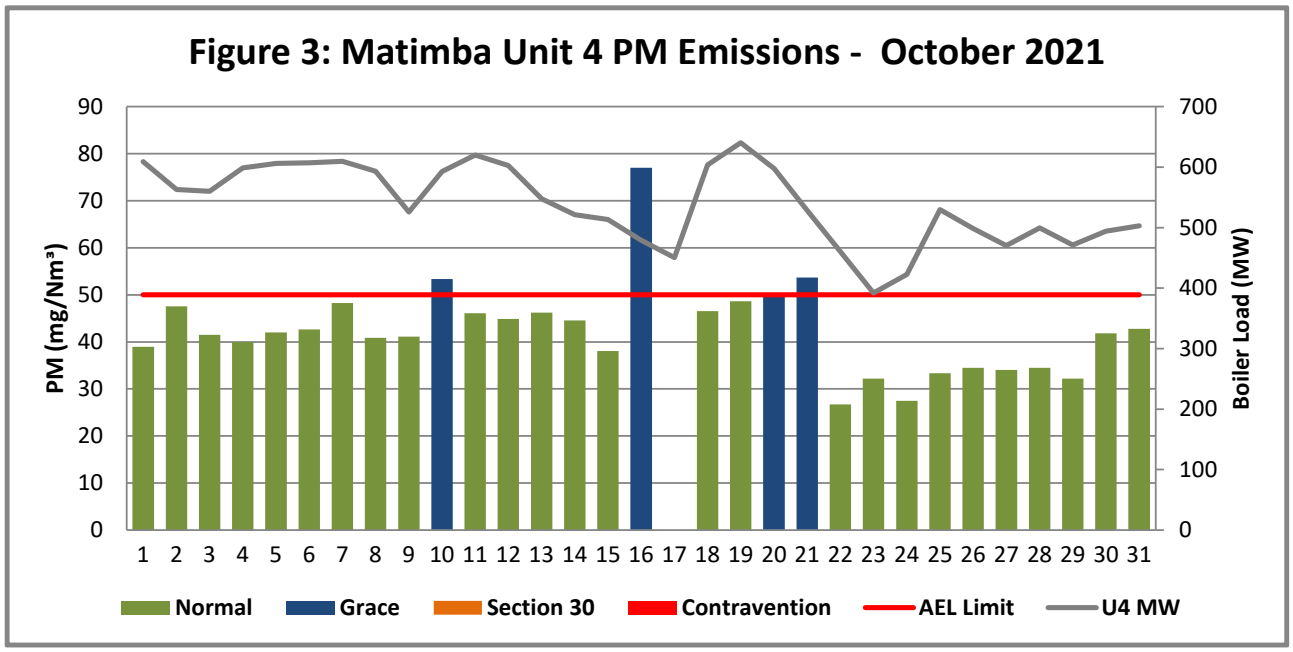

Figure 3: Particulate matter daily average emissions against emission limit for unit 4 for the month of October 2021

Interpretation:

Unit 4 exceeded the daily limit of 50mg/Nm^3 on 10, 16, 20 and 21 October 2021. The exceedances were due to unexpected failures that occurred on the dust handling plant which caused ash build-up in the flue gas cleaning system. This reduced the efficiency of the particulate matter abatement technology. The plant was repaired and emissions returned to below the limit. All exceedances remained within the 48 hour grace period.

Unit 5 Particulate Emissions

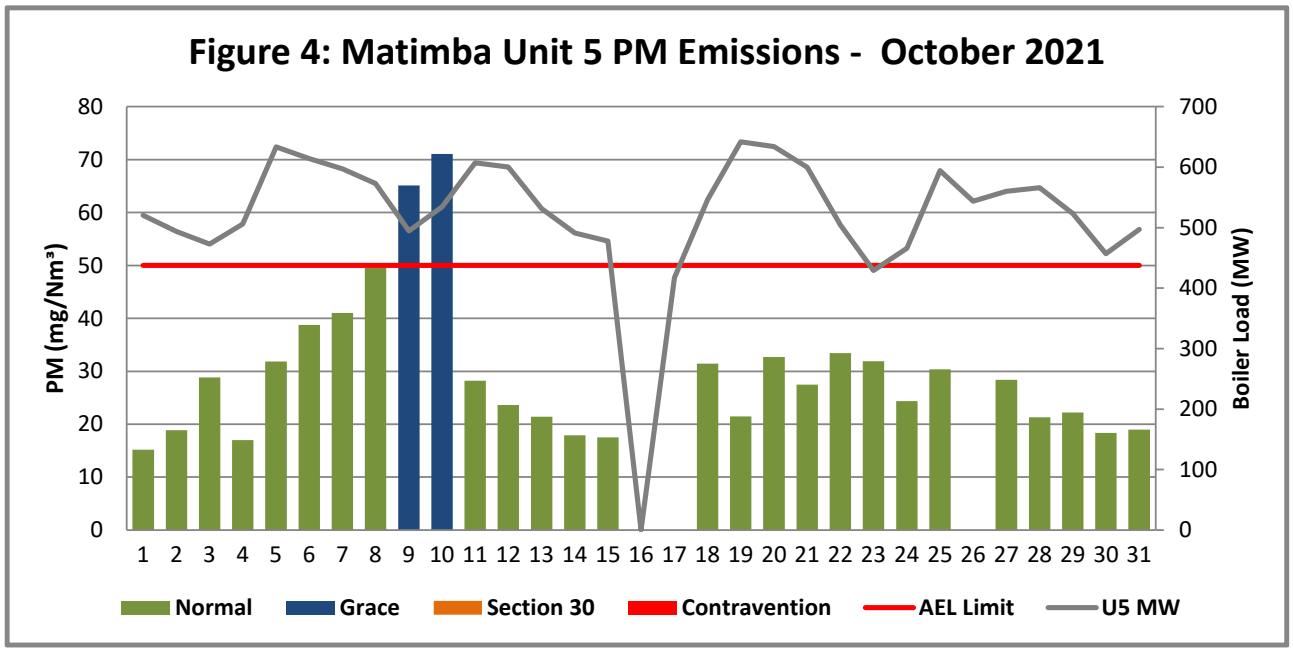

Figure 4: Particulate matter daily average emissions against emission limit for unit 5 for the month of October 2021

Interpretation:

Unit 5 exceeded the daily limit of 50mg/Nm^3 on 9 and 10 October 2021. The exceedances were due to unexpected failures that occurred on the dust handling plant which caused ash build-up in the flue gas cleaning system. This reduced the efficiency of the particulate matter abatement technology. The plant was repaired and emissions returned to below the limit. All exceedances remained within the 48 hour grace period.

Unit 6 Particulate Emissions

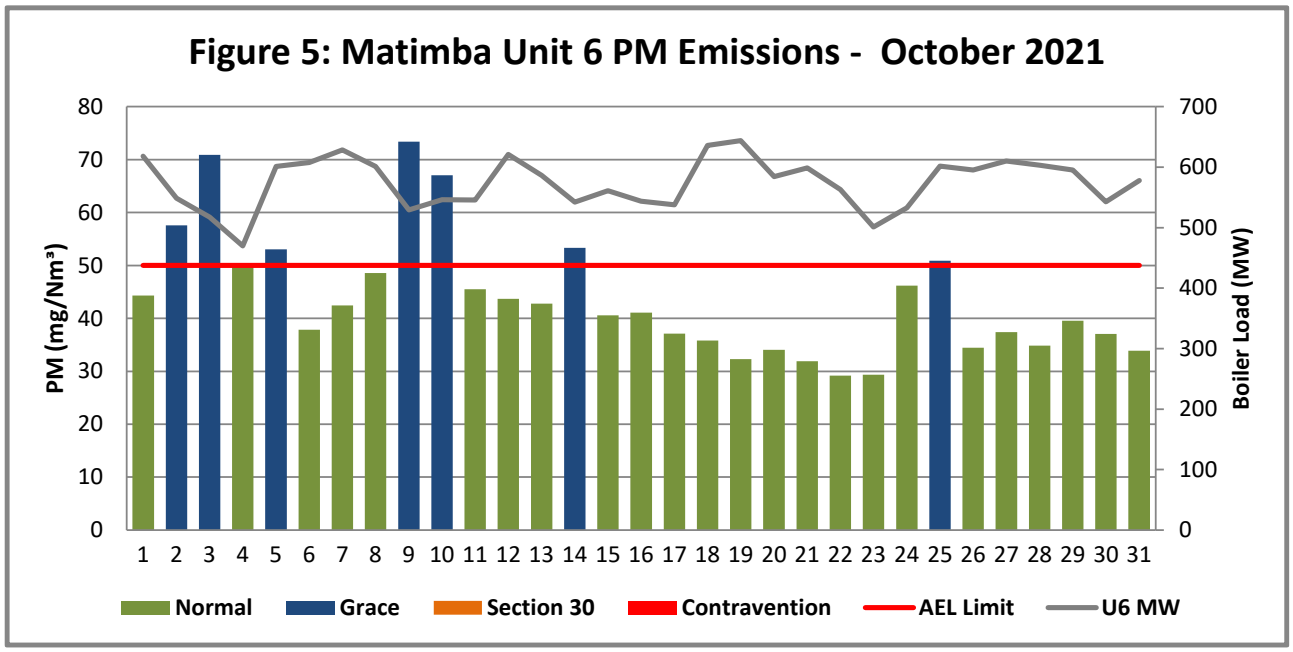

Figure 5: Particulate matter daily average emissions against emission limit for unit 6 for the month of October 2021

Interpretation:

Unit 6 exceeded the daily limit of 50mg/Nm^3 on 2, 3, 5, 9, 10, 14 and 25 October 2021. The exceedances that occurred on 2, 3, 5, and 25 October 2021 were due to unexpected failures that occurred on the dust handling plant which caused ash build-up in the flue gas cleaning system. The exceedances that occurred on 9, 10, and 14 October 2021 were due to breakdowns that occurred on the Sulphur plant. This reduced the efficiency of the particulate matter abatement technology. The plant was repaired and emissions returned to below the limit. All exceedances remained within the 48 hour grace period.

2.4.2 Gaseous Emissions

Unit 1 SO_2 Emissions

Interpretation:

Unit 1 was on outage for the whole duration of October 2021.

Unit 2 SO_2 Emissions

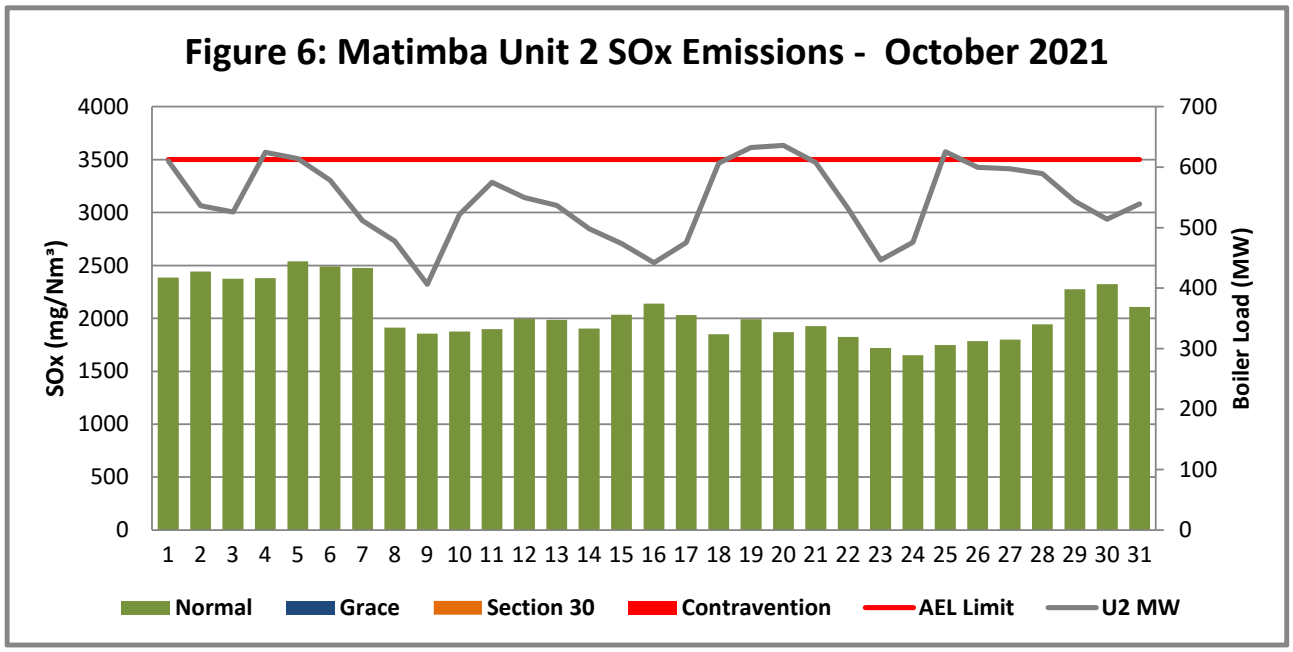

Figure 6: SO2 daily average emissions against emission limit for unit 2 for the month of October 2021

Interpretation:

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

Unit 3 SO_2 Emissions

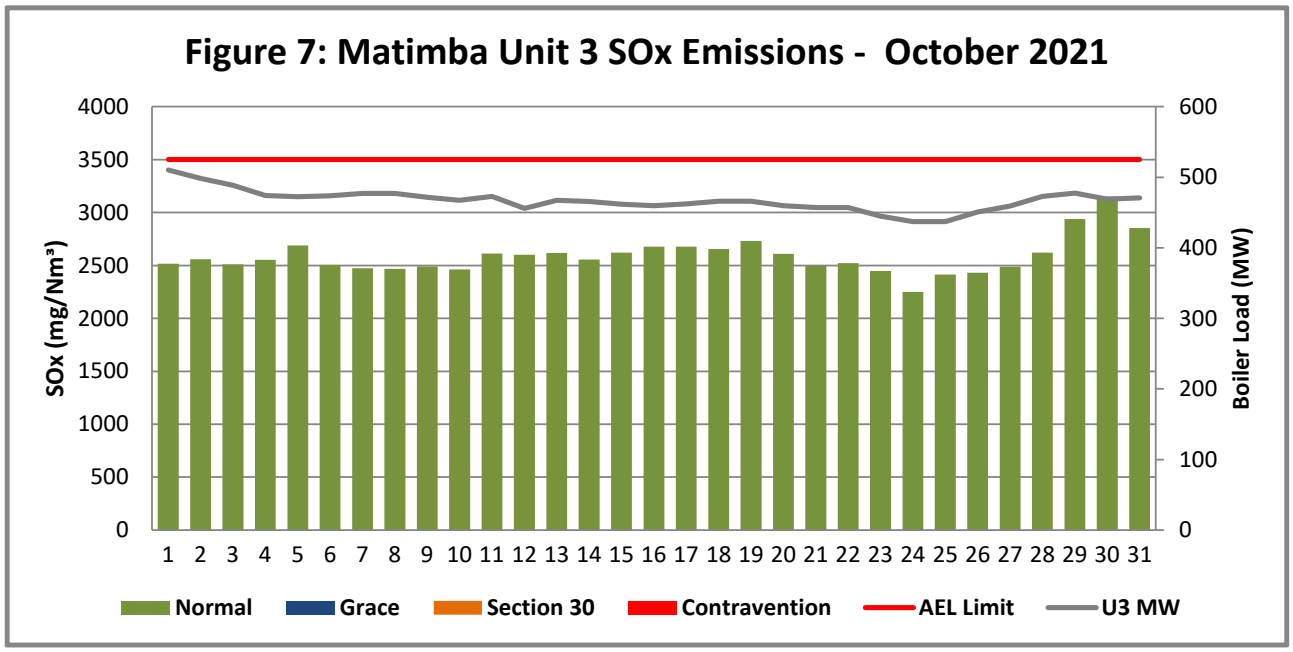

Figure 7: SO2 daily average emissions against emission limit for unit 3 for the month of October 2021

Interpretation:

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

Unit 4 SO_2 Emissions

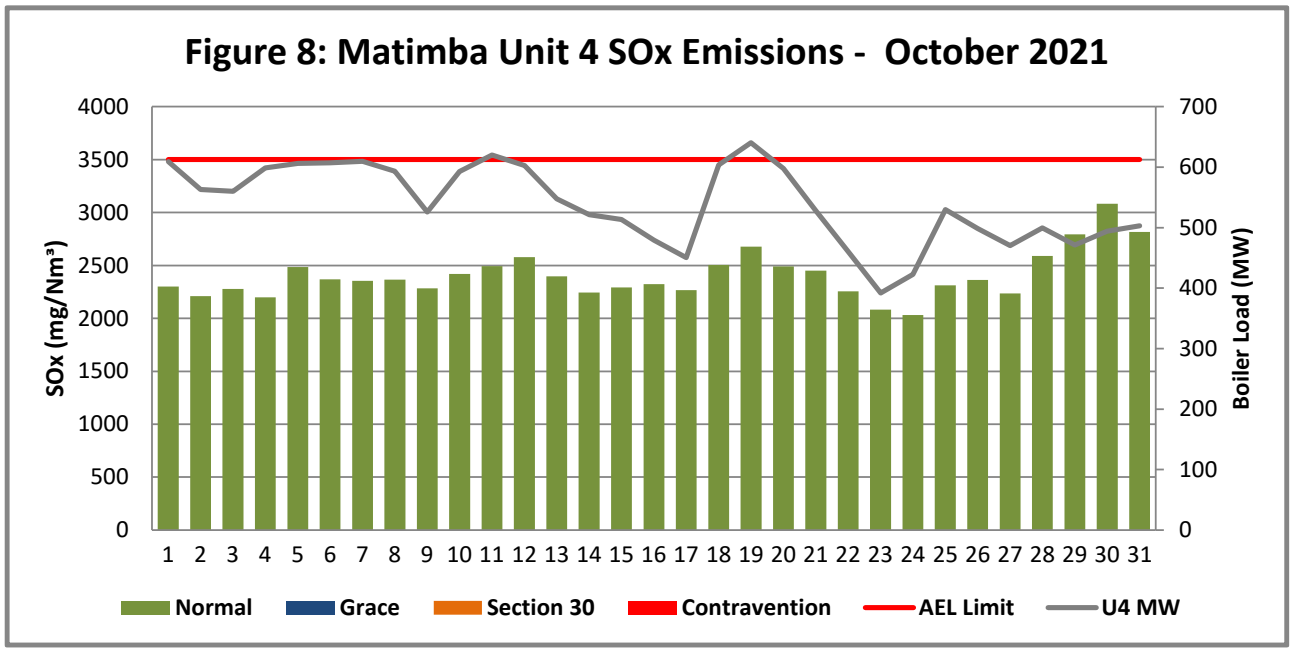

Figure 8: SO2 daily average emissions against emission limit for unit 4 for the month of October 2021

Interpretation:

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

Unit 5 SO_2 Emissions

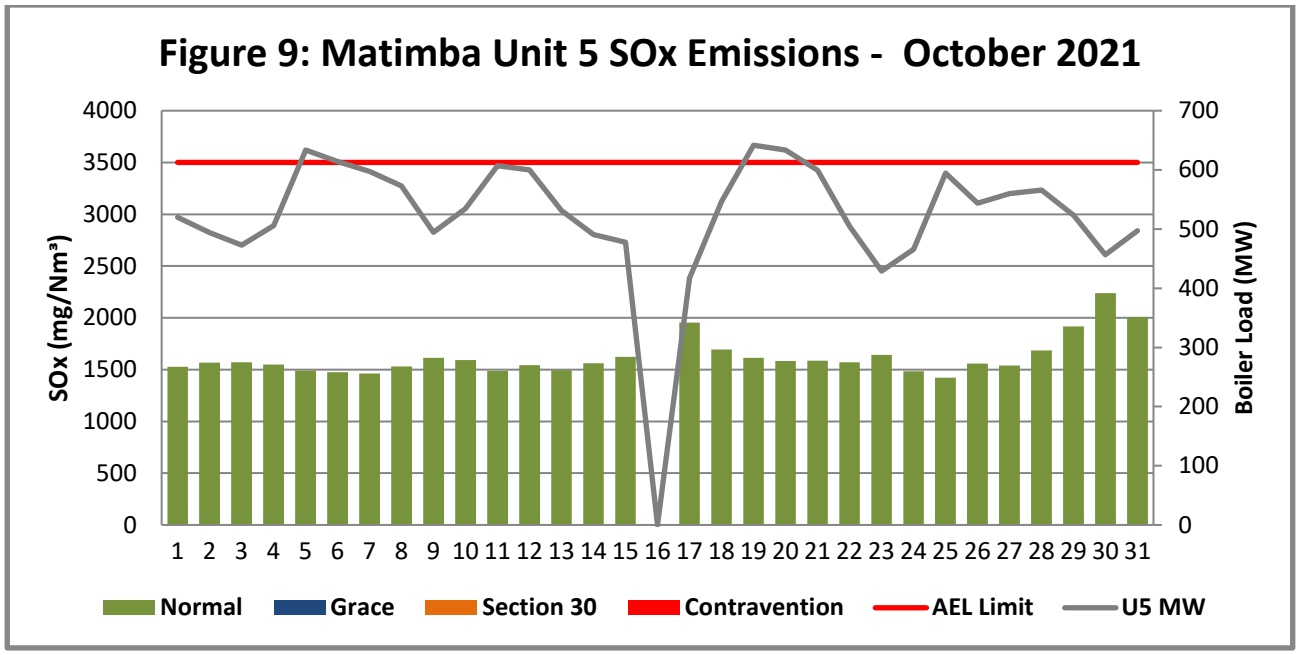

Figure 9: SO2 daily average emissions against emission limit for unit 5 for the month of October 2021

Interpretation:

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

Unit 6 SO_2 Emissions

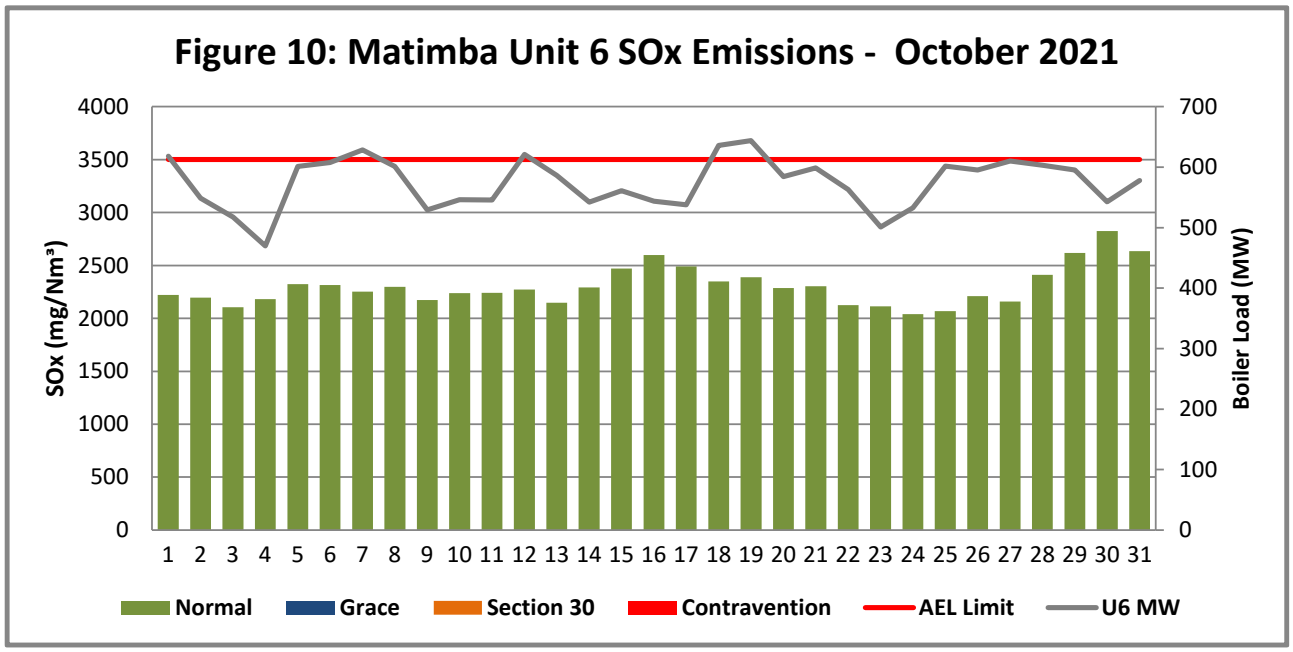

Figure 10: SO2 daily average emissions against emission limit for unit 6 for the month of October 2021

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

Interpretation:

Unit 1 was on outage for the whole duration of October 2021.

Unit 2 NO_x Emissions

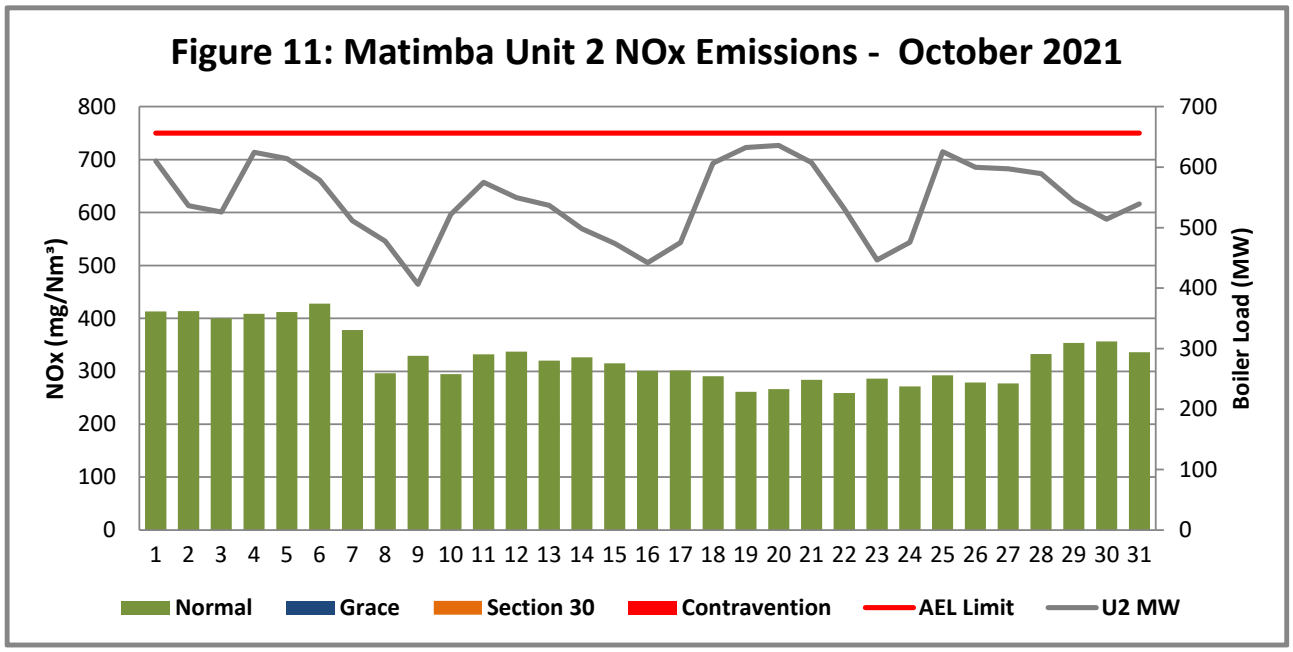

Figure 11: NOx daily average emissions against emission limit for unit 2 for the month of October 2021

Interpretation:

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

Unit 3 NO_x Emissions

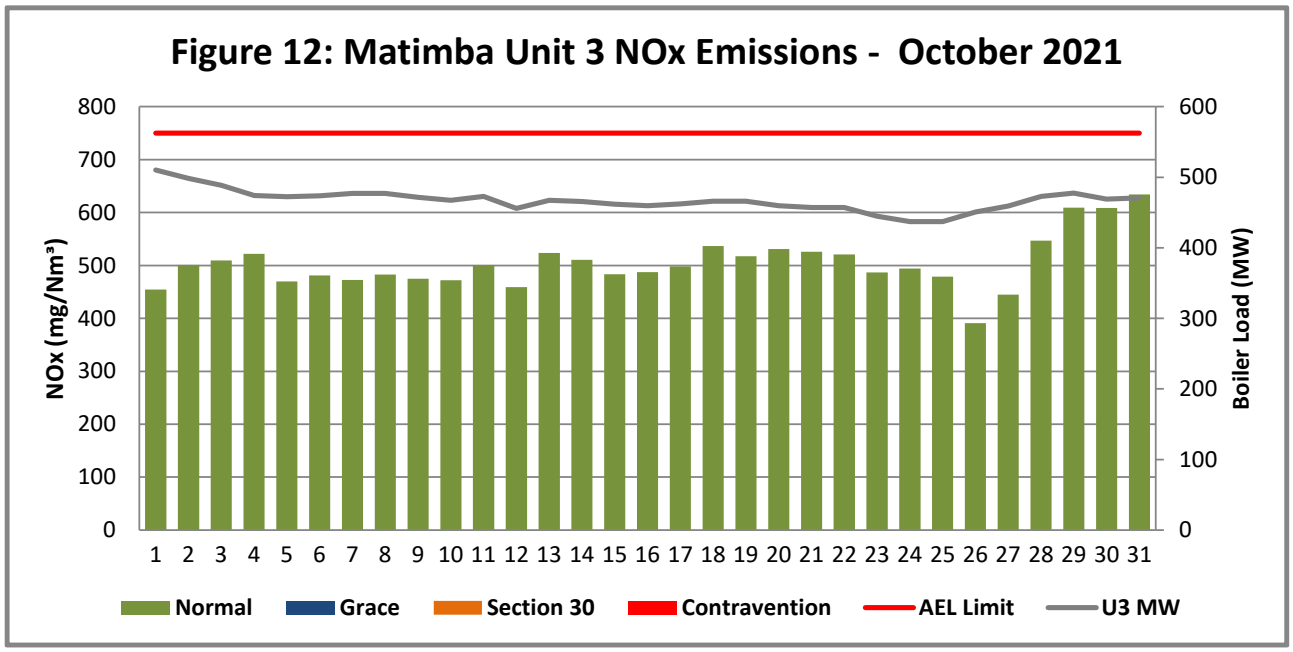

Figure 12: NOx daily average emissions against emission limit for unit 3 for the month of October 2021

Interpretation:

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

Unit 4 NO_x Emissions

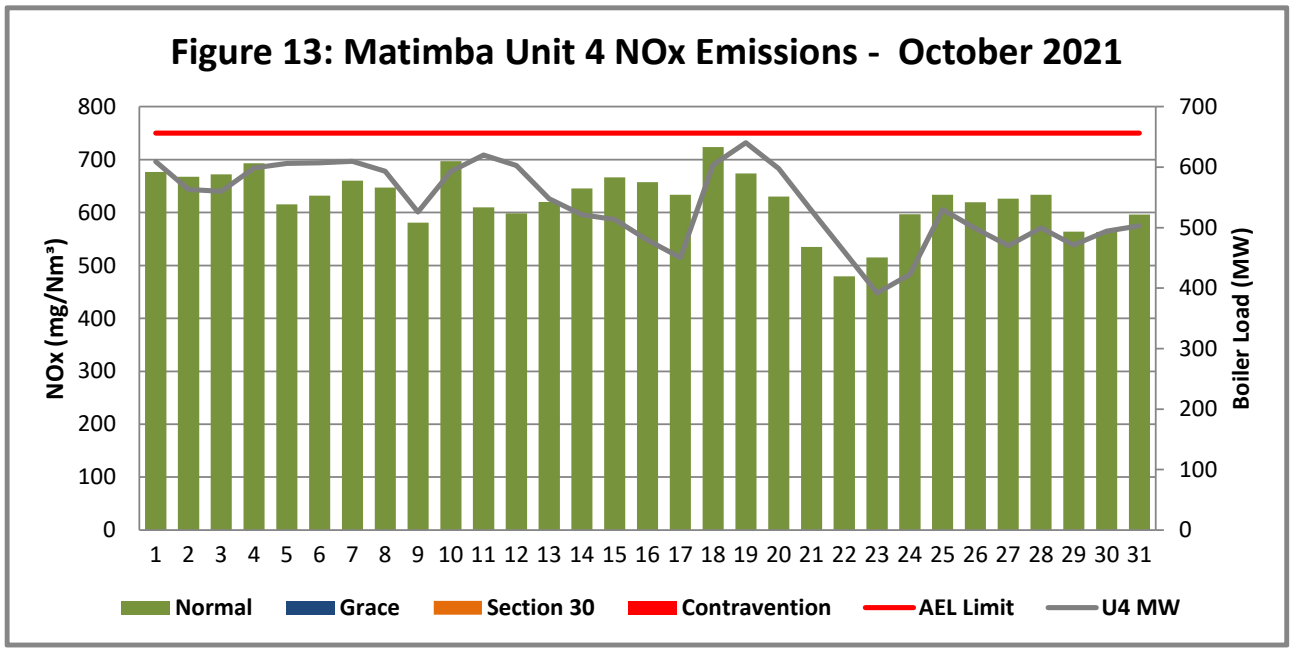

Figure 13: NOx daily average emissions against emission limit for unit 4 for the month of October 2021

Interpretation:

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

Unit 5 NO_x Emissions

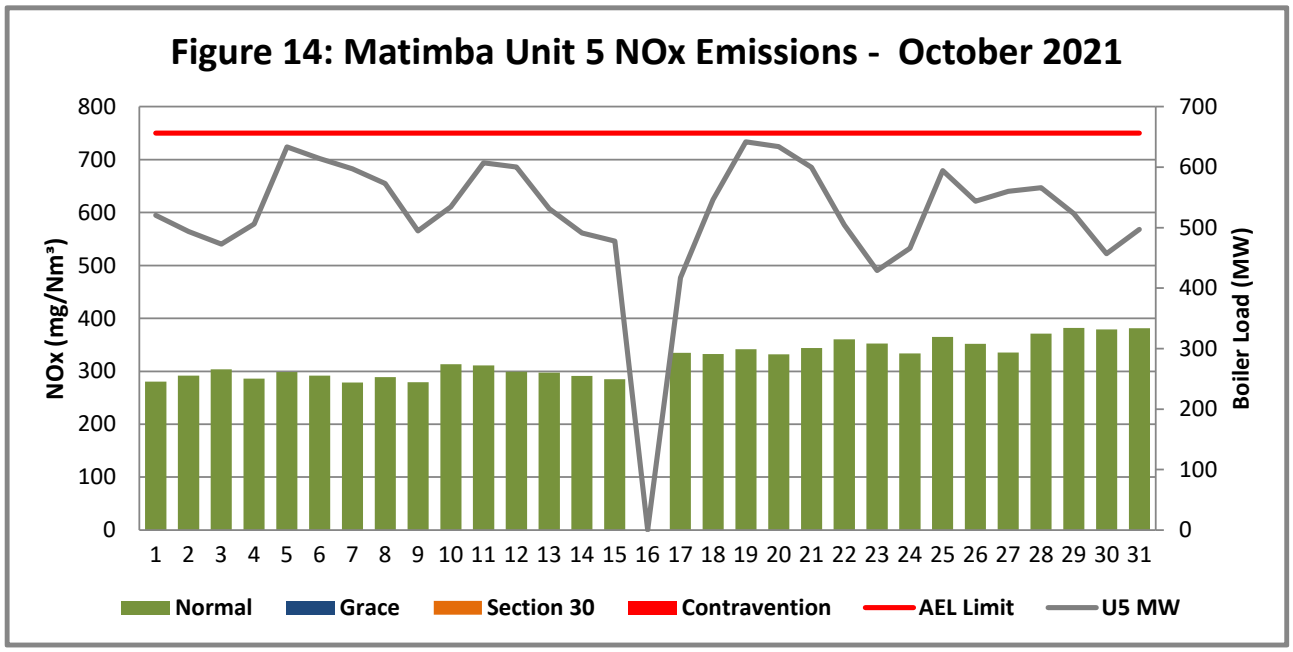

Figure 14: NOx daily average emissions against emission limit for unit 5 for the month of October 2021

Interpretation:

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

Unit 6 NO_x Emissions

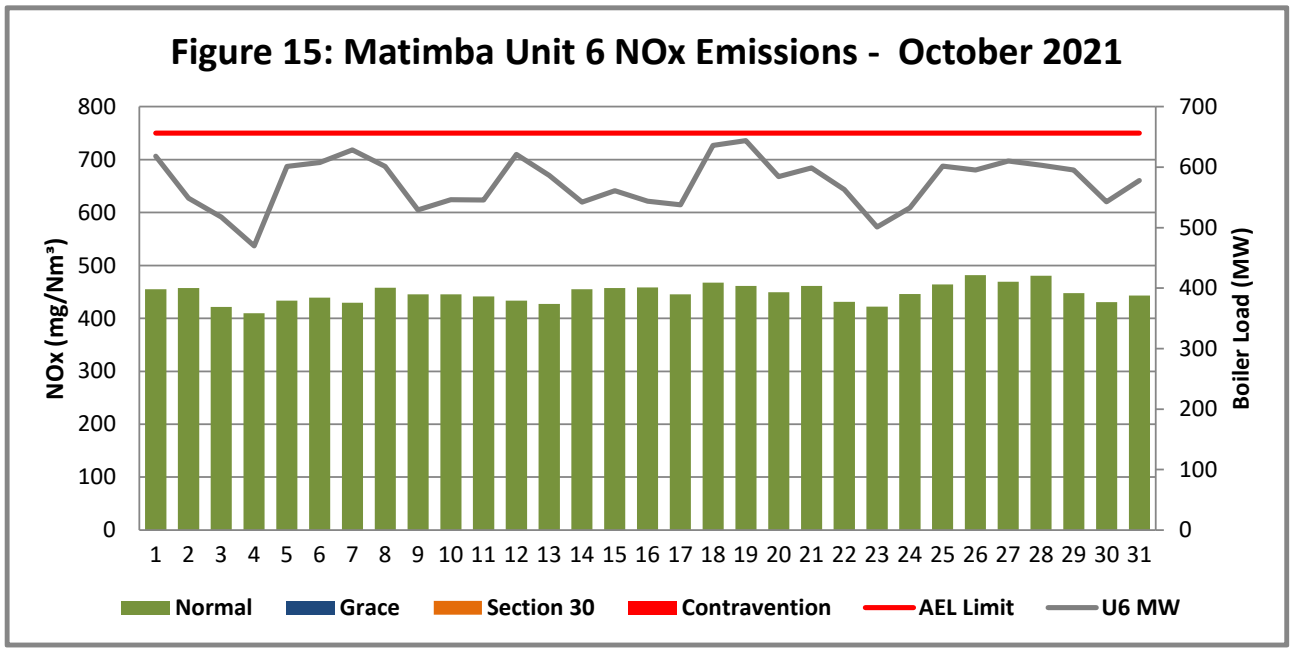

Figure 15: NOx daily average emissions against emission limit for unit 6 for the month of October 2021

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, 29 November 2021
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:	***1165,837***	
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:	0,03	kg/month
TOTAL LOSSES (Total TVOC Emissions for the month):	**0,63**	**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 October 2021

Date	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
2021/10/01	0	14442	12178	14561	12381	14716
2021/10/02	0	12705	11897	13455	11755	13101
2021/10/03	0	12386	11662	13385	8135	12316
2021/10/04	0	14774	11311	14302	11890	11152
2021/10/05	0	14525	11276	14484	15064	14255
2021/10/06	0	13728	11307	14499	14615	14443
2021/10/07	0	12085	11390	14563	14189	14954
2021/10/08	0	11291	11392	14192	13686	14331
2021/10/09	0	9650	11258	12608	11773	12607
2021/10/10	0	12267	11153	14117	12672	12953
2021/10/11	0	13607	11282	14810	14404	13002
2021/10/12	0	12950	10874	14404	14289	14750
2021/10/13	0	12713	11158	13131	12687	13372
2021/10/14	0	11789	11121	12433	11666	12901
2021/10/15	0	11217	11016	12274	10750	13279
2021/10/16	0	10446	10973	2364	0	12993
2021/10/17	0	11213	11029	8748	7537	12808
2021/10/18	0	14338	11122	14366	12931	15102
2021/10/19	0	14954	11121	15297	15260	15320
2021/10/20	0	15025	10965	14343	15081	13906
2021/10/21	0	14396	10900	11881	14305	14239
2021/10/22	0	12578	10901	11019	12029	13384
2021/10/23	0	10583	10625	9393	10238	11953
2021/10/24	0	11183	10432	10102	11074	12625
2021/10/25	0	14799	10430	12634	10074	14320
2021/10/26	0	14184	10748	11956	12556	14154
2021/10/27	0	14137	10962	11247	13375	14547
2021/10/28	0	13936	11271	11922	13424	14321
2021/10/29	0	12883	11398	11302	12500	14155
2021/10/30	0	12161	11193	11816	10890	12942
2021/10/31	0	12732	11229	12013	11798	13705

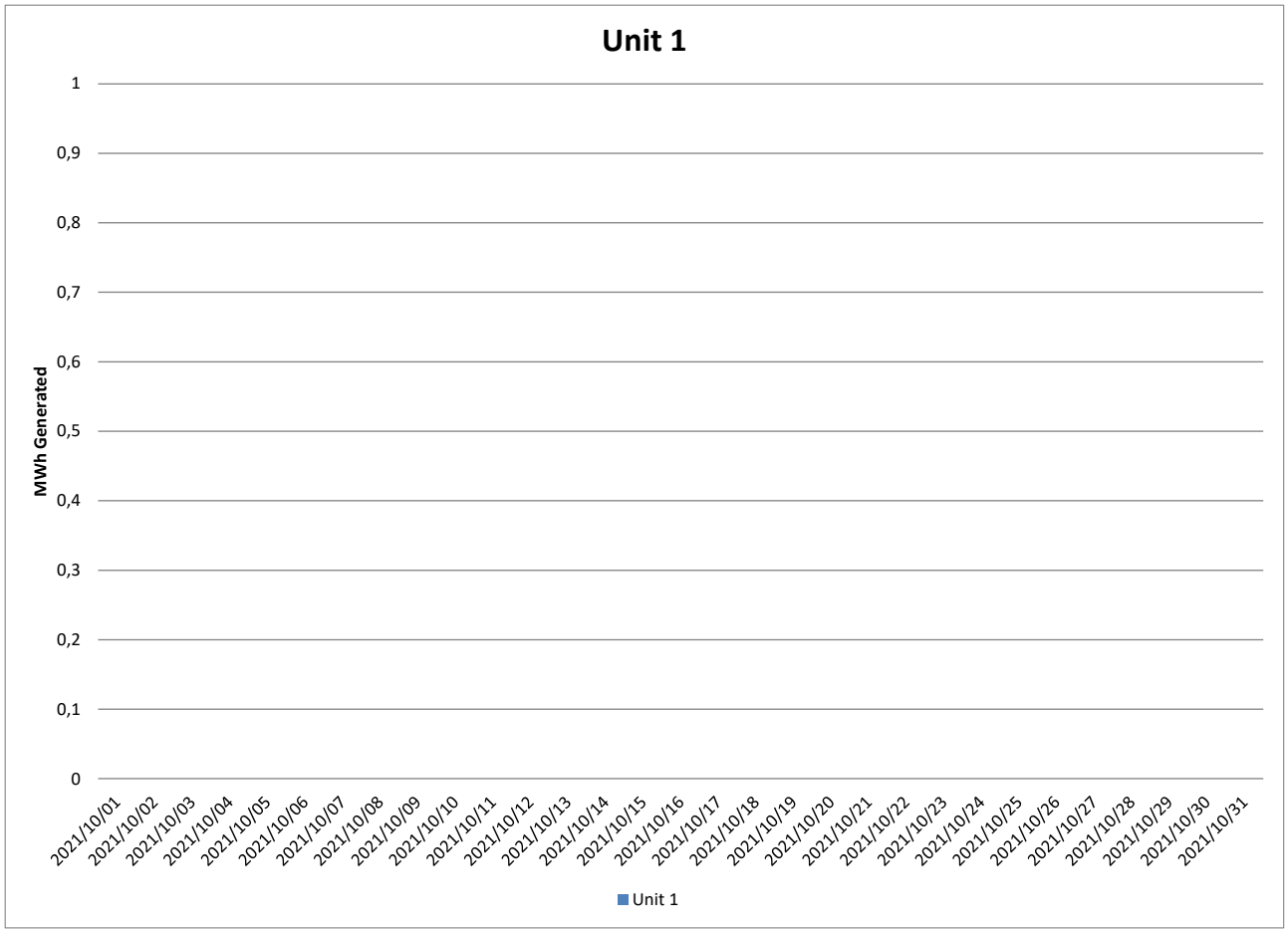

Figure 16: Unit 1 daily generated power in MWh for the month of October 2021

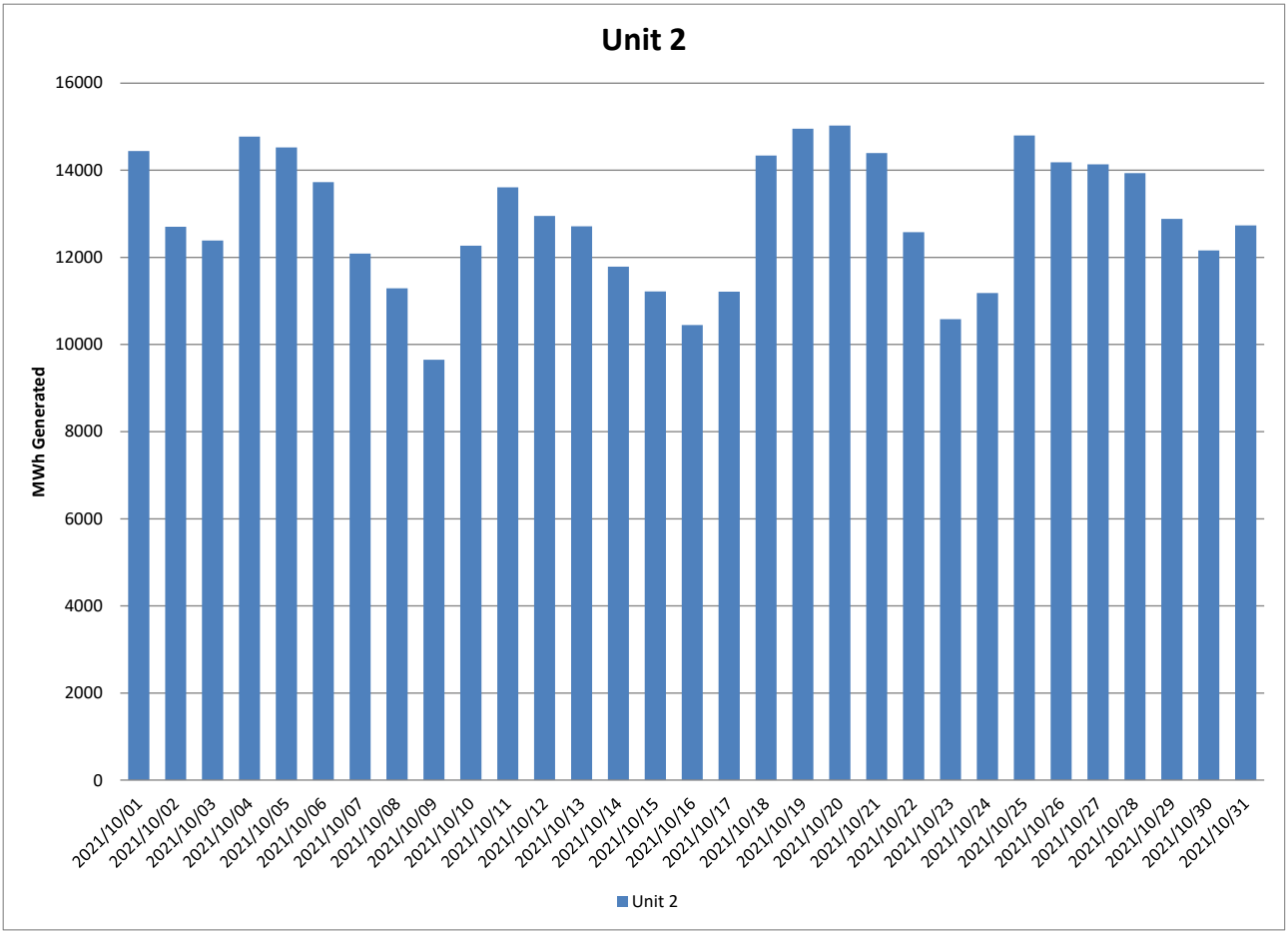

Figure 17: Unit 2 daily generated power in MWh for the month of October 2021

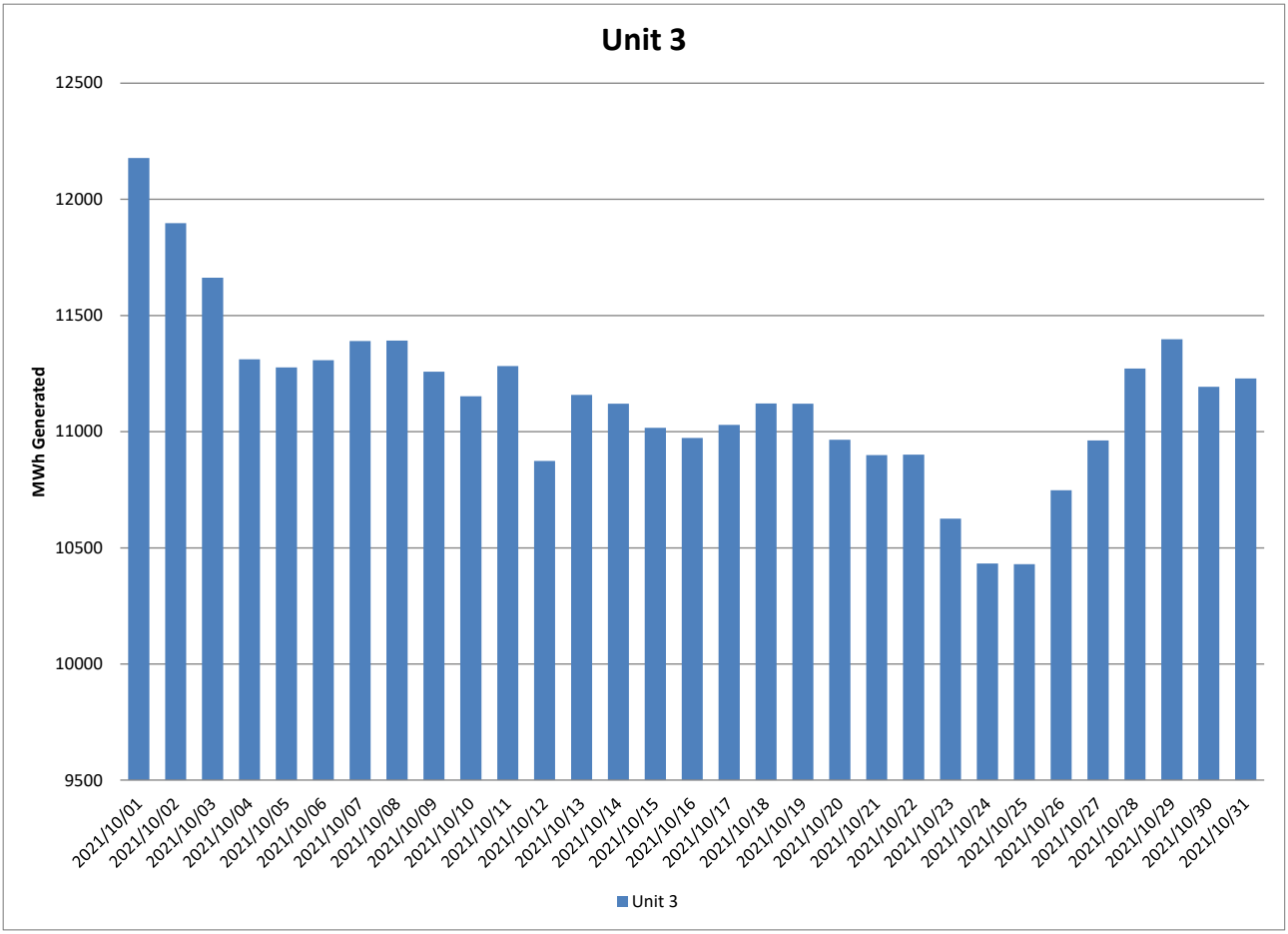

Figure 18: Unit 3 daily generated power in MWh for the month of October 2021

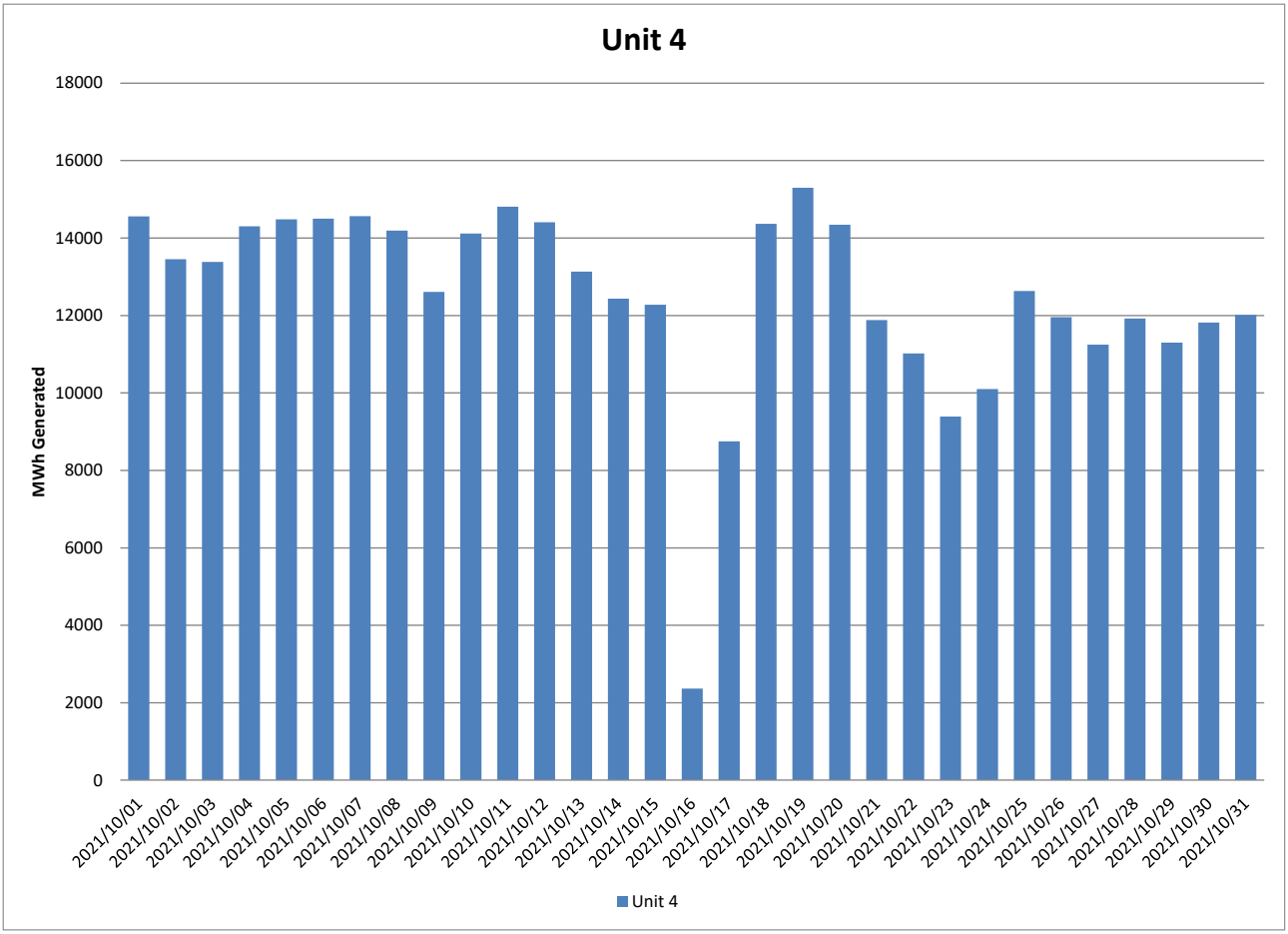

Figure 19: Unit 4 daily generated power in MWh for the month of October 2021

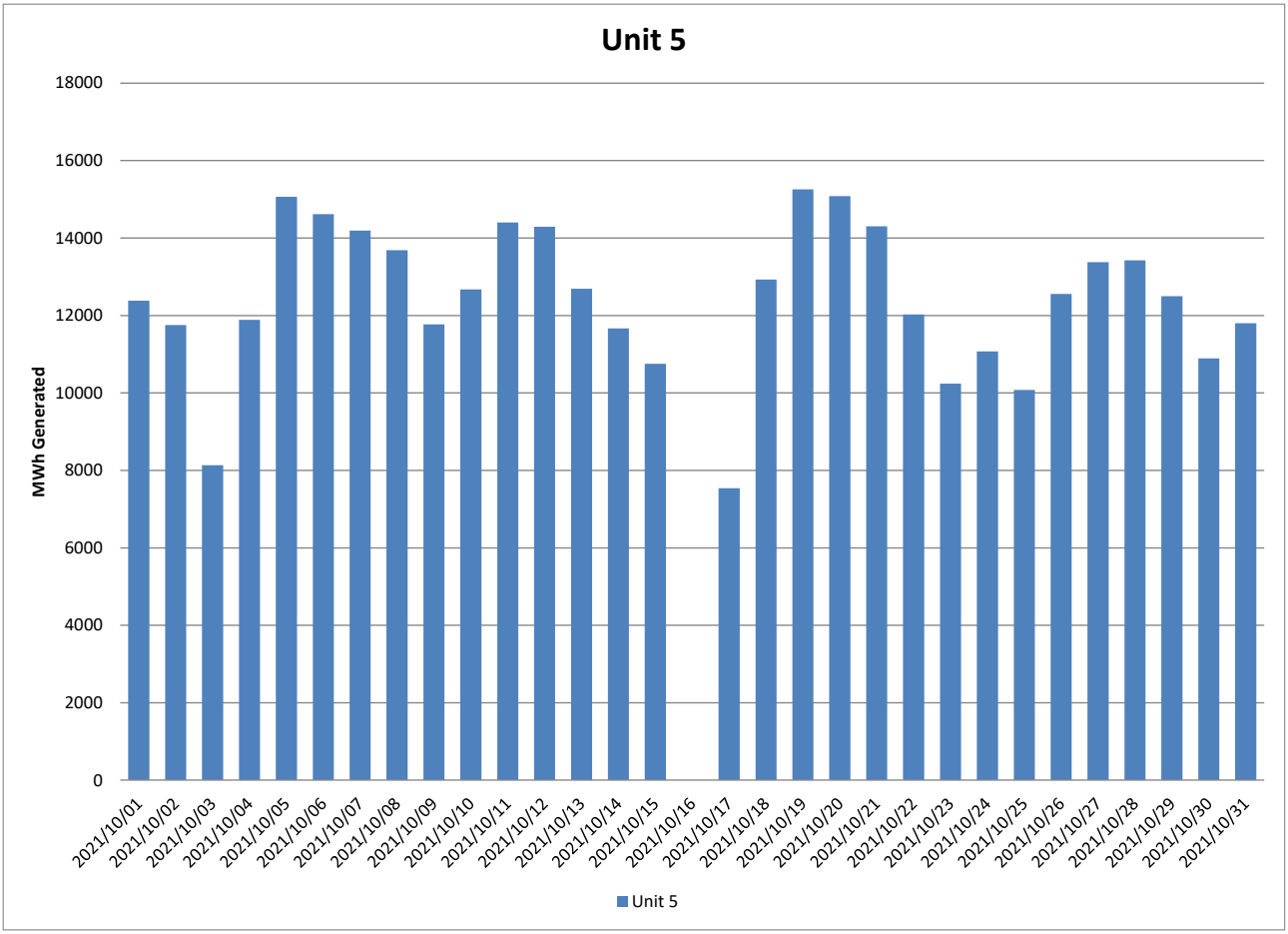

Figure 20: Unit 5 daily generated power in MWh for the month of October 2021

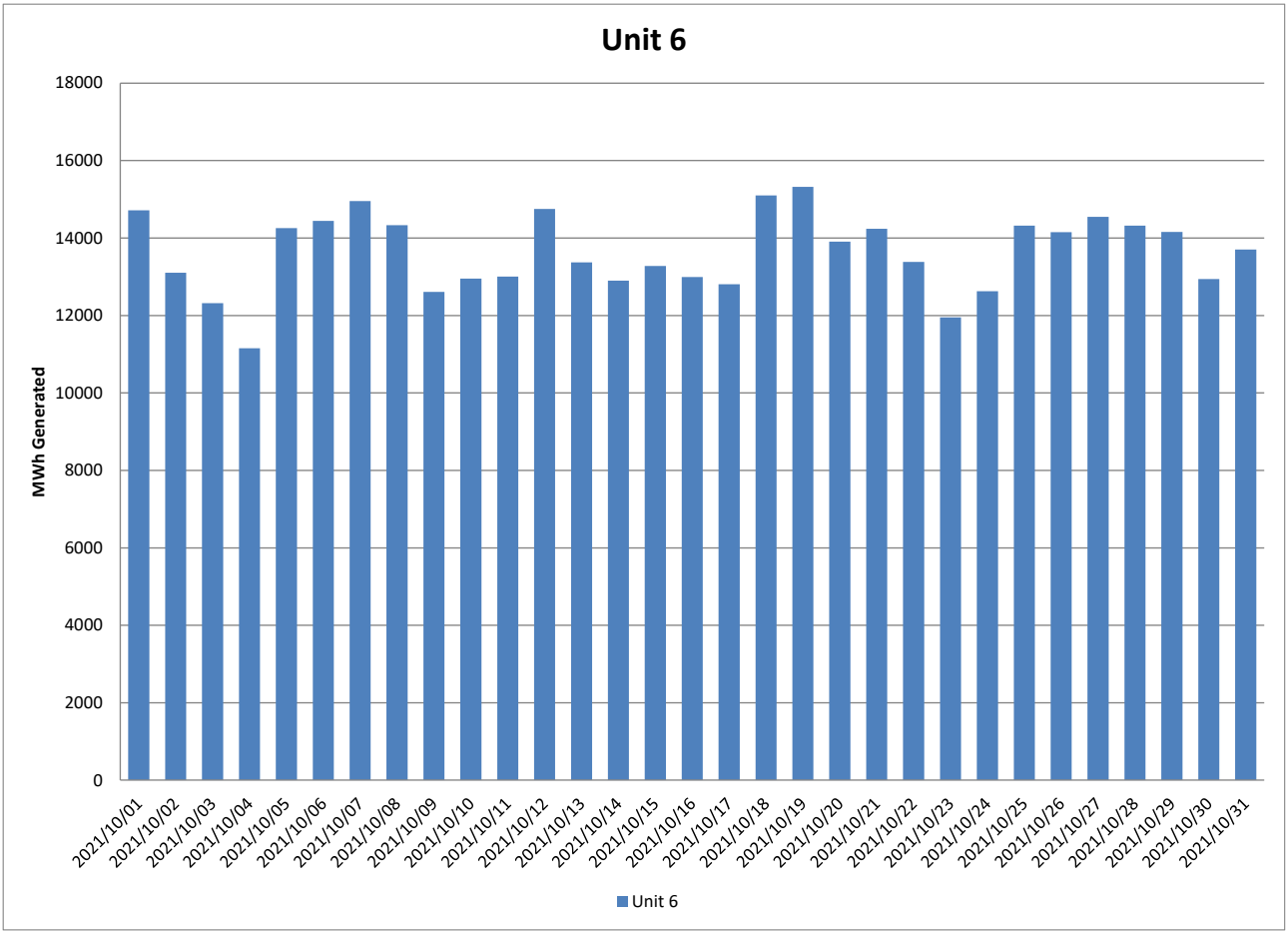

Figure 21: Unit 6 daily generated power in MWh for the month of October 2021

2.6 Pollutant Tonnages

The emitted pollutant tonnages for October 2021 are provided in table 6. Averaged Quality Assurance level 2 (QAL 2) values were used for unit 2 CO_2 data, CO_2 data for unit 3 and unit 5 was calculated by balance with oxygen readings and averaged values for CO_2 was used in particular days for unit 4 (9 October 2021, 14 to 17 October 2021 and 21 to 31 October 2021) and unit 6 (4 October 2021, 10 October 2021, 14 to 16 October 2021 and 29 to 31 October 2021). These averages and calculated values were used due to the data received from the monitor being unreliable and not a true reflection of the emissions within the specified times.

Table 6: Pollutant tonnages for the month of October 2021

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)	CO_2 (tons)
Unit 1	0,0	0,0	0,0	0
Unit 2	80,1	5 681,1	904,5	567 610
Unit 3	71,6	4 991,0	971,0	418 923
Unit 4	72,7	4 578,4	1 189,2	356 989
Unit 5	51,2	3 071,5	615,2	417 841
Unit 6	90,6	4 698,2	912,6	423 527
SUM	366,2	23 020,2	4 592,5	2 184 890

2.7 Reference values

Table 7: Reference values for data provided, October 2021

Compound / Parameter	Units of Measure	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Oxygen	%		6,77	8,10	8,02	7,55	7,56
Moisture	%		3,80	4,30	3,20	4,52	3,40
Velocity	m/s		26,3	24,8	25,0	24,0	27,3
Temperature	^{o}C		130,3	135,1	135,2	122,5	173,5
Pressure	mBar		1 114,3	917,7	919,8	931,3	920,8

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 were 100% available for October 2021 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 unit 2 CO_2 data, CO_2 data for unit 3 and unit 5 was calculated by balance with oxygen readings and averaged values for CO_2 was used in particular days for unit 4 (9 October 2021, 14 to 17 October 2021 and 21 to 31 October 2021) and unit 6 (4 October 2021, 10 October 2021, 14 to 16 October 2021 and 29 to 31 October 2021).

Table 8: Average percentage (%) availability of monitors for the month of October 2021.

Associated Unit/Stack	PM	SO_2	NO	CO_2
Unit 1				
Unit 2	100,0	95,8	89,9	0,0
Unit 3	100,0	99,7	99,7	0,0
Unit 4	99,9	100,0	100,0	48,4
Unit 5	96,4	100,0	100,0	0,0
Unit 6	100,0	100,0	100,0	74,2

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 October 2021.
- No downtime or repairs done on the particulate monitors

Unit 5

- Unit 5 gaseous emission monitor was repaired on 21 October 2021.
- No downtime or repairs done on the particulate monitors

Unit 6

- Unit 6 gaseous emission monitor was repaired on 21 October 2021.
- 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	4	
Fires in	16-10-2021	05h00
Synchronization with Grid	16-10-2021	22h29
Emissions below limit	17-10-2021	07h01
Fires in to synchronization	17,48	HOURS
Synchronization to < Emission limit	8,53	HOURS

Unit	4	
Fires in	17-10-2021	00h17
Synchronization with Grid	17-10-2021	04h29
Emissions below limit	17-10-2021	07h01
Fires in to synchronization	4,2	HOURS
Synchronization to < Emission limit	2,53	HOURS

Unit	4	
Fires in	21-10-2021	14h38
Synchronization with Grid	21-10-2021	16h02
Emissions below limit	21-10-2021	16h46
Fires in to synchronization	1,4	HOURS
Synchronization to < Emission limit	0,73	HOURS

Unit	5	
Fires in	03-10-2021	16h14
Synchronization with Grid	03-10-2021	17h44
Emissions below limit	03-10-2021	17h44
Fires in to synchronization	1,5	HOURS
Synchronization to < Emission limit	0	HOURS

Unit	5	
Fires in	03-10-2021	20h25
Synchronization with Grid	03-10-2021	23h55
Emissions below limit	04-10-2021	03h03
Fires in to synchronization	3,5	HOURS
Synchronization to < Emission limit	3,13	HOURS

Unit	5	
Fires in	17-10-2021	01h48
Synchronization with Grid	17-10-2021	05h44
Emissions below limit	17-10-2021	08h44
Fires in to synchronization	3,93	HOURS
Synchronization to < Emission limit	3	HOURS

Unit	5	
Fires in	25-10-2021	21h36
Synchronization with Grid	26-10-2021	00h40
Emissions below limit	26-10-2021	08h02
Fires in to synchronization	3,07	HOURS
Synchronization to < Emission limit	7,37	HOURS

Unit	6	
Fires in	13-10-2021	16h34
Synchronization with Grid	13-10-2021	17h38
Emissions below limit	13-10-2021	17h38
Fires in to synchronization	1,07	HOURS
Synchronization to < Emission limit	0	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	0	382	382	382	382	382
Emergency Hours declared including hours after stand down	0	389	389	389	389	389
Days over the Limit during Emergency Generation	0	0	0	2	0	1

Unit 4 exceeded the 50mg/Nm^3 limit during emergency generation on the 20 and 21 October 2021. Unit 6 exceeded the 50mg/Nm^3 limit during emergency generation on 2 October 2021. 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

One exceedances of the SO_2 10-minute limit, six exceedances of the $PM_{2.5}$ daily limit and ten exceedances of the PM_{10} daily limit were noted. No other parameters exceeded the set limits during the monitoring period.

Ambient CO, PM2.5, PM10 and NO2 concentrations at Marapong monitoring site show influence of emissions from low level sources in the area while ambient Hg show influence of emissions from low level sources, tall stack emitters and other industrial activities. Ambient SO2 concentrations show influence of emissions from tall stack emitters and other industrial activities.

The average data recovery for the period was 51% and the station availability was 64,5%.

Detailed results can be found in Attachment 1, “Marapong Monthly Report_October 2021”.

2.14 Electrostatic precipitator and Sulphur plant status

Unit 1

- All precipitator fields in service.
- 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

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

Unit 4

- 6 out of 32 precipitator fields is out of service.
- 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

GENERAL MANAGER: MATIMBA POWER STATION