Eskom	Matimba Power Station Emissions report	Matimba Power Station

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

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Date: 2022/01/27	Date: 27/01/2022	Date: 2022-01-28

Content

Figures

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 December 2021.

During the period under review, Matimba experienced 12 exceedances of the daily particulate matter emission limit (50mg/Nm^3) 1 of these exceedances occurred outside of the 48 hour grace period and were reported as a section 30 incident. No exceedances of the monthly SO_x limit (3500mg/Nm^3) or the daily NO_x limit (750 mg/Nm^3) occurred.

The monthly fuel oil usage limit of 1200 tons/month was exceeded with a monthly consumption rate of 1416 tons for December 2021. The exceedance was due to multiple unit start-ups on units 1, 2, 3 and 6.

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	1 093 074
	Fuel Oil	Tons/month	1 200	1415,887
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate**
	Energy	GWh	4 212.6	1 869,052

The coal consumption rate for the month of December 2021 was within the permitted maximum limit. Fuel oil usage exceeded the maximum permitted consumption rate in December 2021. The exceedance was due to multiple unit start-ups on unit 1, unit 2, unit 3 and unit 6 during the reporting period.

2.2 Abatement technology

Table 2: Abatement Equipment Control Technology Utilised

Associated Unit	Technology Type	Minimum utilisation (%)	Efficiency (%)
Unit 1	Electrostatic Precipitator	100%	99,858%
Unit 2	Electrostatic Precipitator	100%	99,900%
Unit 3	Electrostatic Precipitator	100%	99,935%
Unit 4	Electrostatic Precipitator	100%	99,890%
Unit 5	Electrostatic Precipitator	100%	99,894%
Unit 6	Electrostatic Precipitator	100%	99,921%
Associated Unit	**Technology Type**	**Minimum utilisation (%)**	**Actual Utilisation (%)**
Unit 1	SO_3 Plant	100%	100%
Unit 2	SO_3 Plant	100%	96,7%
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%	100%

Fluegas conditioning plant availability was below the required 100% for unit 2 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**	1.6%	1,29%
	Ash Content	40%	34,97%

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

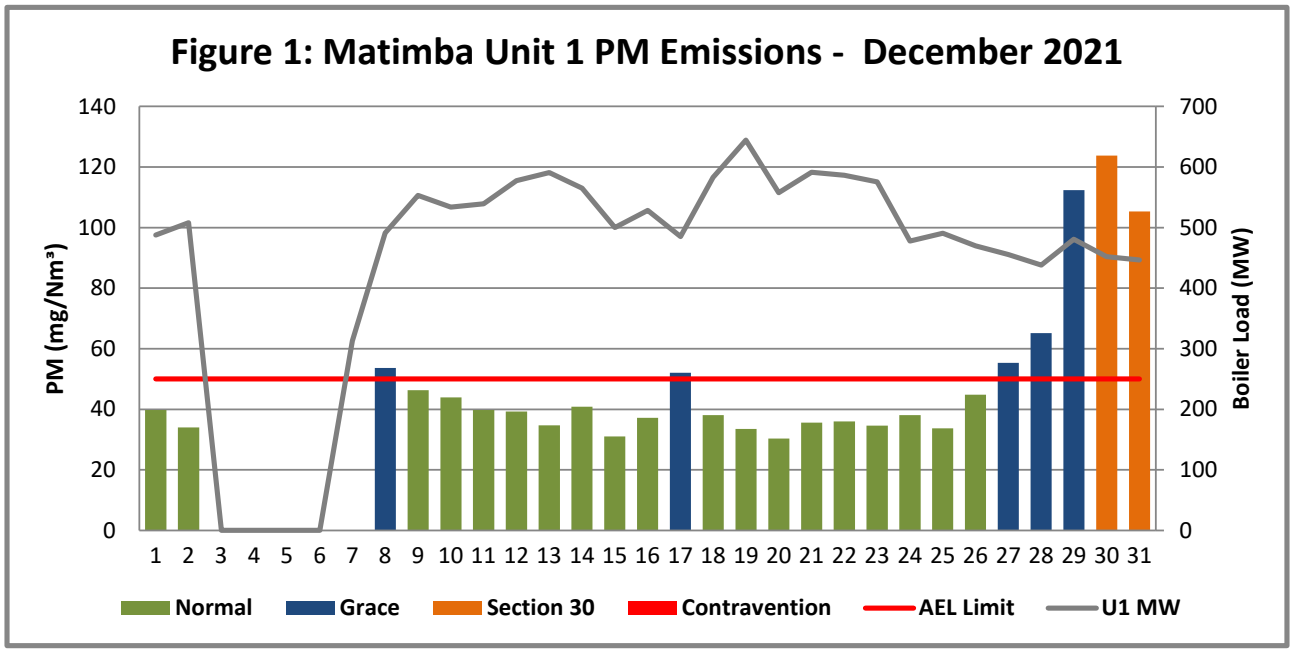

Figure 1: Particulate matter daily average emissions against emission limit for unit 1 for the month of December 2021

Interpretation:

Unit 1 exceeded the 50mg/Nm^3 emission limit on 8, 17 and 27-31 December 2021. The exceedances were due to unexpected breakdowns that occurred on the ash conveying plant which led to ash build-up within the flue gas stream and reduced the efficiency of the electrostatic precipitator field. The 48 hour grace period was exceeded on 31 December 2021 and a section 30 incident was reported. All other exceedances remained within the 48 hour grace period. The plant was repaired on 31 December 2021 and emissions normalised on 01 January 2022.

Unit 2 Particulate Emissions

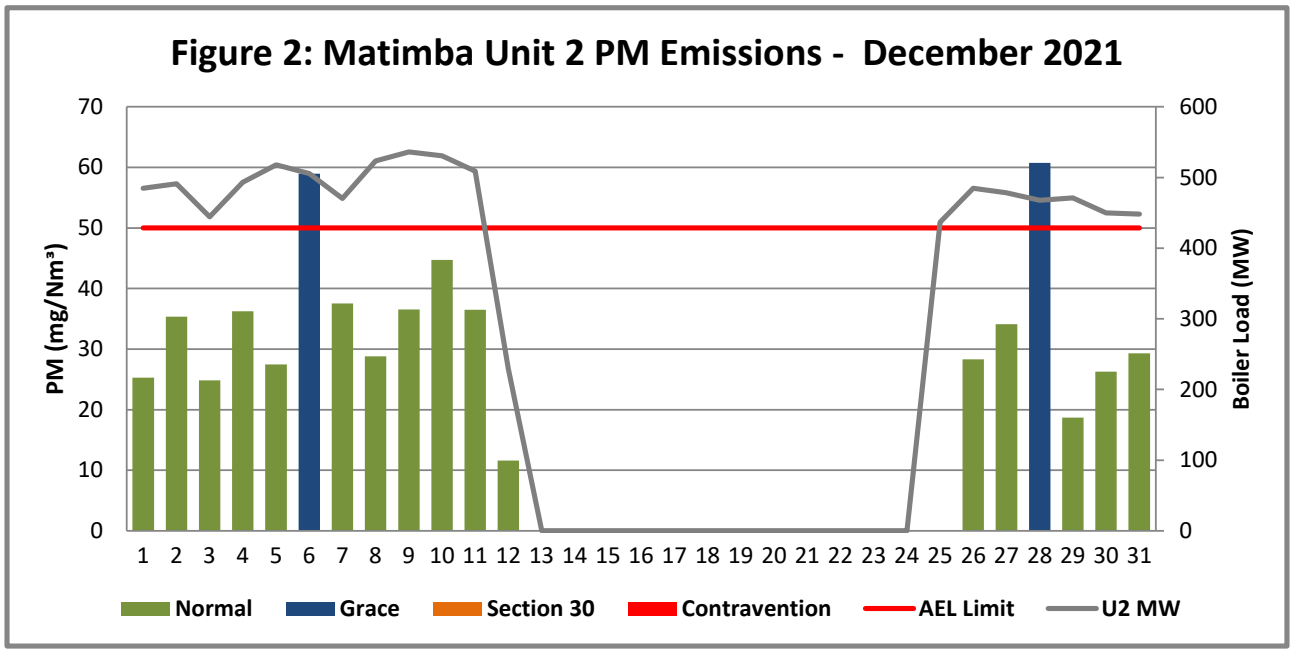

Figure 2: Particulate matter daily average emissions against emission limit for unit 2 for the month of December 2021

Interpretation:

Unit 2 exceeded the 50mg/Nm^3 emission limit on 6 and 28 December 2021. The exceedance that occurred on 06 December 2021 was due to breakdowns experienced within the dust handling plant, and the exceedances that occurred on 28 December 2021 occurred due to breakdowns experienced 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 3 Particulate Emissions

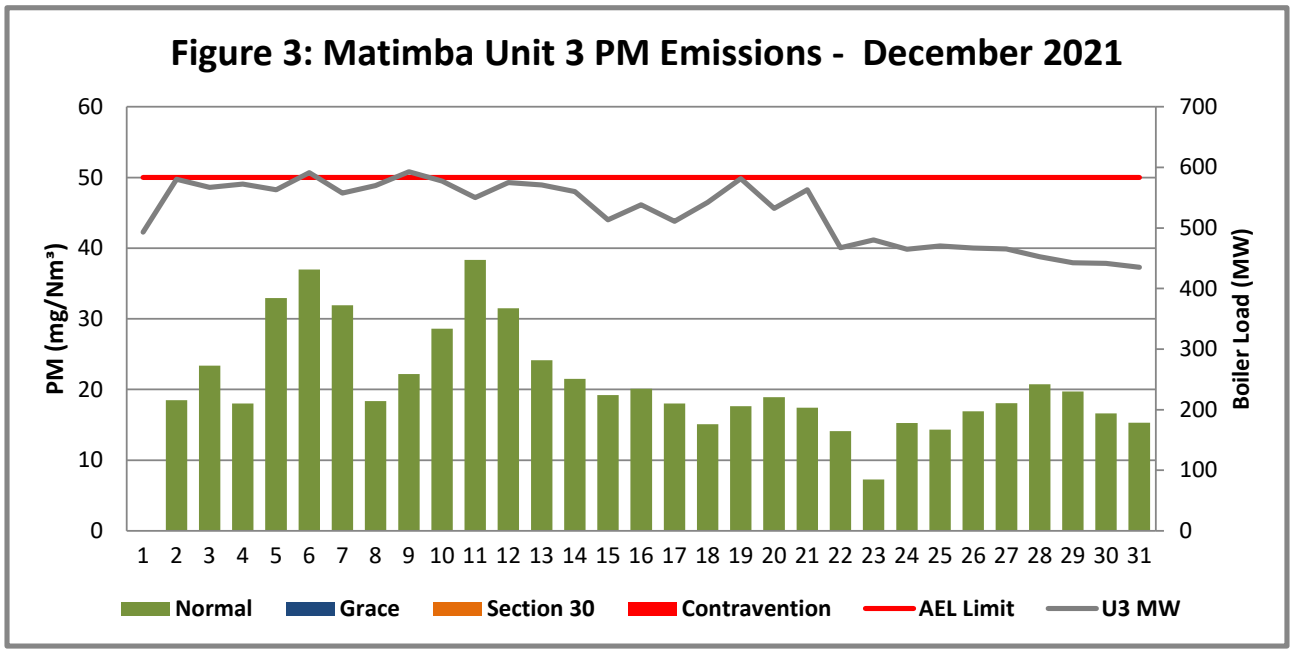

Figure 3: Particulate matter daily average emissions against emission limit for unit 3 for the month of December 2021

Interpretation:

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

Unit 4 Particulate Emissions

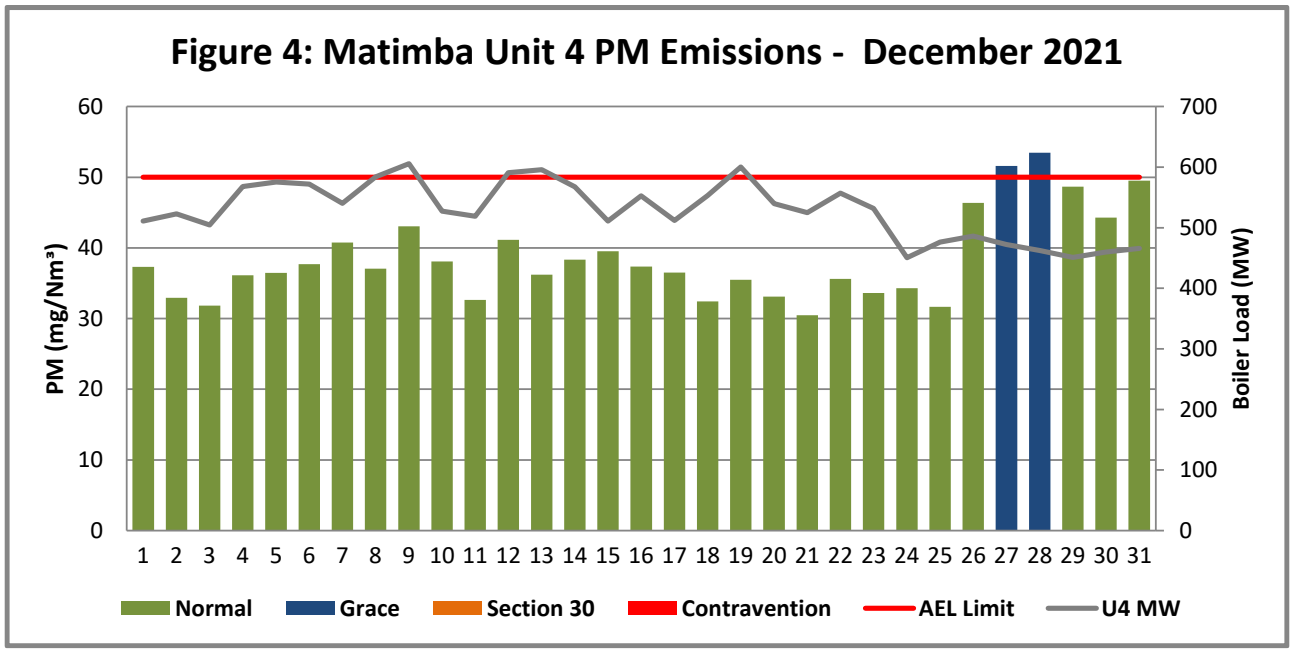

Figure 4: Particulate matter daily average emissions against emission limit for unit 4 for the month of December 2021

Interpretation:

Unit 4 exceeded the daily limit of 50mg/Nm^3 on 27 and 28 December 2021. 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

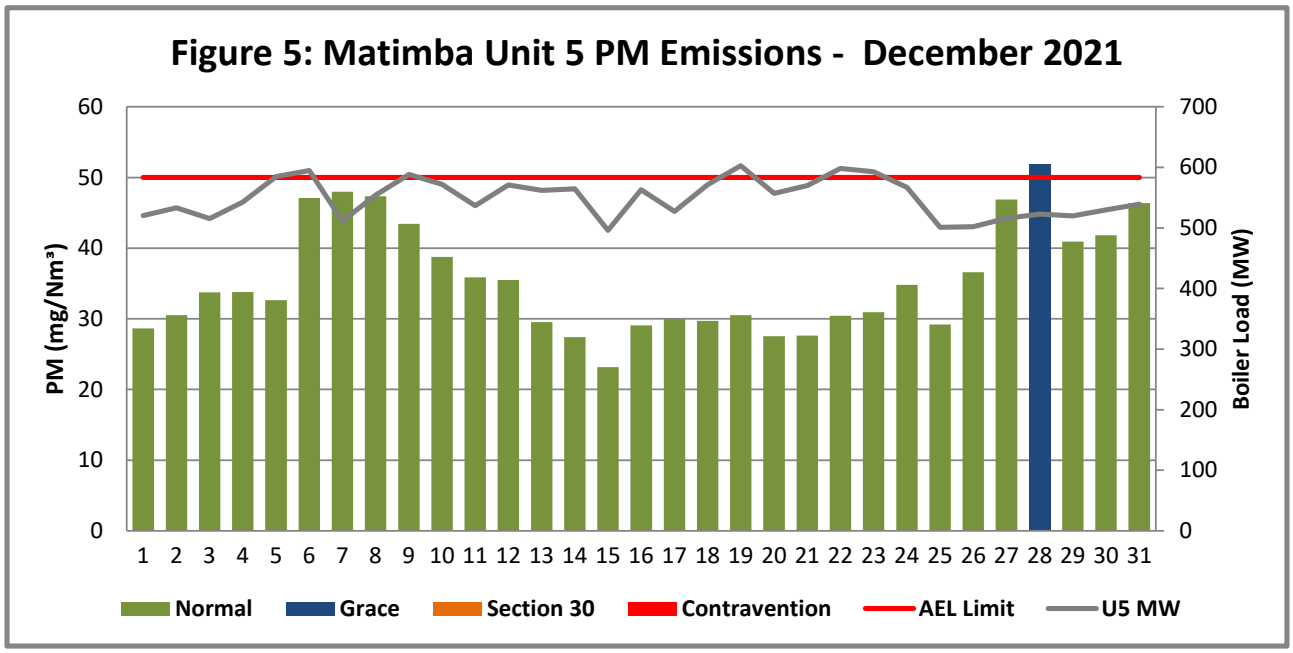

Figure 5: Particulate matter daily average emissions against emission limit for unit 5 for the month of December 2021

Interpretation:

Unit 5 exceeded the daily limit of 50mg/Nm^3 on 28 December 2021. 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. All exceedances remained within the 48 hour grace period

Unit 6 Particulate Emissions

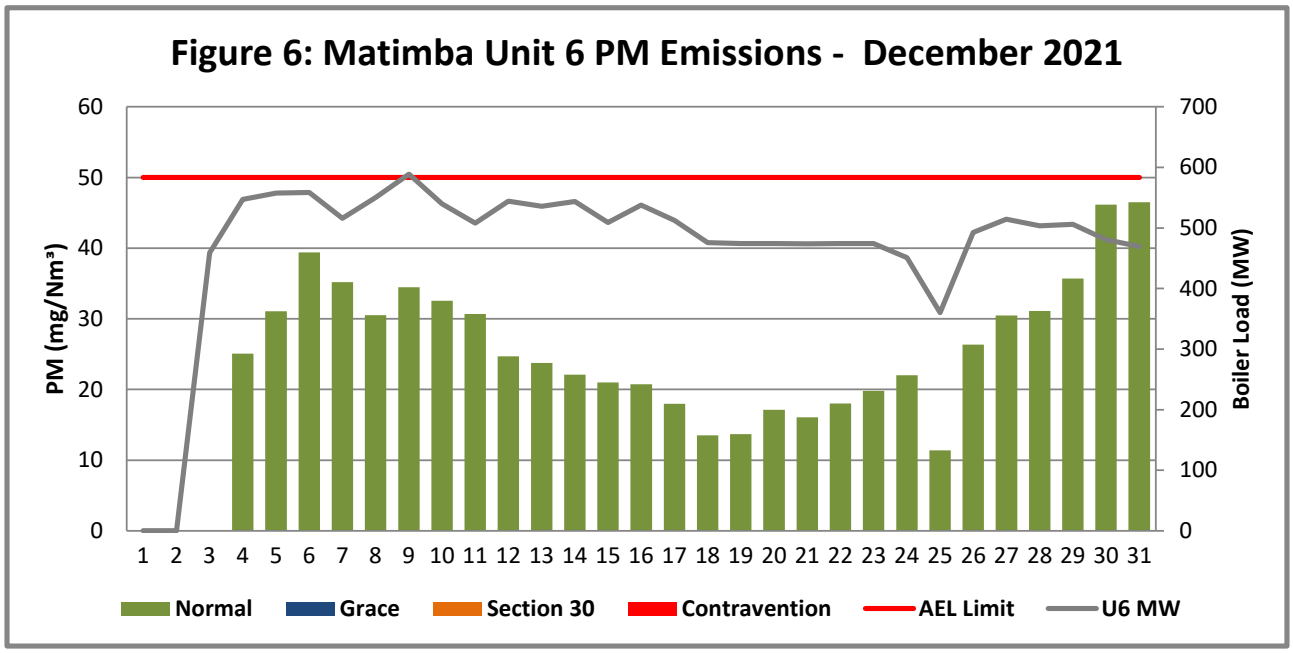

Figure 6: Particulate matter daily average emissions against emission limit for unit 6 for the month of December 2021

Interpretation:

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

2.4.2 Gaseous Emissions

Unit 1 SO_2 Emissions

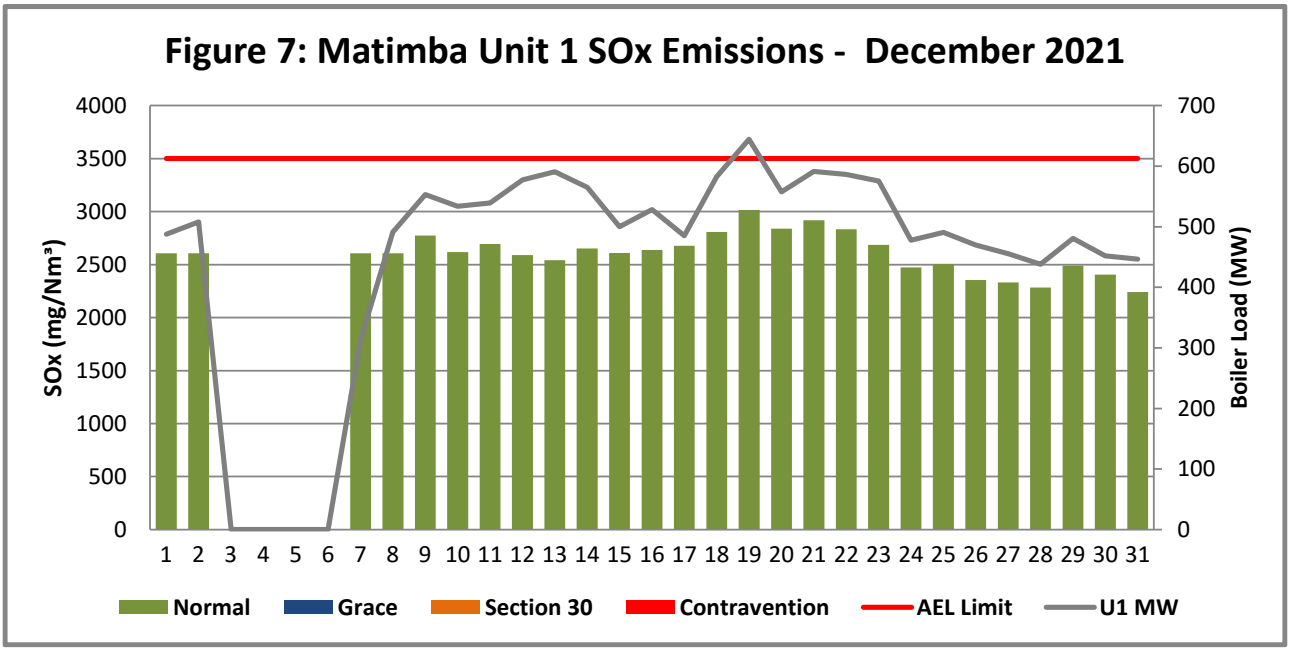

Figure 7: SO2 daily average emissions against emission limit for unit 1 for the month of December 2021

Interpretation:

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

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Unit 2 SO_2 Emissions

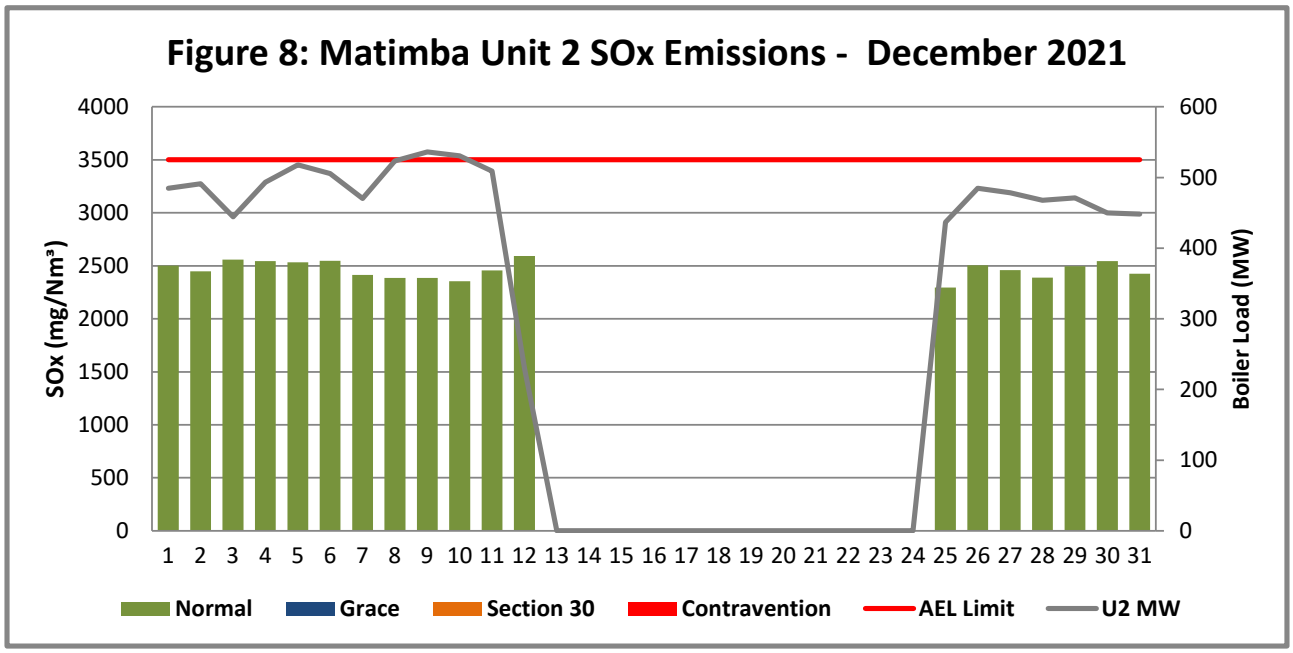

Figure 8: SO2 daily average emissions against emission limit for unit 2 for the month of December 2021

Interpretation:

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

Unit 3 SO_2 Emissions

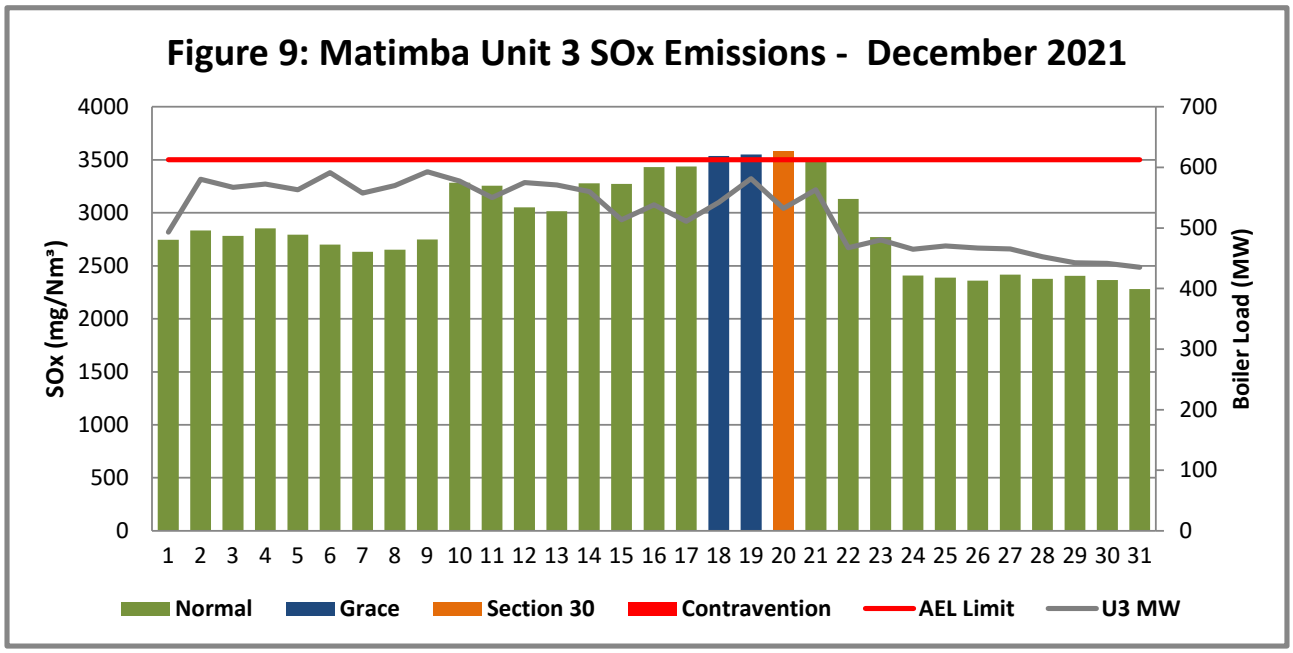

Figure 9: SO2 daily average emissions against emission limit for unit 3 for the month of December 2021

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 December 2021 until 21 December 2021. 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

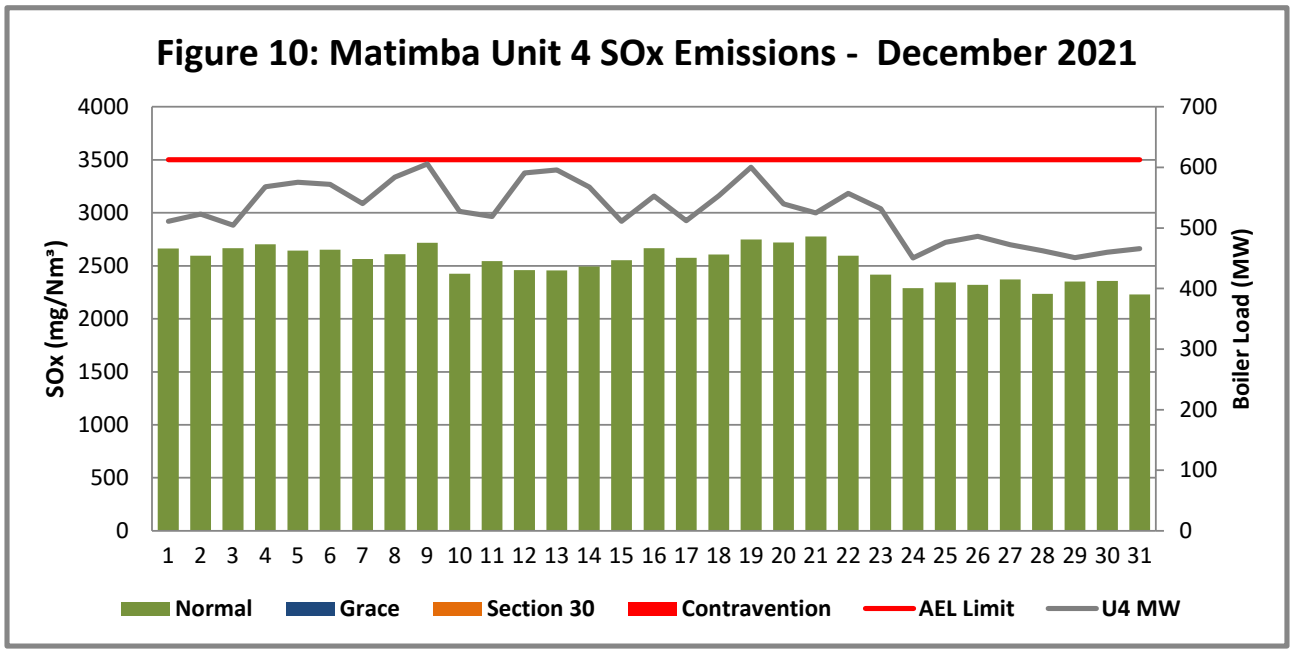

Figure 10: SO2 daily average emissions against emission limit for unit 4 for the month of December 2021

Interpretation:

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

Unit 5 SO_2 Emissions

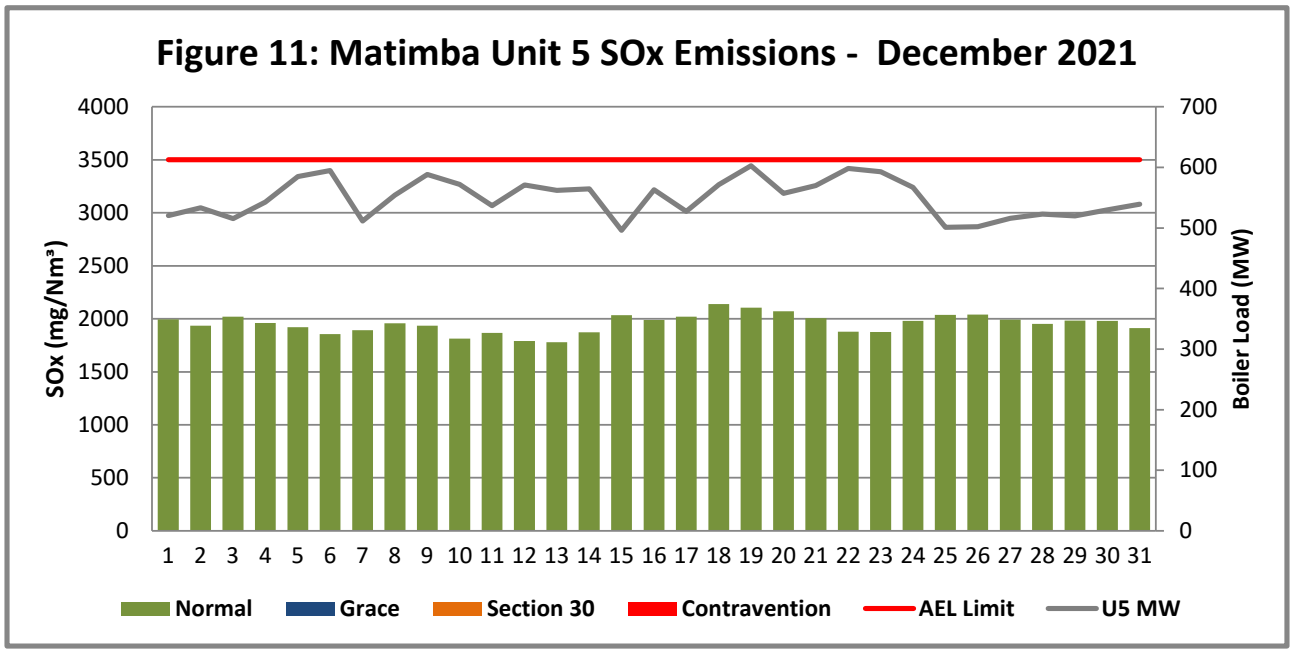

Figure 11: SO2 daily average emissions against emission limit for unit 5 for the month of December 2021

Interpretation:

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

Unit 6 SO_2 Emissions

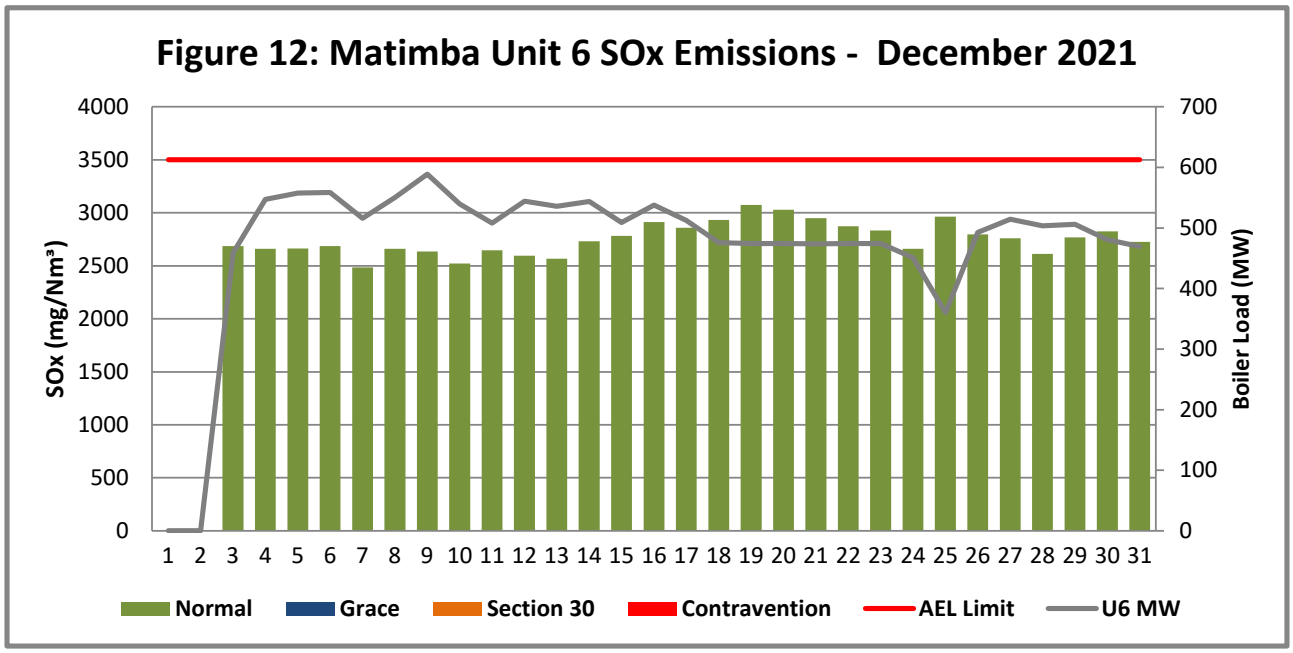

Figure 12: SO2 daily average emissions against emission limit for unit 6 for the month of December 2021

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

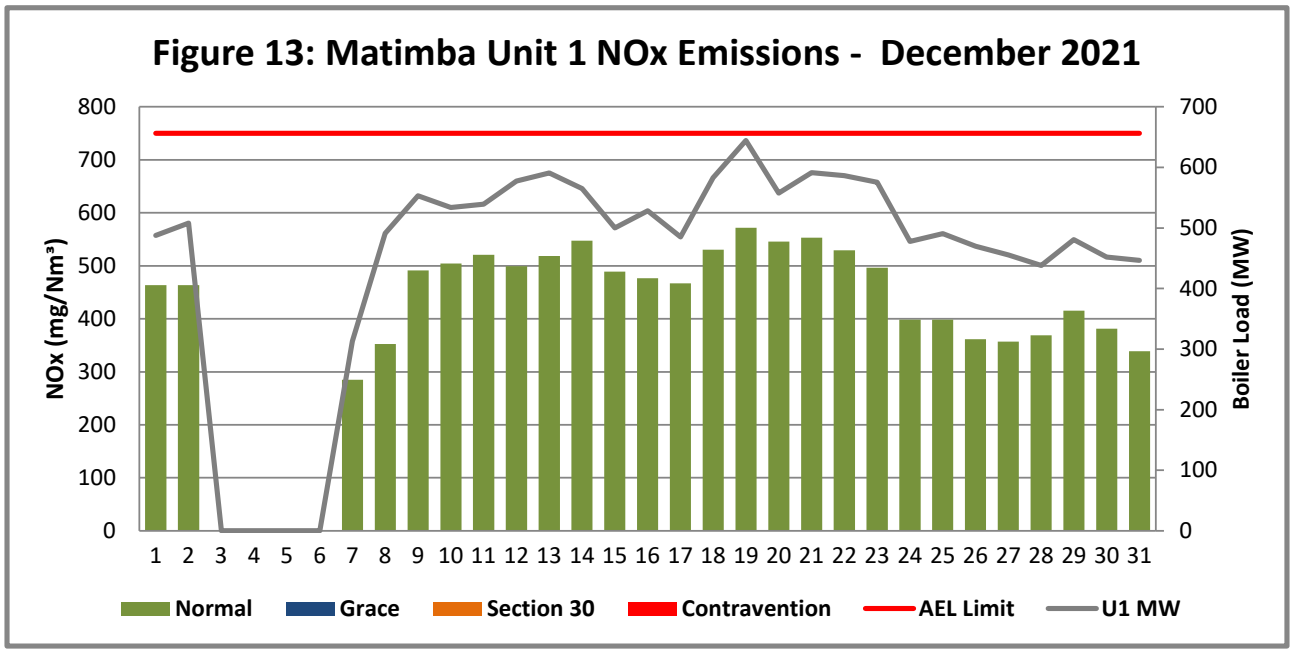

Figure 13: Figure 14: NOx daily average emissions against emission limit for unit 1 for the month of December 2021

Interpretation:

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

Unit 2 NO_x Emissions

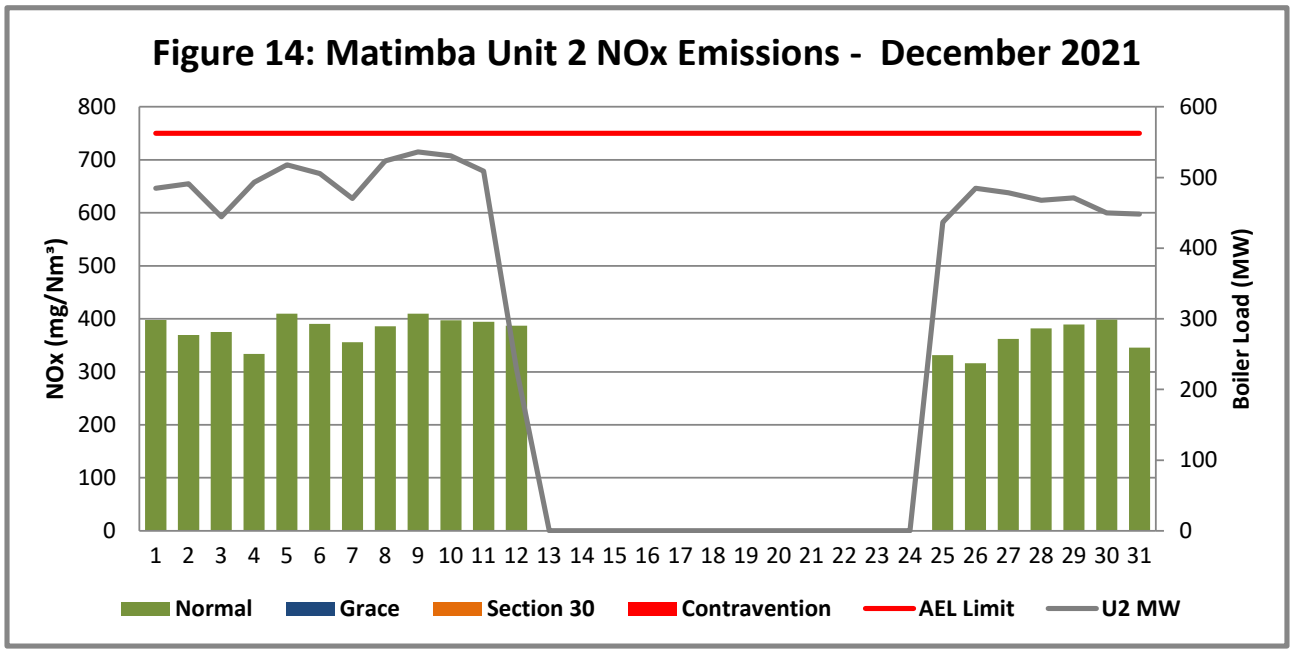

Figure 15: NOx daily average emissions against emission limit for unit 2 for the month of December 2021

Interpretation:

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

Unit 3 NO_x Emissions

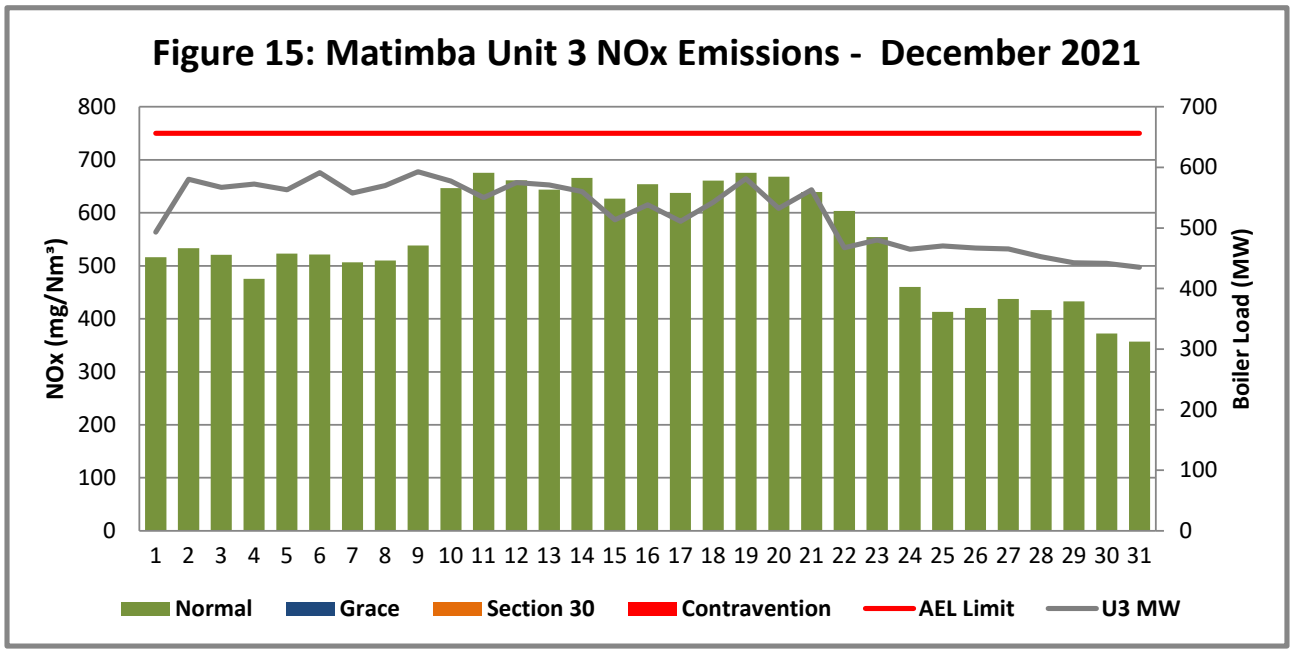

Figure 16: NOx daily average emissions against emission limit for unit 3 for the month of December 2021

Interpretation:

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

Unit 4 NO_x Emissions

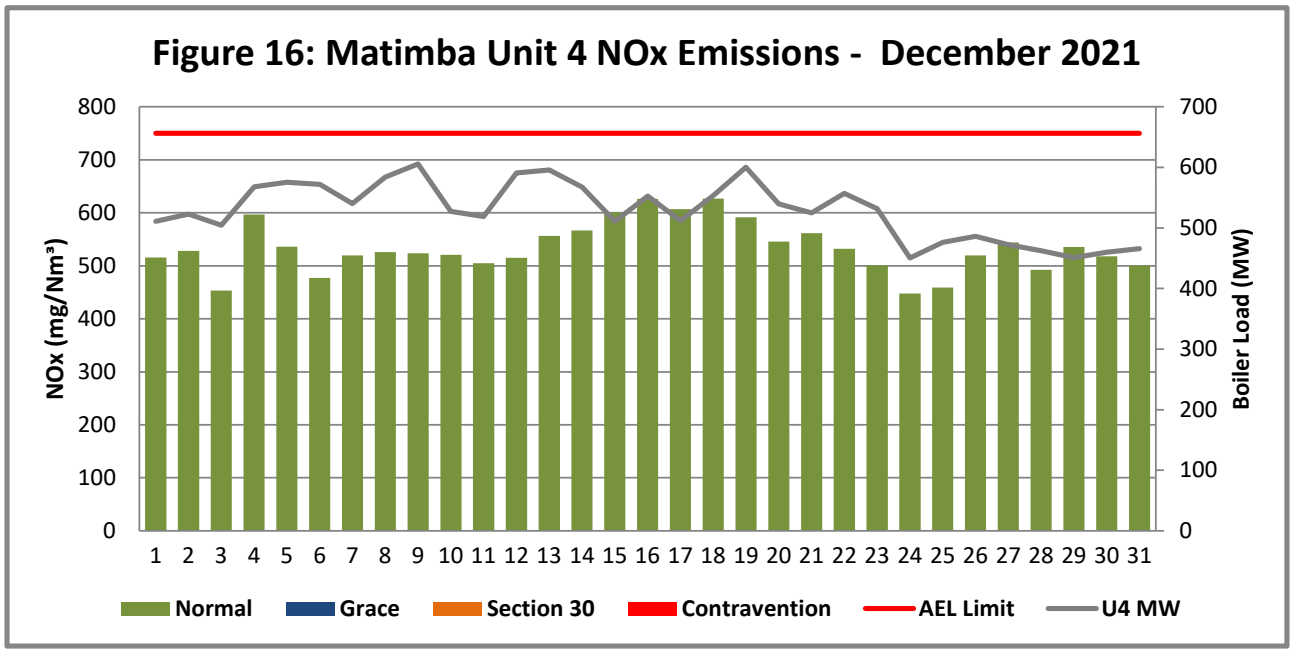

Figure 17: NOx daily average emissions against emission limit for unit 4 for the month of December 2021

Interpretation:

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

Unit 5 NO_x Emissions

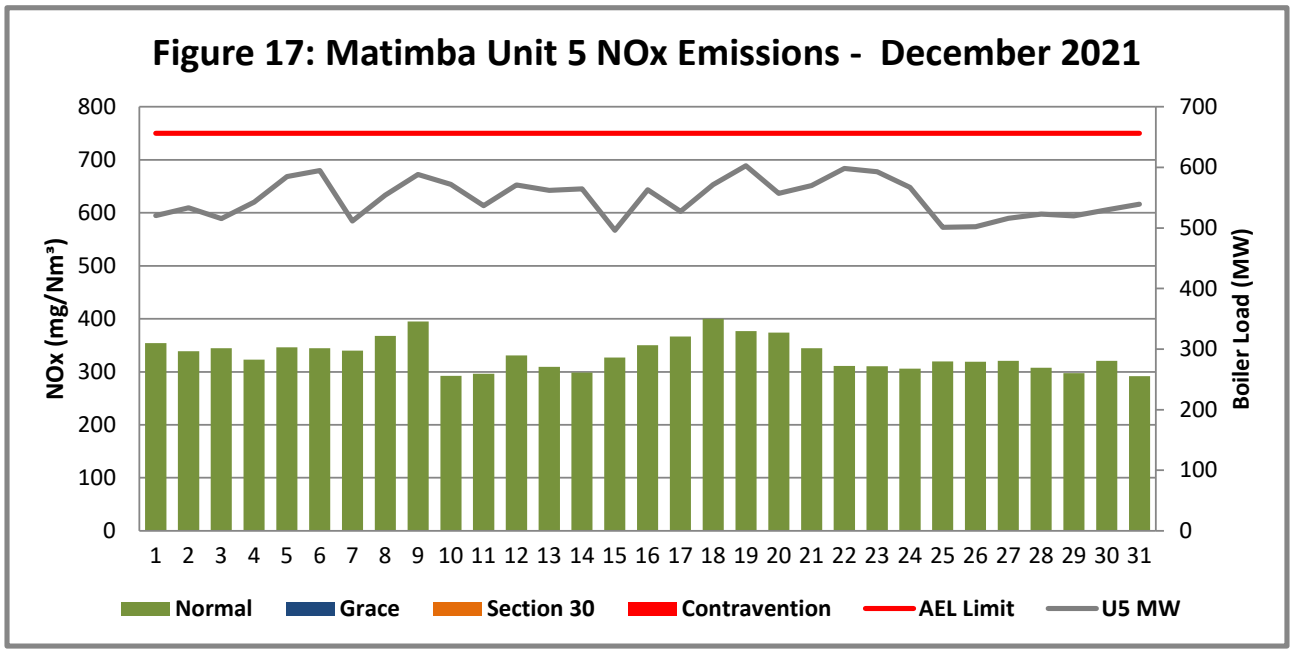

Figure 18: NOx daily average emissions against emission limit for unit 5 for the month of December 2021

Interpretation:

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

Unit 6 NO_x Emissions

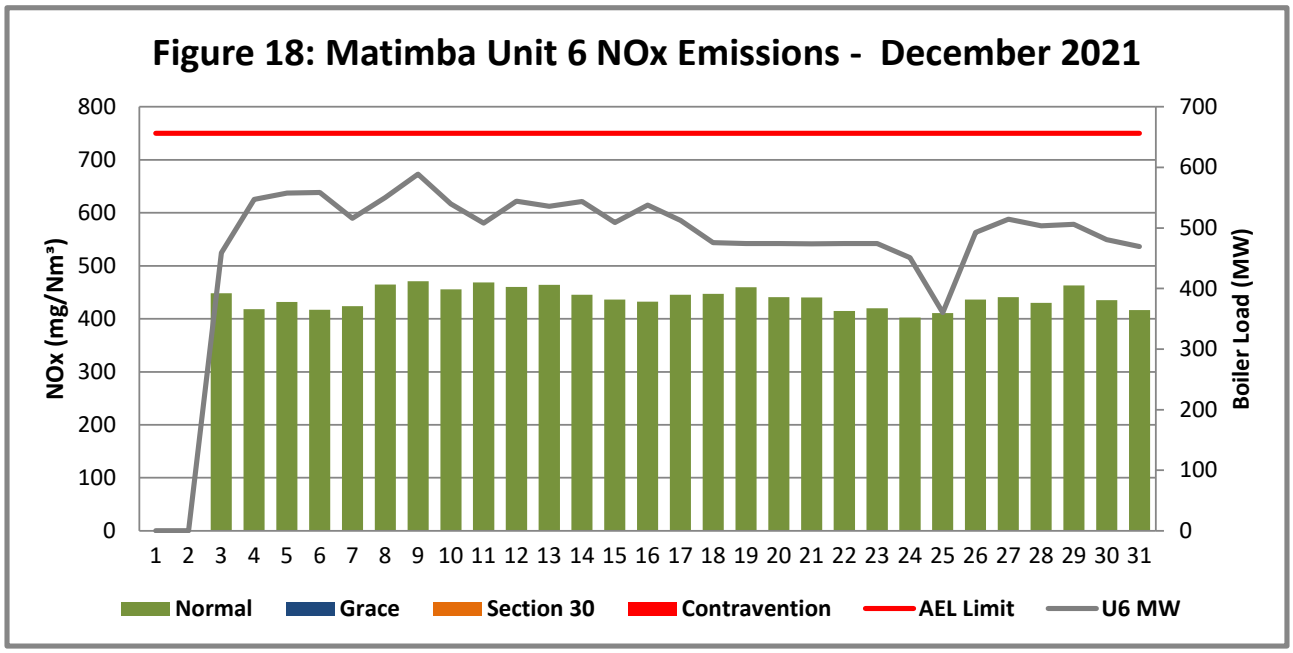

Figure 19: NOx daily average emissions against emission limit for unit 6 for the month of December 2021

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:	Friday, 14 January 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:	**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:	***1415,887***	
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:	0,04	kg/month
TOTAL LOSSES (Total TVOC Emissions for the month):	**0,61**	**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 2021

Date	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
2021/12/01	11662	11468	8427	12212	12374	0
2021/12/02	9946	11618	13847	12476	12689	0
2021/12/03	0	10505	13543	12075	12276	10199
2021/12/04	0	11657	13681	13563	12912	13011
2021/12/05	0	12223	13398	13718	13864	13228
2021/12/06	0	11970	14116	13684	14150	13290
2021/12/07	6819	11110	13307	12897	12204	12271
2021/12/08	11779	12377	13607	13943	13150	13052
2021/12/09	13252	12676	14140	14480	13978	14001
2021/12/10	12763	12553	13785	12629	13618	12848
2021/12/11	12931	12088	13141	12384	12747	12085
2021/12/12	13860	345,9	13742	14108	13611	12915
2021/12/13	14132	0	13587	14266	13365	12748
2021/12/14	13568	0	13374	13564	13457	12917
2021/12/15	11948	0	12246	12199	11765	12085
2021/12/16	12693	0	12883	13252	13429	12827
2021/12/17	11642	0	12191	12240	12515	12150
2021/12/18	13934	0	12909	13187	13590	11325
2021/12/19	15450	0	13891	14354	14350	11274
2021/12/20	13366	0	12702	12903	13253	11262
2021/12/21	14119	0	13438	12535	13517	11249
2021/12/22	14073	0	7191	13327	14235	11264
2021/12/23	13806	0	11471	12742	14100	11276
2021/12/24	11537	0	11093	10756	13483	10710
2021/12/25	11731	7730	11223	11413	11987	8609
2021/12/26	6949	11447	11149	11602	11897	11645
2021/12/27	10942	11345	11106	11320	12307	12224
2021/12/28	10506	7513	10804	11061	12444	11979
2021/12/29	11528	11159	10560	10823	12394	12054
2021/12/30	10844	10704	10546	10963	12565	11421
2021/12/31	10710	10568	10387	11146	12834	11165

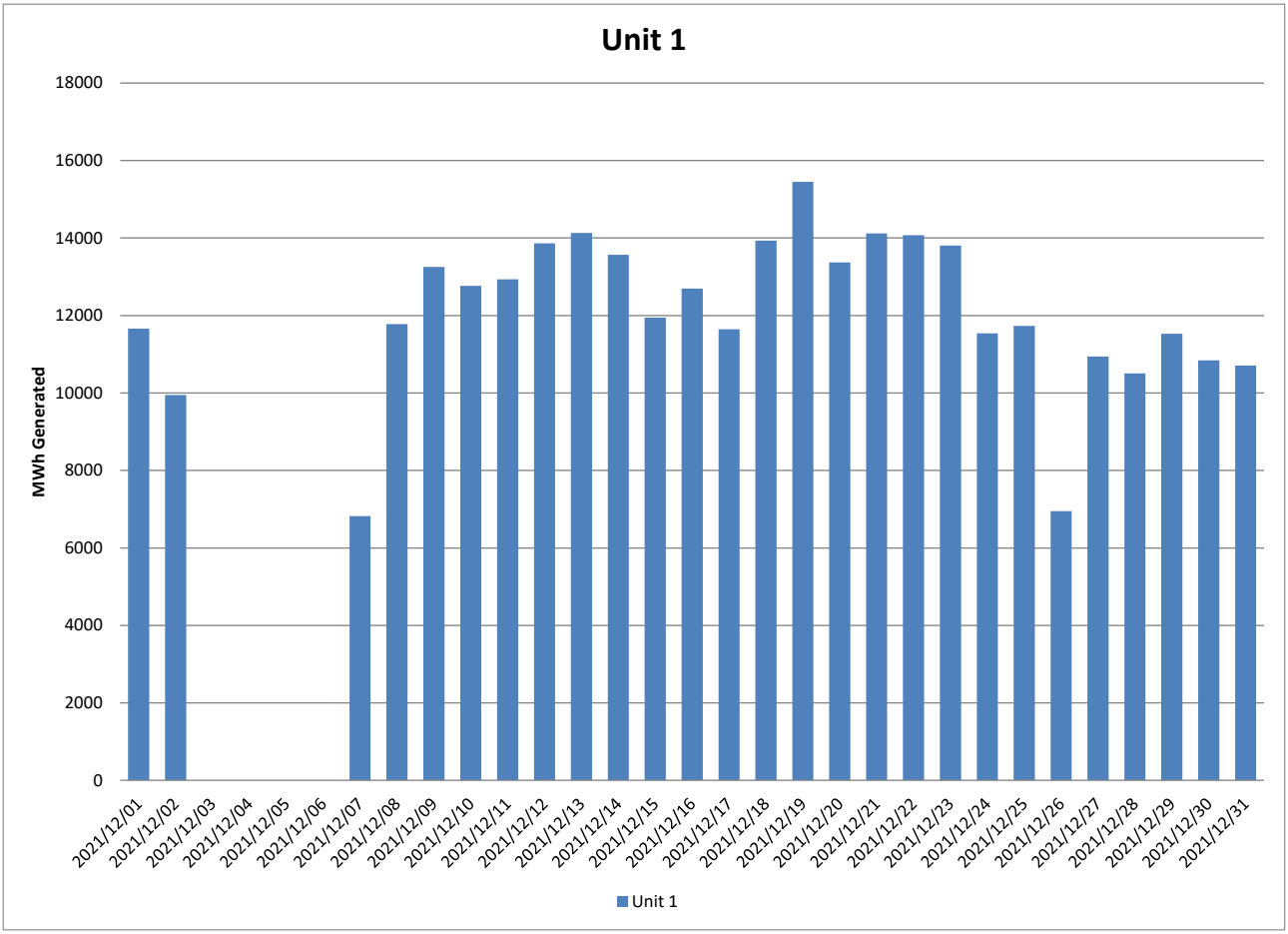

Figure 20: Unit 1 daily generated power in MWh for the month of December 2021

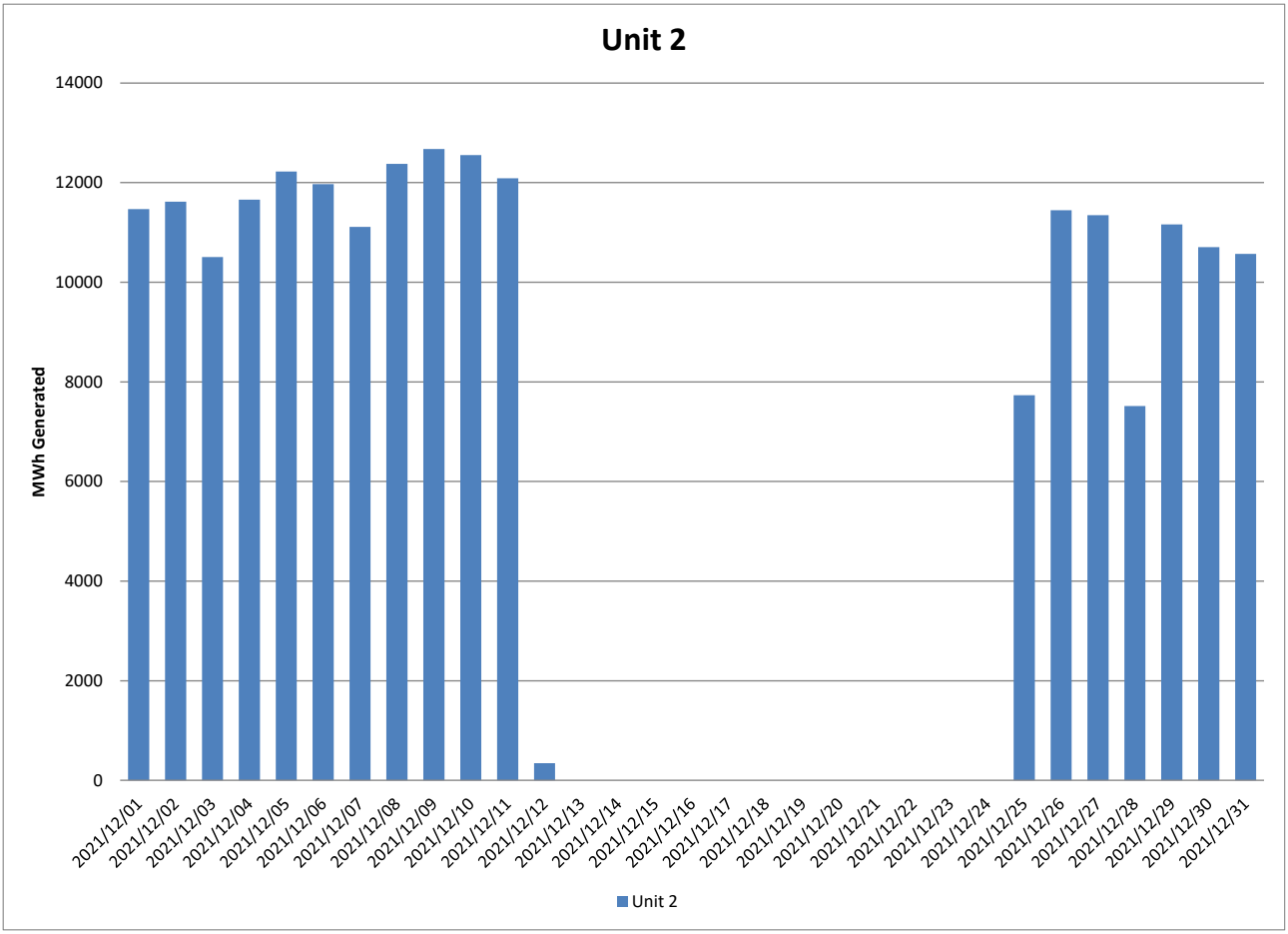

Figure 21: Unit 2 daily generated power in MWh for the month of December 2021

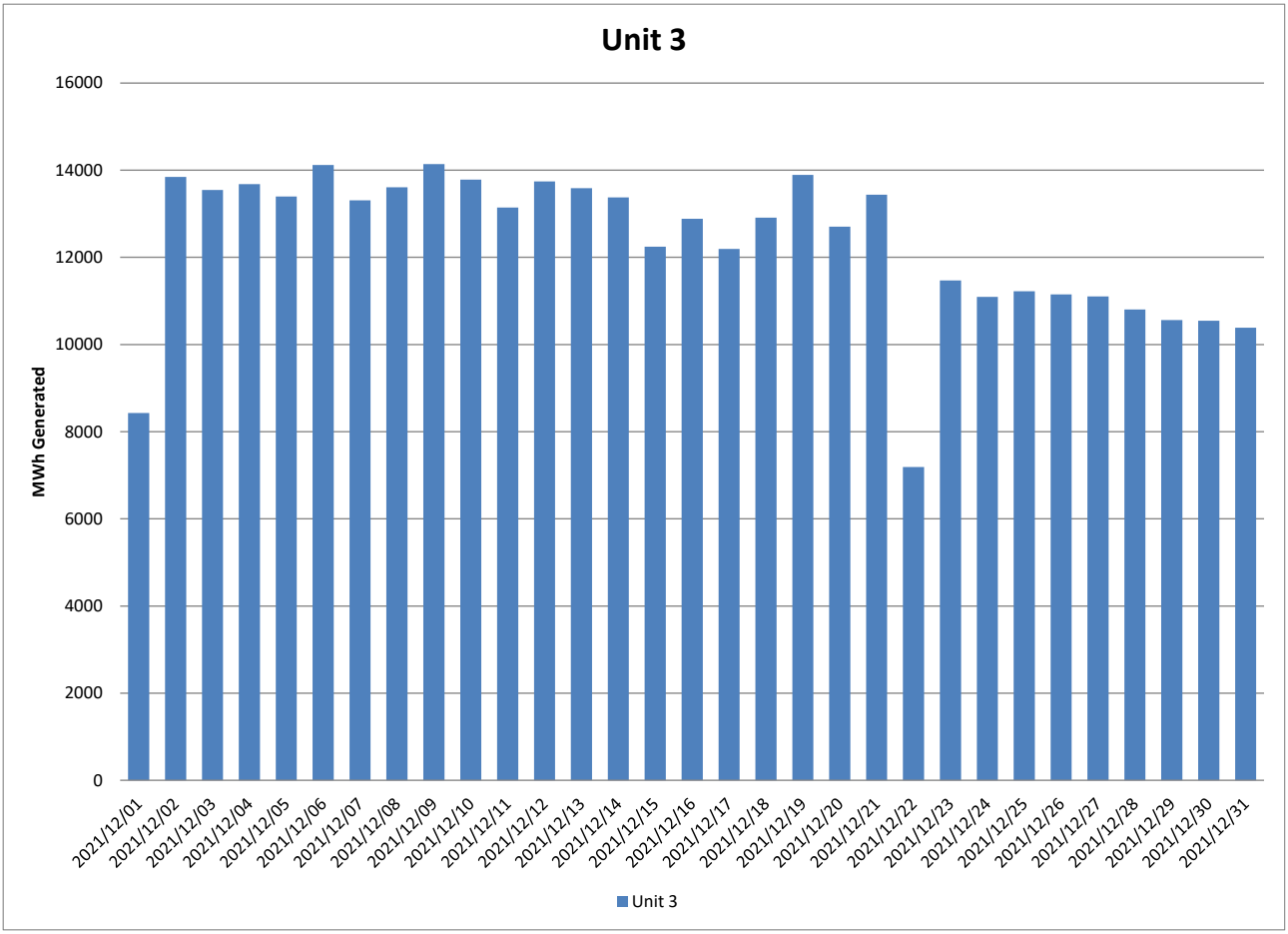

Figure 22: Unit 3 daily generated power in MWh for the month of December 2021

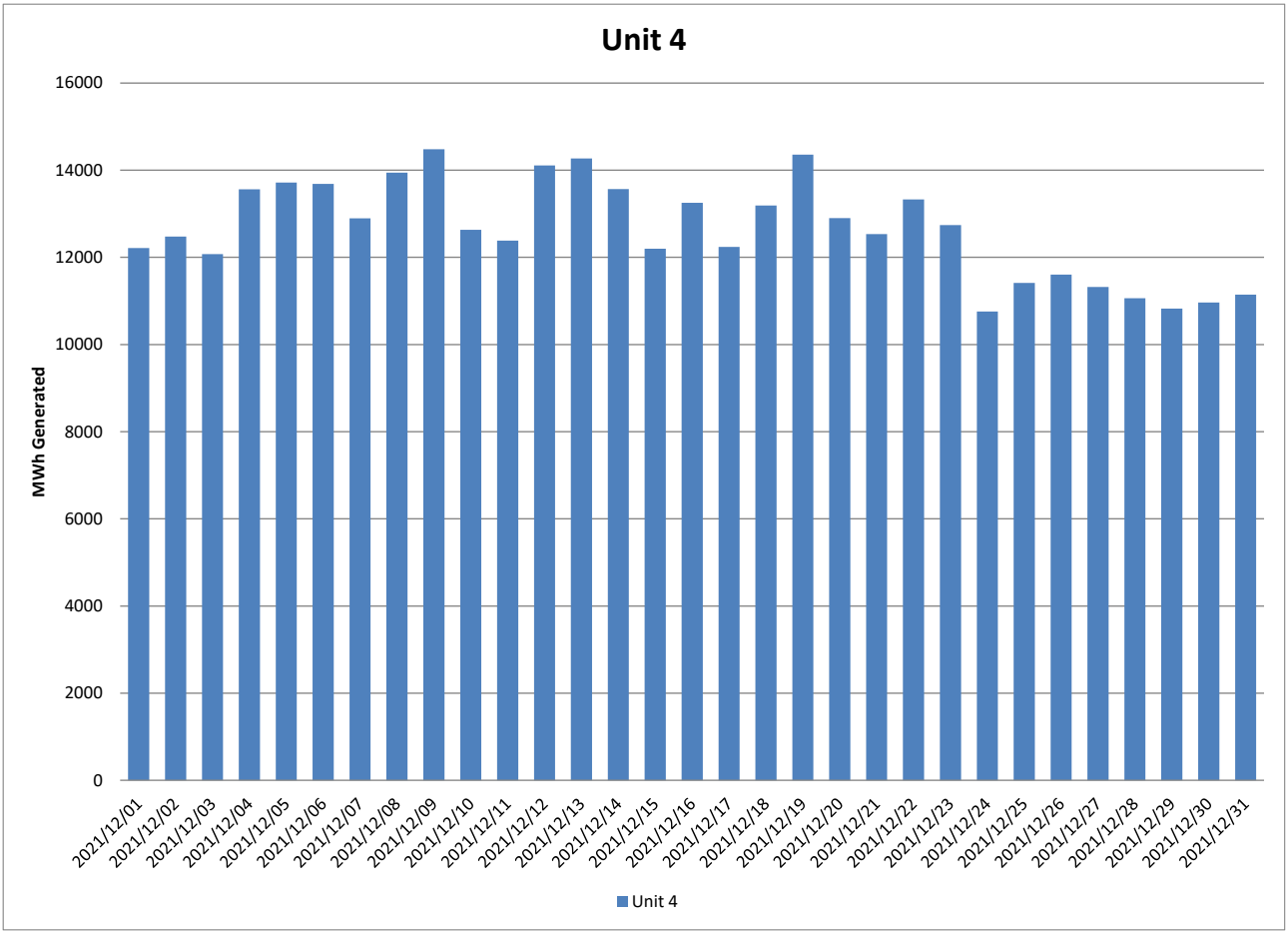

Figure 23: Unit 4 daily generated power in MWh for the month of December 2021

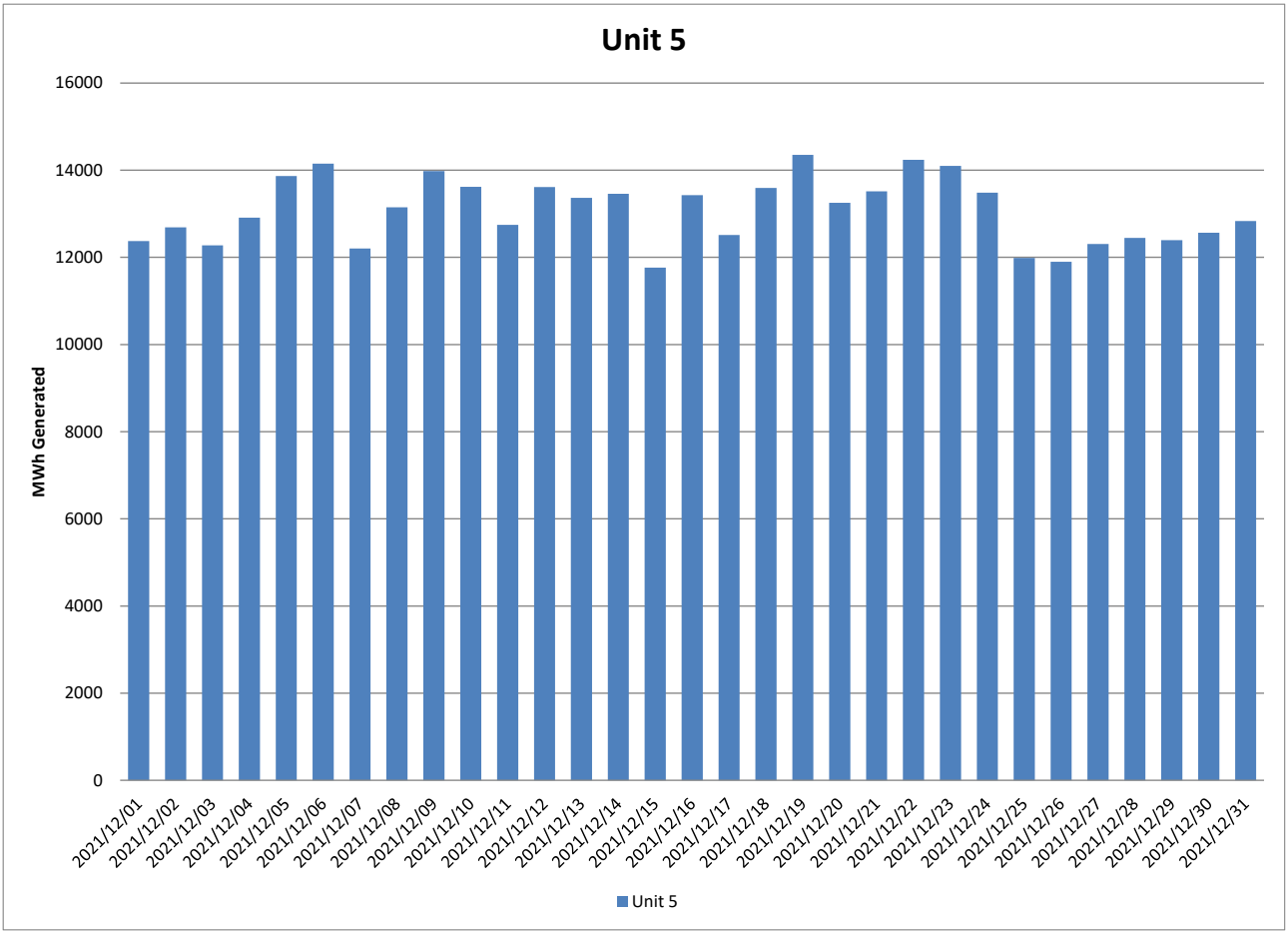

Figure 24: Unit 5 daily generated power in MWh for the month of December 2021

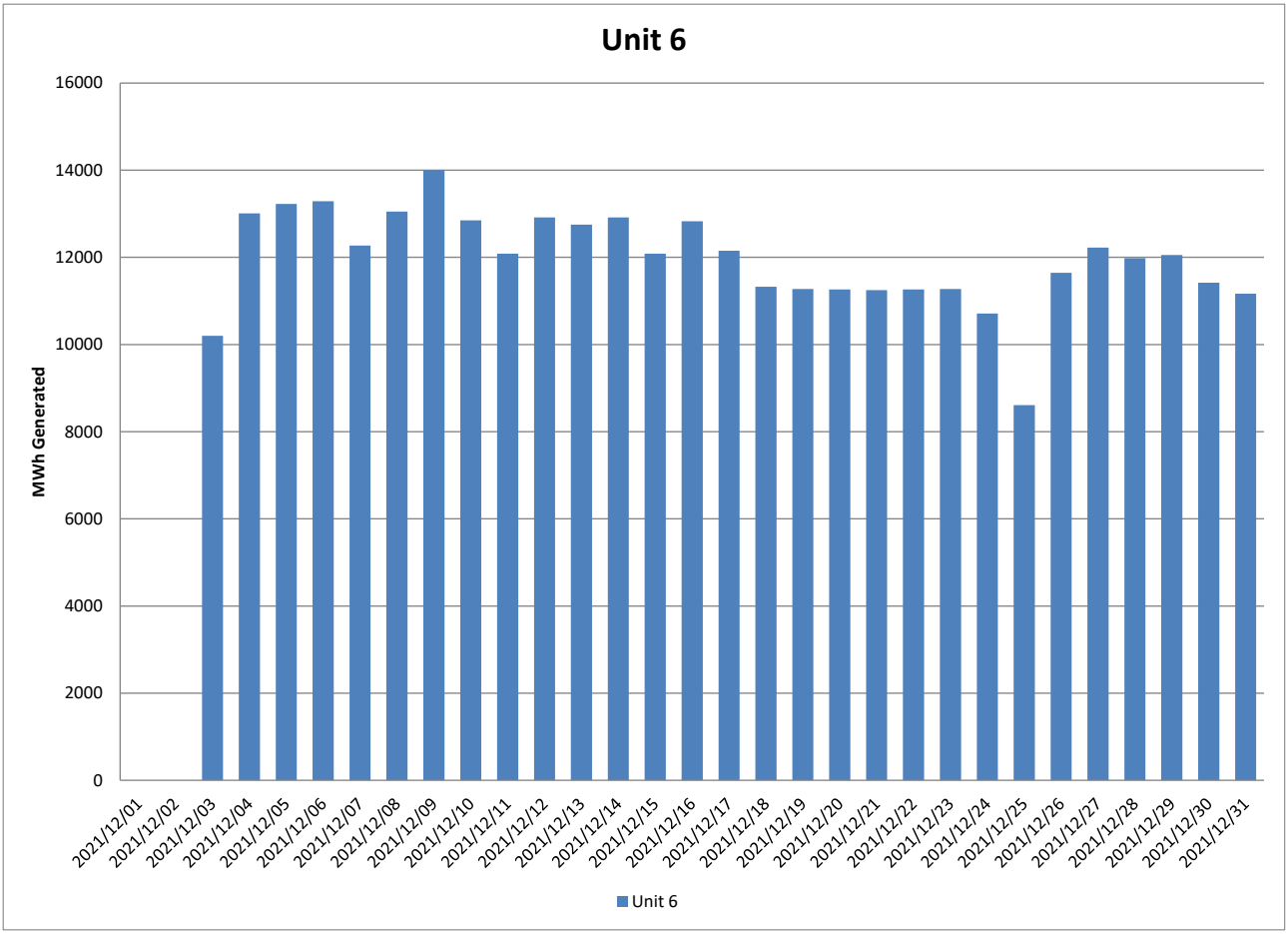

Figure 25: Unit 6 daily generated power in MWh for the month of December 2021

2.6 Pollutant Tonnages

The emitted pollutant tonnages for December 2021 are provided in table 6. Averaged Quality Assurance level 2 (QAL 2) values were used for O_2 data for Unit 1 and CO_2 data for Unit 2 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 December 2021

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	78,5	3 870,9	684,7
Unit 2	34,0	3 605,9	551,0
Unit 3	42,2	5 735,6	1 082,0
Unit 4	70,2	5 672,5	1 196,7
Unit 5	71,7	4 043,1	691,0
Unit 6	46,5	4 779,4	766,4
SUM	343,0	27 707,4	4 971,8

2.7 Reference values

Table 7: Reference values for data provided, December 2021

Compound / Parameter	Units of Measure	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Oxygen	%	8,77	8,52	8,91	6,31	7,79	8,57
Moisture	%	5,36	3,76	5,48	3,55	5,49	3,28
Velocity	m/s	23,1	26,0	28,2	25,0	25,4	26,7
Temperature	^{o}C	133,9	127,0	131,4	133,2	124,6	170,1
Pressure	mBar	933,5	1 152,5	914,0	920,7	931,3	922,4

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 December 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 O_2 data for Unit 1 and CO_2 data for Unit 2 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 December 2021.

Associated Unit/Stack	PM	SO_2	NO	CO_2
Unit 1	99,7	82,9	97,9	0,0
Unit 2	99,8	100,0	95,0	0,0
Unit 3	100,0	99,9	99,9	70,8
Unit 4	100,0	100,0	99,2	0,0
Unit 5	100,0	99,9	99,9	0,0
Unit 6	100,0	100,0	100,0	0,0

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

Unit 5

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

Unit 6

- Unit 6 gaseous emission monitor was repaired on 21 December 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	1	
Fires in	2021-12-06	19h51
Synchronization with Grid	2021-12-07	02h04
Emissions below limit	2021-12-07	13h42
Fires in to synchronization	6,22	HOURS
Synchronization to < Emission limit	11,63	HOURS

Unit	1	
Fires in	2021-12-26	09h01
Synchronization with Grid	2021-12-26	13h38
Emissions below limit	2021-12-26	15h52
Fires in to synchronization	4,62	HOURS
Synchronization to < Emission limit	2,23	HOURS

Unit	2	
Fires in	2021-12-24	02h12
Synchronization with Grid	2021-12-25	05h57
Emissions below limit	2021-12-25	10h18
Fires in to synchronization	27,75	HOURS
Synchronization to < Emission limit	4,35	HOURS

Unit	2	
Fires in	2021-12-28	14h20
Synchronization with Grid	2021-12-28	17h20
Emissions below limit	2021-12-28	19h21
Fires in to synchronization	3	HOURS
Synchronization to < Emission limit	2,02	HOURS

Unit	3	
Fires in	2021-11-30	16h44
Synchronization with Grid	2021-12-01	06h45
Emissions below limit	2021-12-01	06h45
Fires in to synchronization	14,02	HOURS
Synchronization to < Emission limit	0	HOURS

Unit	3	
Fires in	2021-12-22	05h45
Synchronization with Grid	2021-12-22	10h26
Emissions below limit	2021-12-22	12h27
Fires in to synchronization	4,68	HOURS
Synchronization to < Emission limit	2,02	HOURS

Unit	6	
Fires in	2021-12-02	20h56
Synchronization with Grid	2021-12-03	01h32
Emissions below limit	2021-12-03	01h44
Fires in to synchronization	4,6	HOURS
Synchronization to < Emission limit	0,2	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	251	55	235	251	251	166

Unit 1 exceeded the 50mg/Nm^3 limit during emergency generation 5 times in December 2021. Unit 2 exceeded the 50mg/Nm^3 limit during emergency generation 1 time in December 2021. Unit 4 exceeded the 50mg/Nm^3 limit during emergency generation 2 times in December 2021. Unit 5 exceeded the 50mg/Nm^3 limit during emergency generation 1 time in December 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

The ambient air quality report was not available at the time of publishing this report.

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.
- No abnormalities on the SO3 plant. Preventative maintenance done during the month.

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

GENERAL MANAGER: MATIMBA POWER STATION