Eskom	Technical and Generic Report	Matimba Power Station

Title: **Matimba Power Station December 2023 emissions report**

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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 2023.

During the period under review, Matimba experienced thirty-nine (39) exceedances of the daily particulate matter emission limit (50mg/Nm3), twenty-sic (26) of these exceedances occurred outside of the 48-hour grace period and were recorded on the Eskom incident management process as non-compliance to the Atmospheric Emissions Licence and thirteen (13) exceedances occurred within the 48-hour grace period.

There were no exceedances of the monthly SOx limit (3500mg/Nm3) and the daily NOx emission limit (750mg/Nm3) occurred.

Flue gas conditioning plant availability was below the required 100% for Unit 1,3,5 and 6 due to unplanned breakdowns and defects. Unit 6 SO3 plant experienced recurring low precipitator temperatures which cause the plant to be constantly on hold throughout the month. Issues and defects that affected the availability were addressed and the plants returned to operation.

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	735 874
	Fuel Oil	Tons/month	1 200	1075.537
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate**
	Energy	MW	4000	1735.745

The consumption rates for the month of December 2023 were all 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%	99,99%
Unit 2	Electrostatic Precipitator	100%	Unit Off
Unit 3	Electrostatic Precipitator	100%	99,99%
Unit 4	Electrostatic Precipitator	100%	99,99%
Unit 5	Electrostatic Precipitator	100%	99,99%
Unit 6	Electrostatic Precipitator	100%	99,99%
Associated Unit	**Technology Type**	**Minimum utilisation (%)**	**Actual Utilisation (%)**
Unit 1	SO_3 Plant	100%	94%
Unit 2	SO_3 Plant	100%	OFF
Unit 3	SO_3 Plant	100%	97%
Unit 4	SO_3 Plant	100%	100%
Unit 5	SO_3 Plant	100%	98%
Unit 6	SO_3 Plant	100%	85%

Flue gas conditioning plant availability was below the required 100% for Unit 1,3,5 and 6 due to unplanned breakdowns and defects. Unit 6 SO_3 plant was on hold throughout the month due to precipitator temperature low. Defects were addressed and plants returned to service.

Table 3: Energy Source Material Characteristics.

	Characteristic	Stipulated Range (Unit)	Monthly Average Content
Coal burned	**Sulphur Content**	1.6%	1,40%
	Ash Content	40%	34,96%

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

2.3 Emissions reporting

2.3.1 Particulate Matter Emissions

The emission monitors Correlation spot test were performed in August 2023 and the results were applied and used for gaseous emissions calculation for December 2023.The spot test results for PM emissions does not meet the minimum requirements outlined in the Eskom emission calculation Methodology and were not applied.

Unit 1 Particulate Emissions

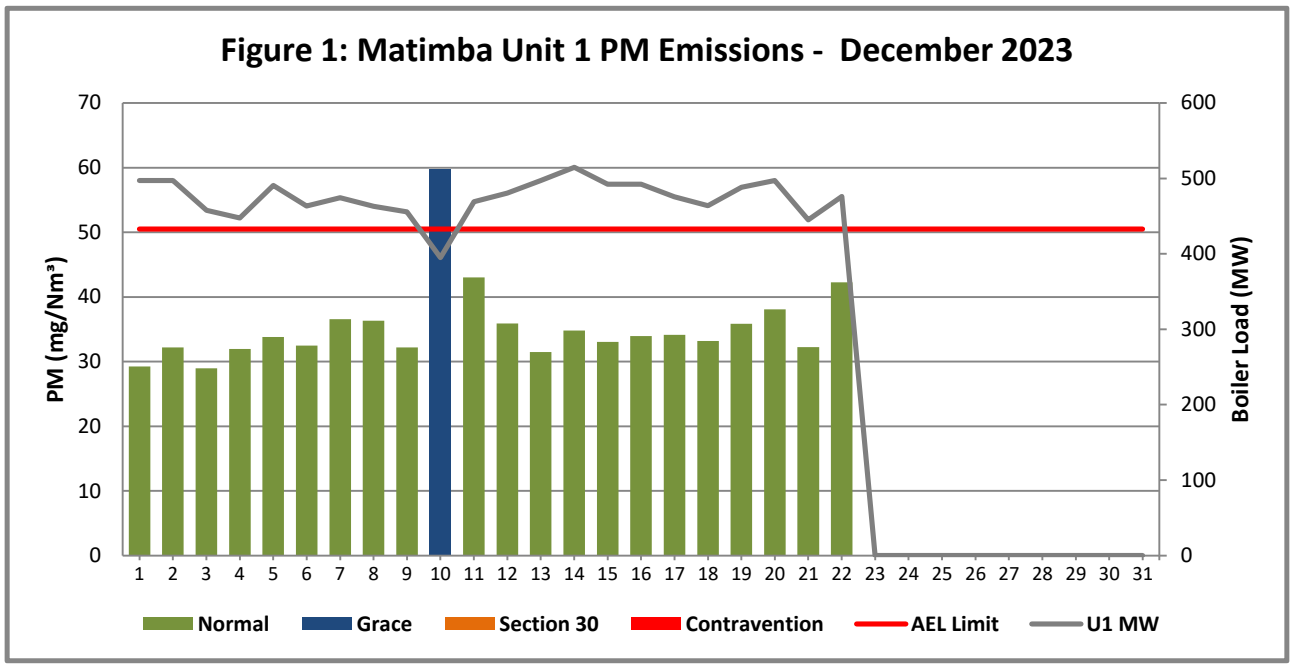

Figure 1: Particulate matter daily average emissions against emission limit for unit 1 for the month of December 2023

Interpretation:

Unit 1 exceeded the daily particulate emission limit of 50mg/Nm3 on 10 December 2023. The exceedance was due to unavailability of the ash conveyance system that led to ash accumulation 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 exceedance remained within the 48-hour grace period. Unit was taken off load on 23 December 2023.

Unit 3 Particulate Emissions

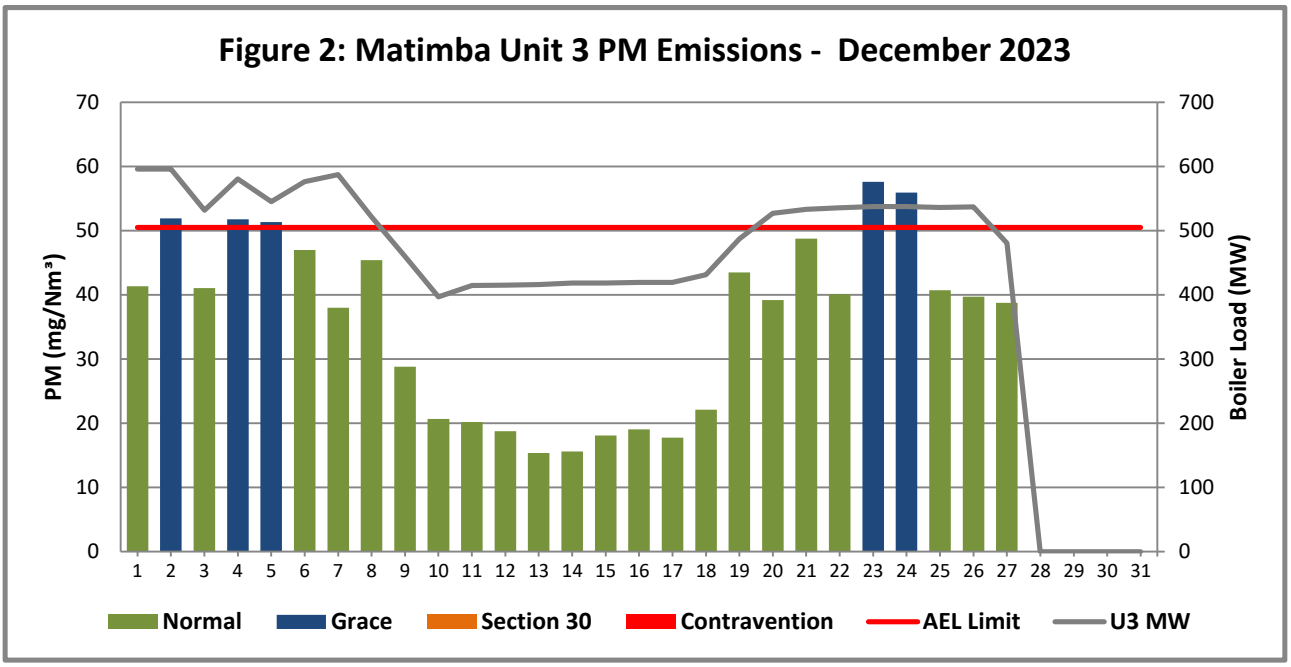

Figure 2: Particulate matter daily average emissions against emission limit for unit 3 for the month of December 2023

Interpretation:

Unit 3 exceeded the daily particulate emission limit of 50mg/Nm3 on 2,4,5,23, and 24 December 2023. All exceedances occurred within the 48-hour grace period. The exceedances were due to unavailability of the ash conveyance system that led to ash accumulation 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 unit was taken off load on 28 December 2023.

Unit 4 Particulate Emissions

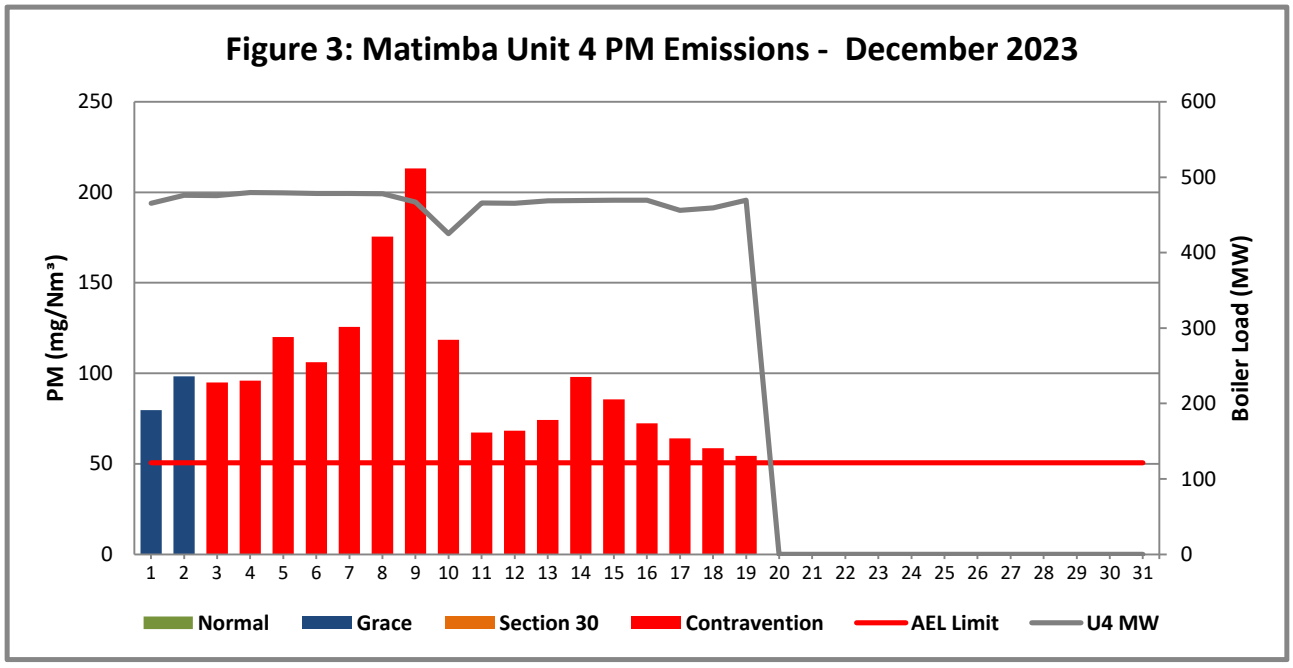

Figure 3: Particulate matter daily average emissions against emission limit for unit 4 for the month of December 2023

Interpretation:

Unit 4 Particulate matter exceeded the daily limit of 50 mg/Nm^3 on 1 to 19 December 2023. Exceedances of 3 to 19 December 2023 occurred outside of the 48-hour grace period and were recorded on the Eskom incident management process as non-compliance to the Atmospheric Emissions Licence. 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 investigation into the causes of the exceedances were done and corrective measure put in place to correct the root causes. The unit was taken off load on 20 December 2023.

Unit 5 Particulate Emissions

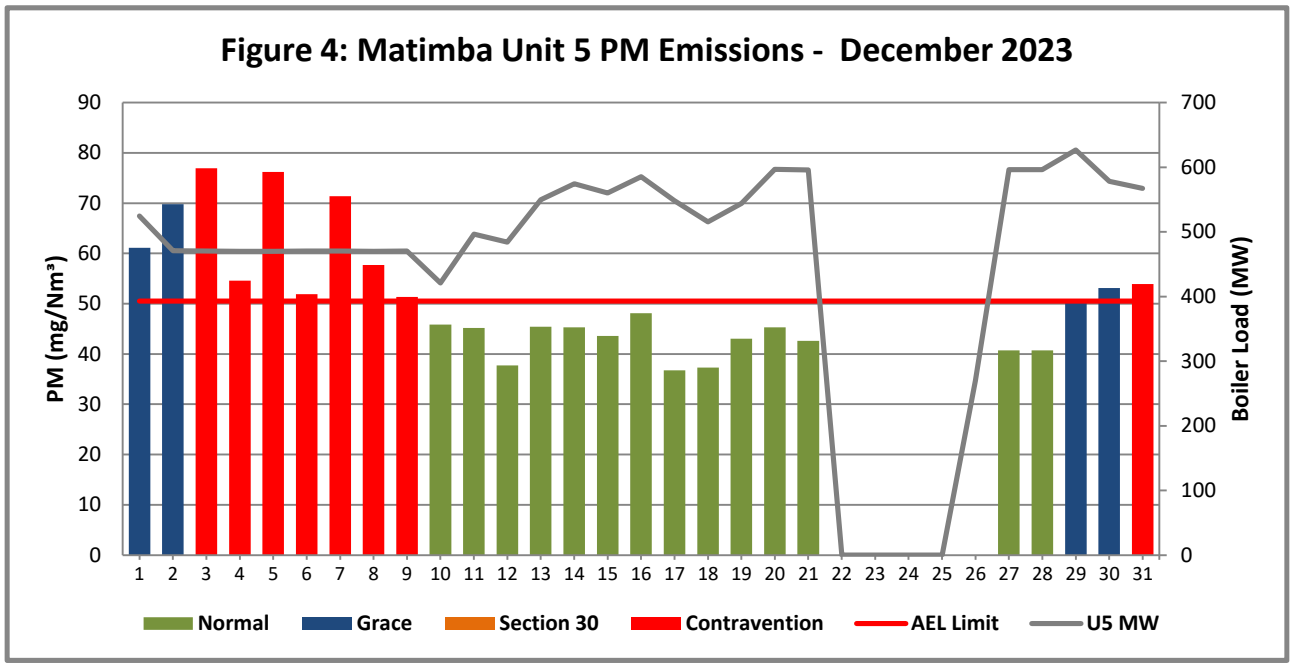

Figure 4: Particulate matter daily average emissions against emission limit for unit 5 for the month of December 2023

Interpretation:

Unit 5 Particulate matter exceeded the daily limit of 50 mg/Nm^3 on 1 to 9 and 29 to 31 December 2023. Exceedances of 3 to 9 and 31 December 2023 occurred outside of the 48-hour grace period and were recorded on the Eskom incident management process as non-compliance to the Atmospheric Emissions Licence. 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 investigation into the causes of the exceedances were done and corrective measure put in place to correct the root causes. Unit was taken off load on 22 December 2023 and returned on service on 26 December 2023

Unit 6 Particulate Emissions

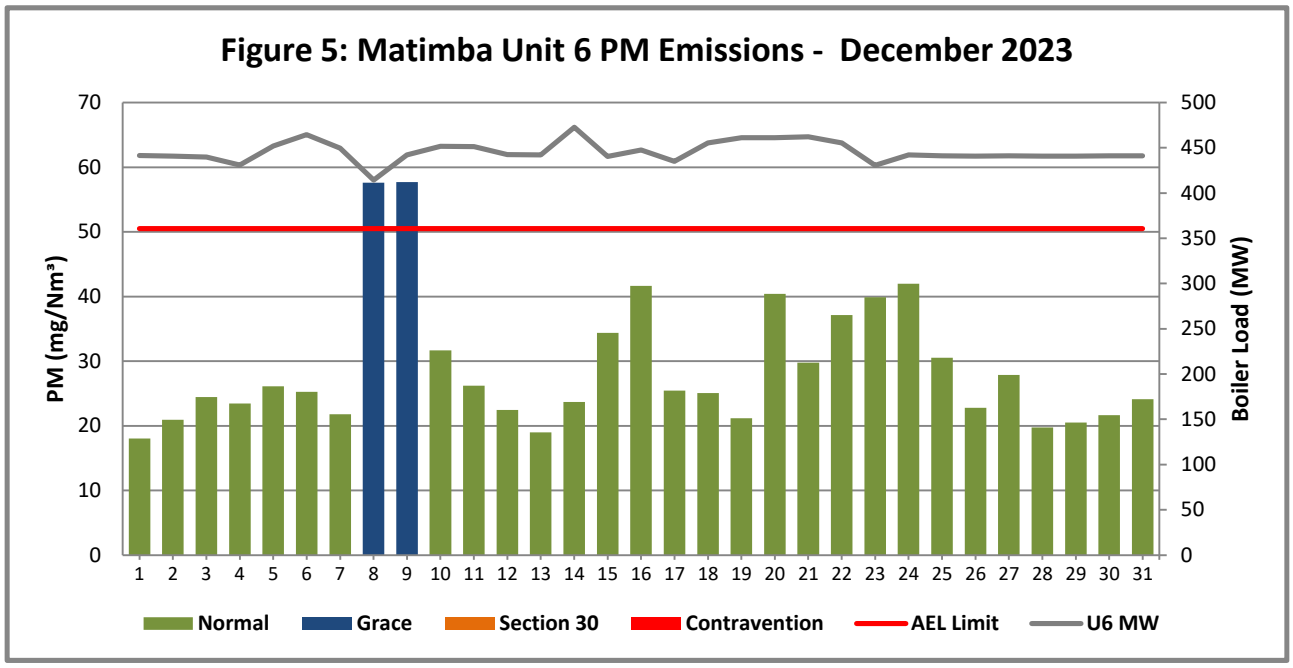

Figure 5: Particulate matter daily average emissions against emission limit for unit 6 for the month of December 2023

Interpretation:

Unit 6 Particulate matter exceeded the daily limit of 50 mg/Nm3 on 8 and 9 December 2023. All exceedances occurred within the 48-hour grace period.

2.3.2 Gaseous Emissions

Gaseous emissions analyzers calibration for all 6 units were performed in December 2023 as per the AEL requirements.

The quality assurance spot tests were performed on the monitors in August 2023 and the test results are used for the December 2023 emission calculation.

Unit 1 SO_2 Emissions

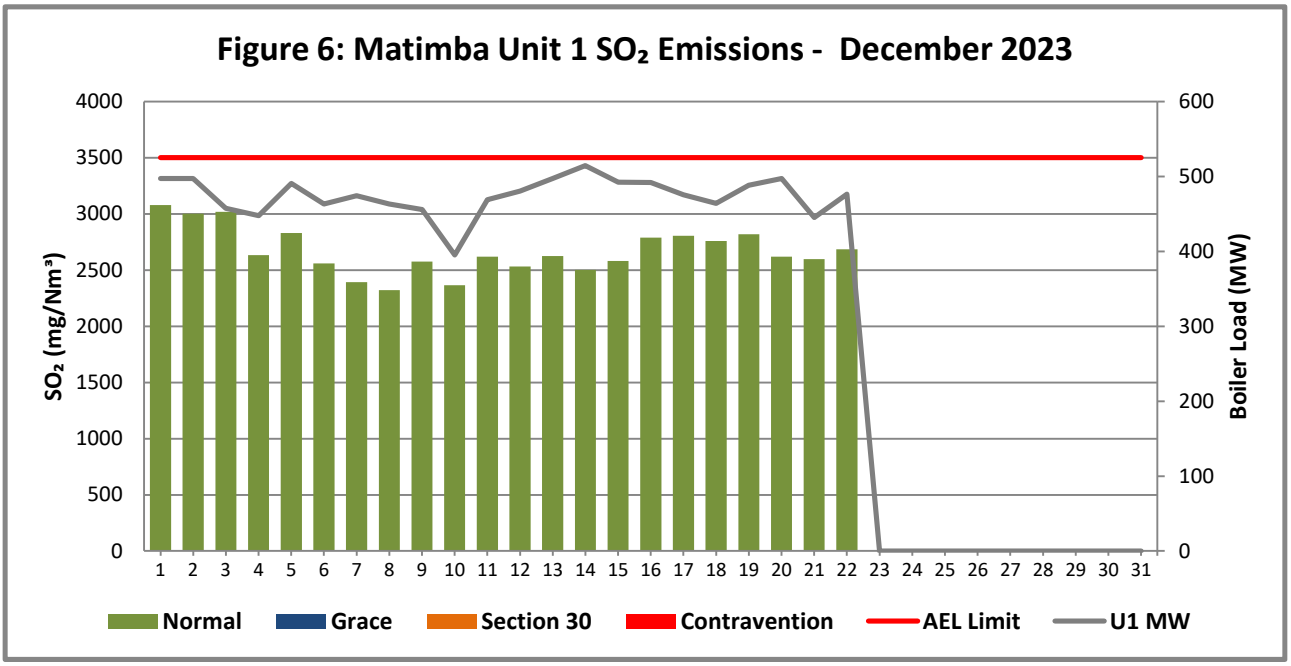

Figure 6: SO2 daily average emissions against emission limit for unit 1 for the month of December 2023

Interpretation:

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

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Unit 3 SO_2 Emissions

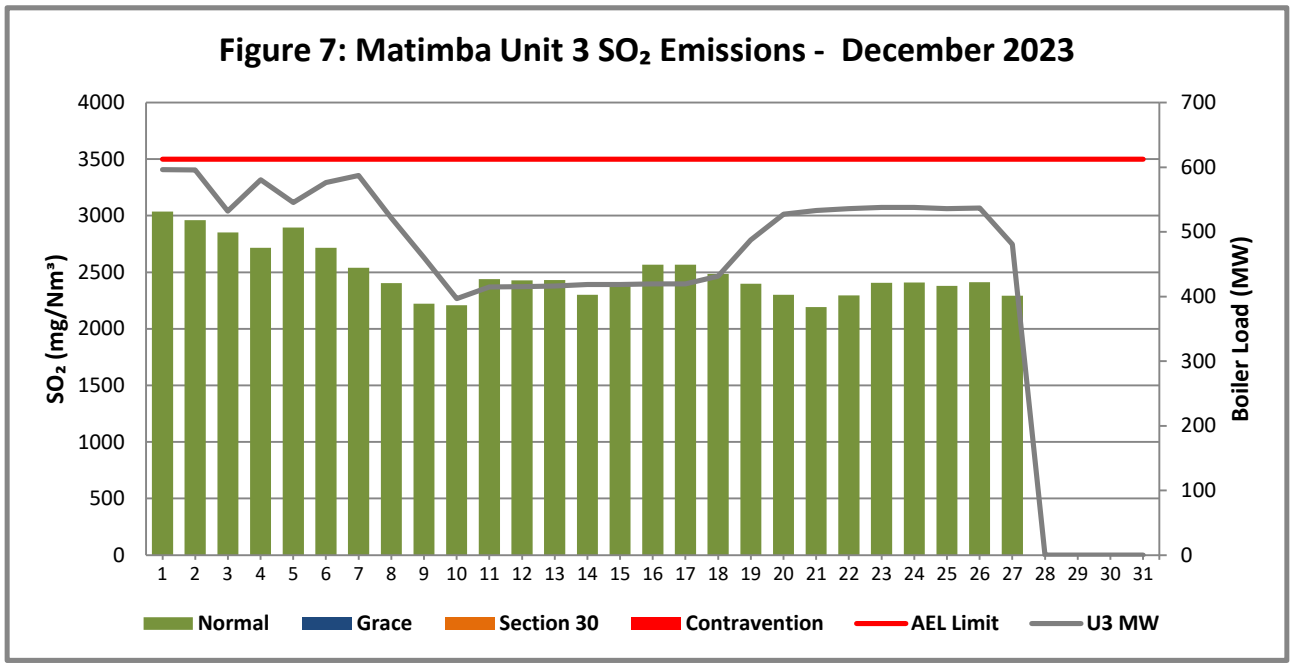

Figure 7: SO2 daily average emissions against emission limit for unit 3 for the month of December 2023

Interpretation:

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

Unit 4 SO_2 Emissions

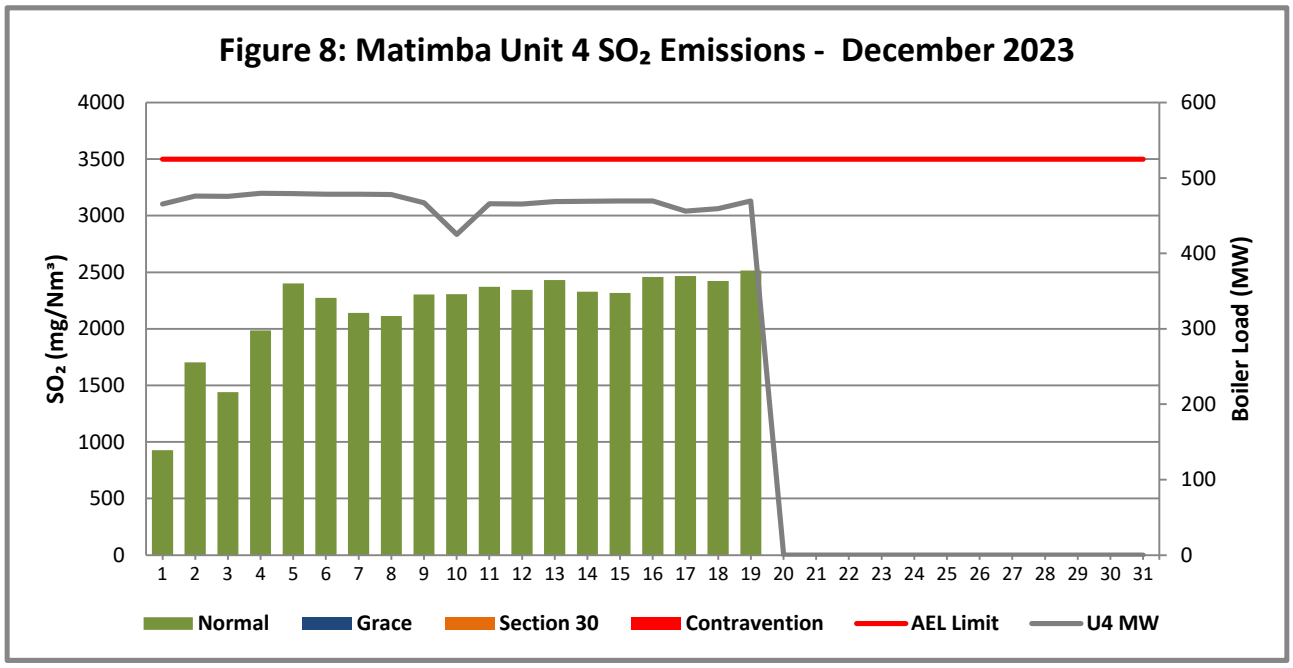

Figure 8: SO2 daily average emissions against emission limit for unit 4 for the month of December 2023

Interpretation:

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

Unit 5 SO_2 Emissions

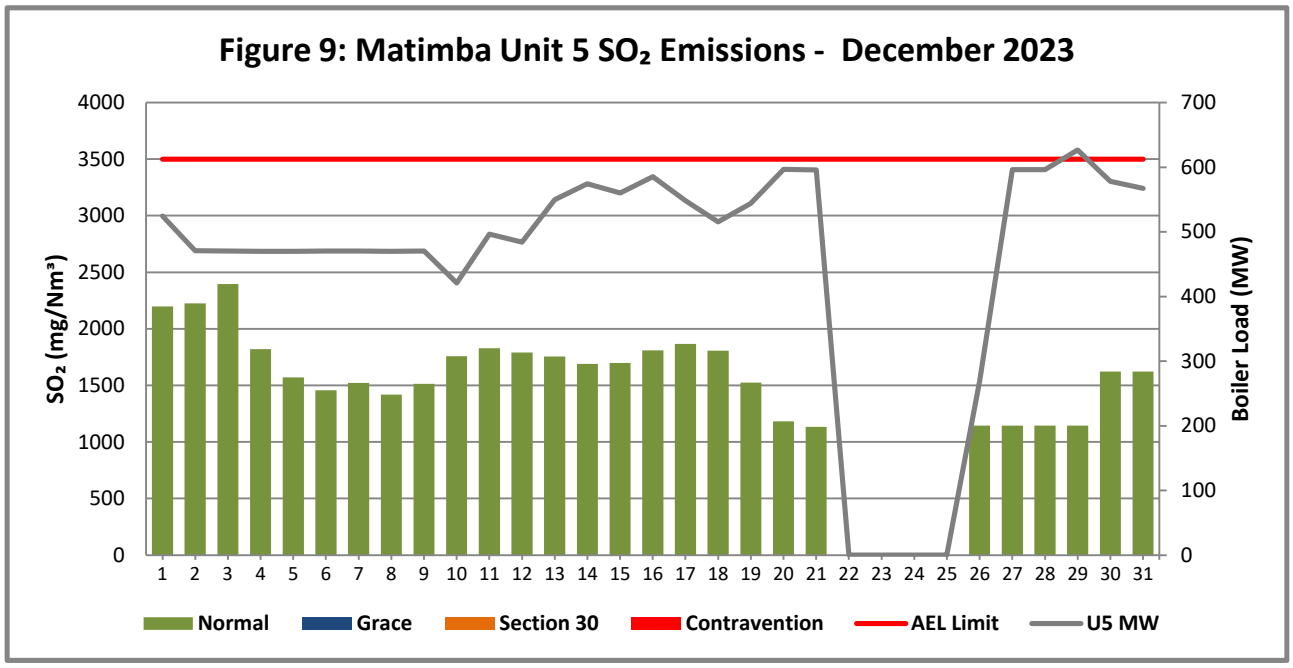

Figure 9: SO2 daily average emissions against emission limit for unit 5 for the month of December 2023

Interpretation:

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

Unit 6 SO_2 Emissions

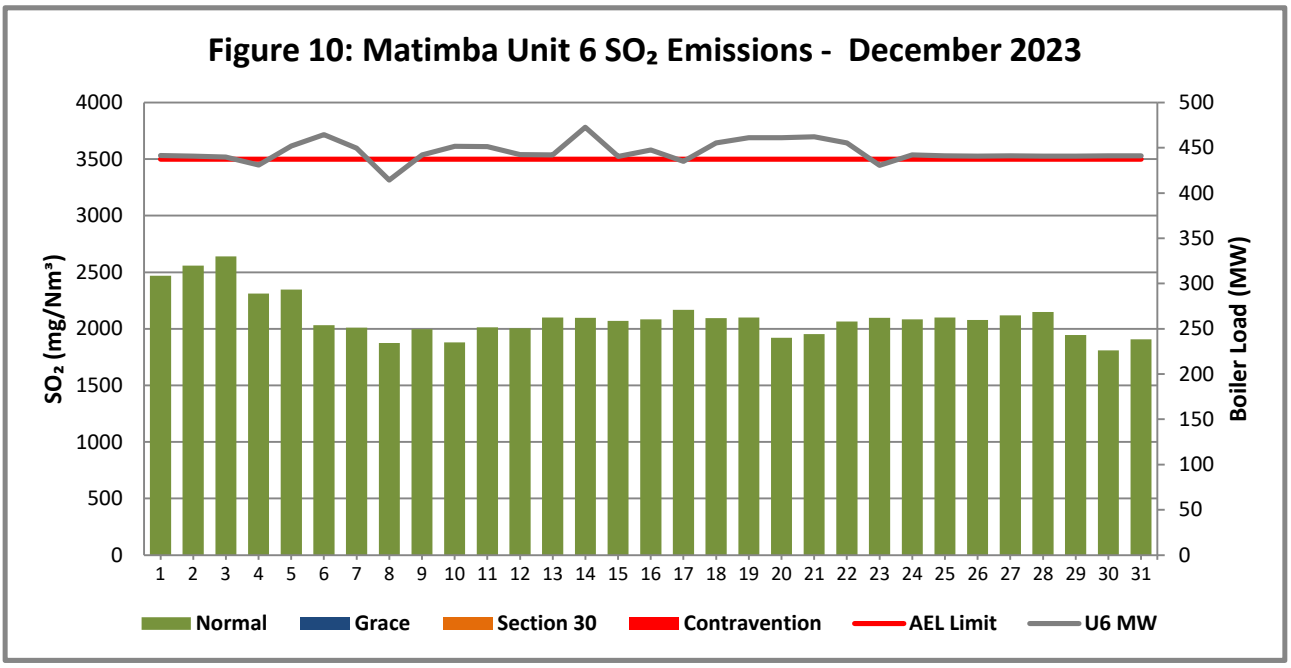

Figure 10: SO2 daily average emissions against emission limit for unit 6 for the month of December 2023

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

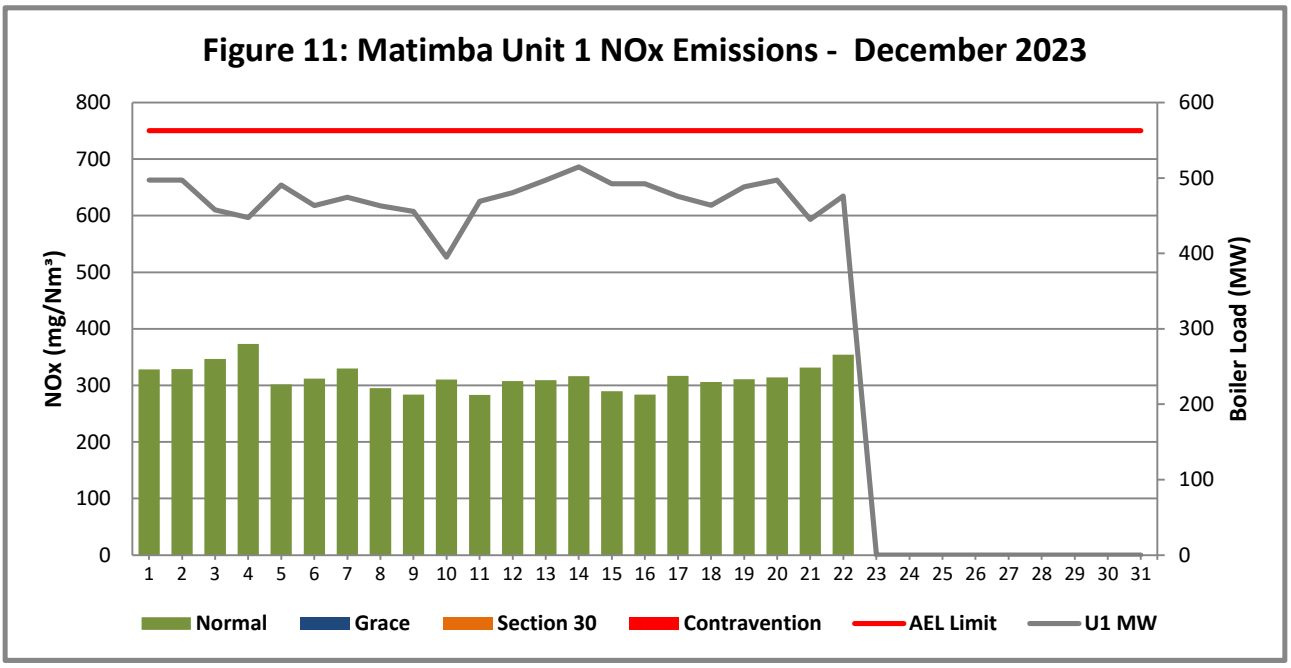

Figure 11: NOx daily average emissions against emission limit for unit 1 for the month of December 2023

Interpretation:

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

Unit 3 NO_x Emissions

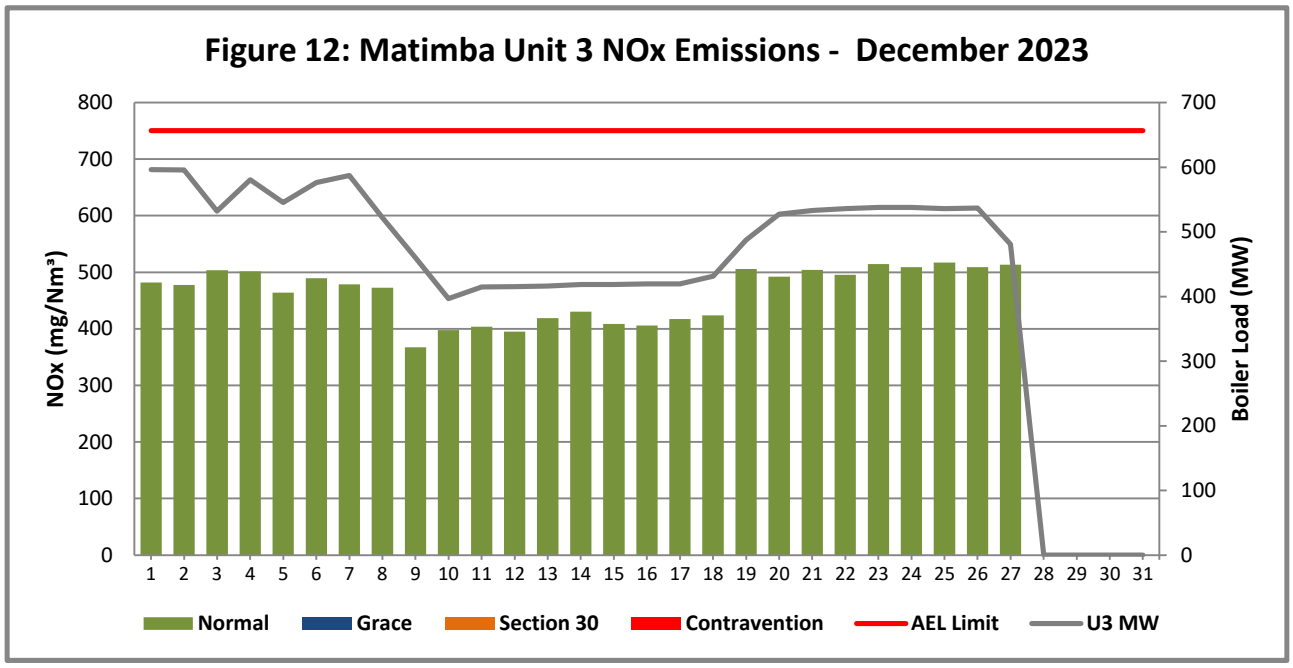

Figure 12: NOx daily average emissions against emission limit for unit 3 for the month of December 2023

Interpretation:

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

Unit 4 NO_x Emissions

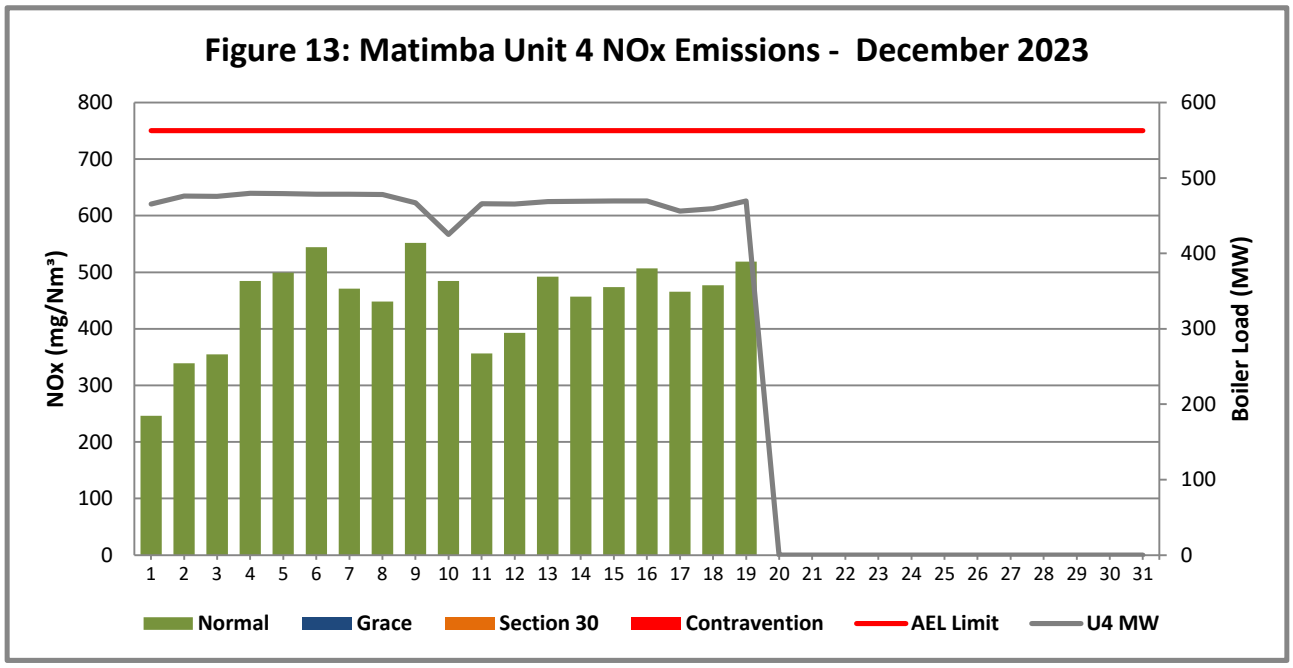

Figure 13: NOx daily average emissions against emission limit for unit 4 for the month of December 2023

Interpretation:

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

Unit 5 NO_x Emissions

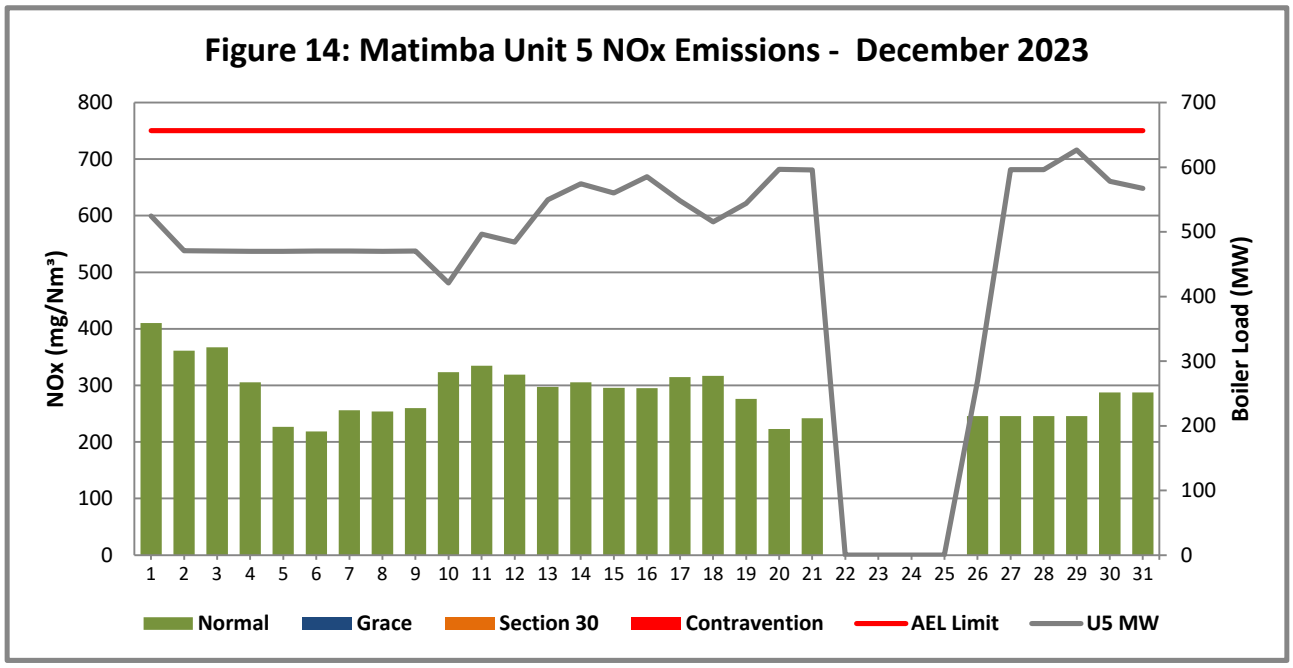

Figure 14: NOx daily average emissions against emission limit for unit 5 for the month of December 2023

Interpretation:

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

Unit 6 NO_x Emissions

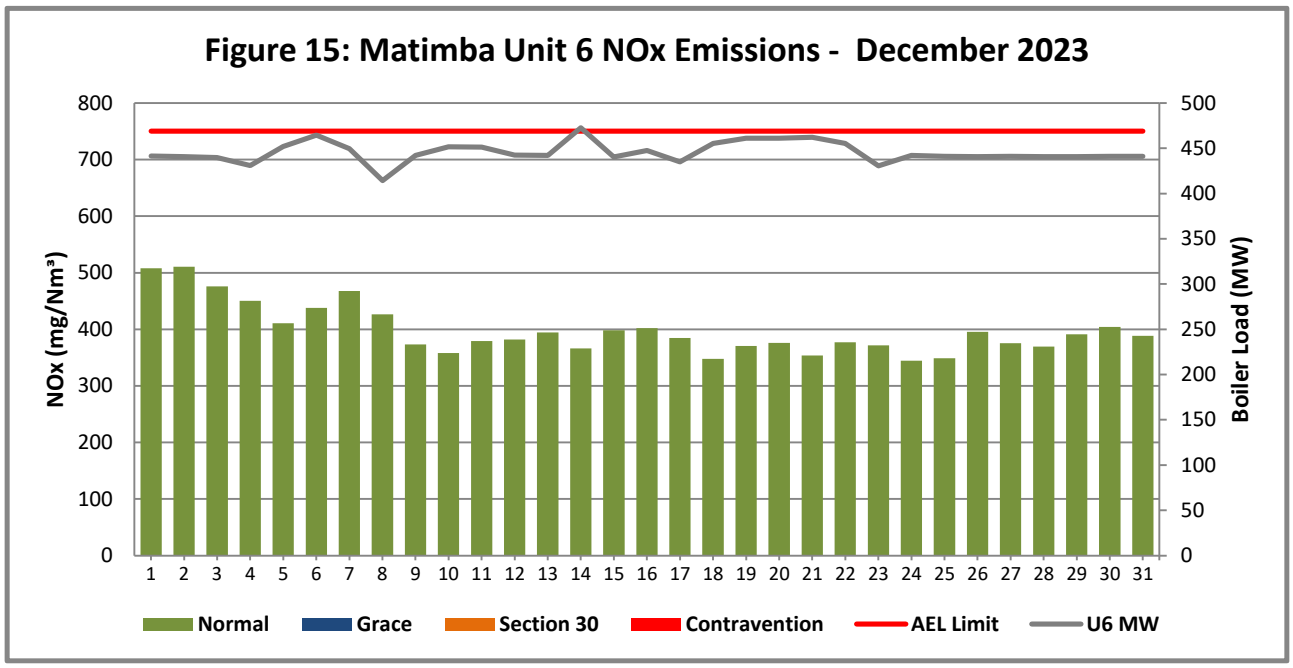

Figure 15: NOx daily average emissions against emission limit for unit 6 for the month of December 2023

Interpretation:

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

2.3.3 Total Volatile Organic Compounds

Table 4: Total volatile compound estimates

Eskom

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

Date:	Thursday, 25 January 2024
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:	***1075.537***	
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:	0.03	kg/month
TOTAL LOSSES (Total TVOC Emissions for the month):	**0.60**	**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.

2.3.4 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.

2.4 Daily power generated

Table 5: Daily power generated per unit in MWh for the month of December 2023

Date	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
2023/12/01	10930.1	0	12988.1	10003.9	11272.2	9503.09
2023/12/02	10912.2	0	12980.2	10249.1	10037.9	9486.34
2023/12/03	10030.6	0	11556.2	10272.7	10019	9456.52
2023/12/04	9759.47	0	12638.6	10355.8	10005.8	9247.26
2023/12/05	10773.2	0	11841.3	10343.5	9999.49	9710.77
2023/12/06	10153	0	12508.1	10332	10039.7	9998.15
2023/12/07	10397.5	0	12786.5	10318.9	10025.9	9662.79
2023/12/08	10149.6	0	11355.7	10317.8	10023	8893.45
2023/12/09	10009.3	0	9963.28	10074.9	10025.8	9497.7
2023/12/10	8609.96	0	8602.2	9183.42	8984.39	9751.11
2023/12/11	10276.1	0	9005.42	10063.2	10577.7	9769
2023/12/12	10540.7	0	8977.82	10091.2	10305.8	9549
2023/12/13	10918.4	0	8976.12	10159.4	11760.1	9513.49
2023/12/14	11323.2	0	9061.05	10131.5	12320.1	10245
2023/12/15	10816.5	0	9024.18	10177.1	12008.7	9518.72
2023/12/16	10805.5	0	9038.94	10187.9	12557.2	9585.4
2023/12/17	10423.5	0	9081.54	9874.65	11791.2	9360.57
2023/12/18	10166.6	0	9302.11	9916.94	11005	9820.87
2023/12/19	10706.3	0	10545.7	7546.84	11606.9	9928.98
2023/12/20	10920.7	0	11415.8	0	12812.3	9932.64
2023/12/21	9732.14	0	11491.4	0	4428.95	9962.09
2023/12/22	5405.82	0	11482	0	0	9811.37
2023/12/23	0	0	11559.2	0	0	9248.87
2023/12/24	0	0	11563.8	0	0	9516.19
2023/12/25	0	0	11529.7	0	0	9501.22
2023/12/26	0	0	11566.8	0	3384.33	9534.96
2023/12/27	0	0	9984.22	0	11375.2	9547.43
2023/12/28	0	0	0	0	14063.9	9525.39
2023/12/29	0	0	0	0	13979.4	9525.87
2023/12/30	0	0	0	0	12554.9	9528.15
2023/12/31	0	0	0	0	12310.9	9515.37

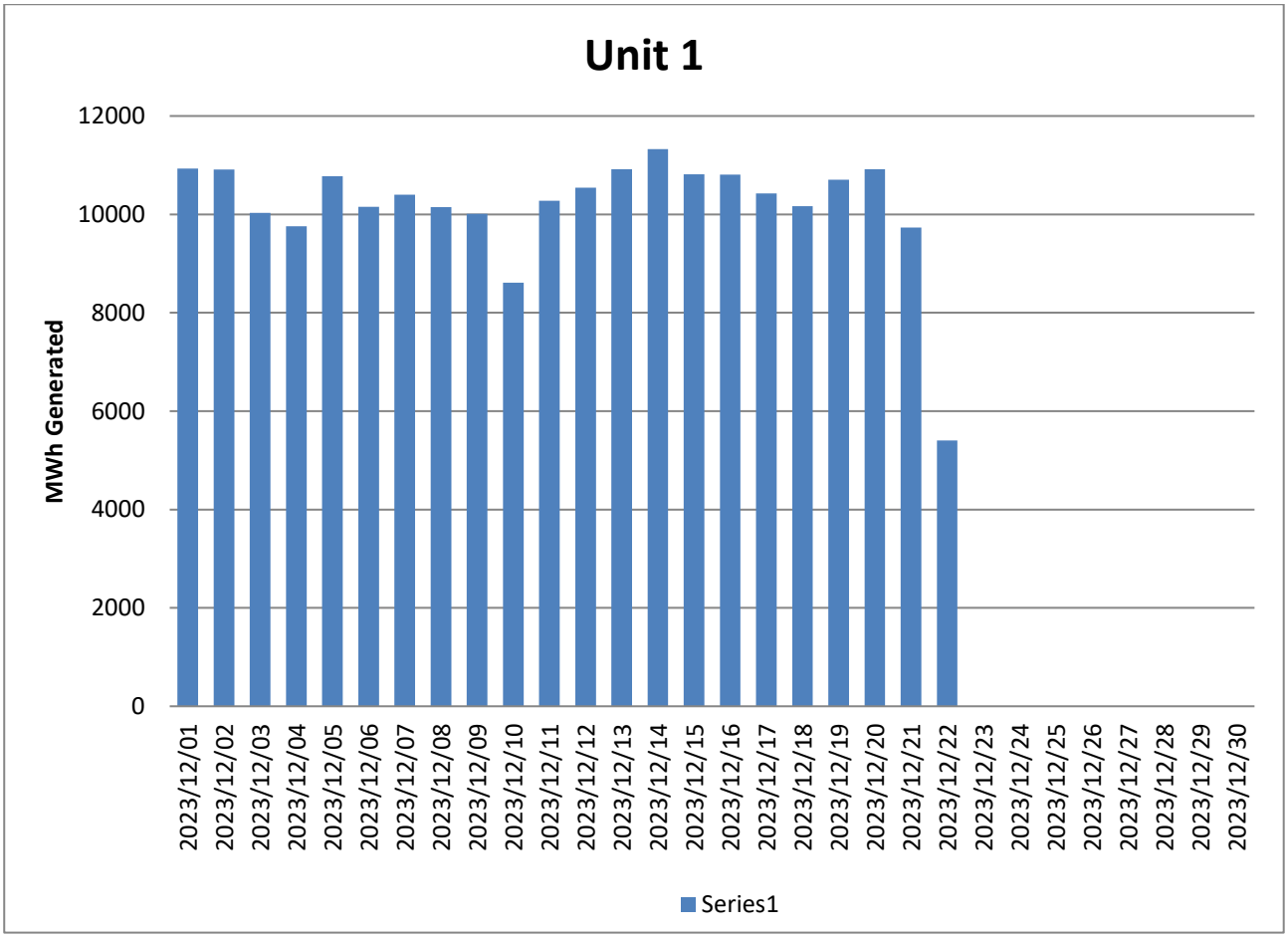

Figure 16: Unit 1 daily generated power in MWh for the month of December 2023

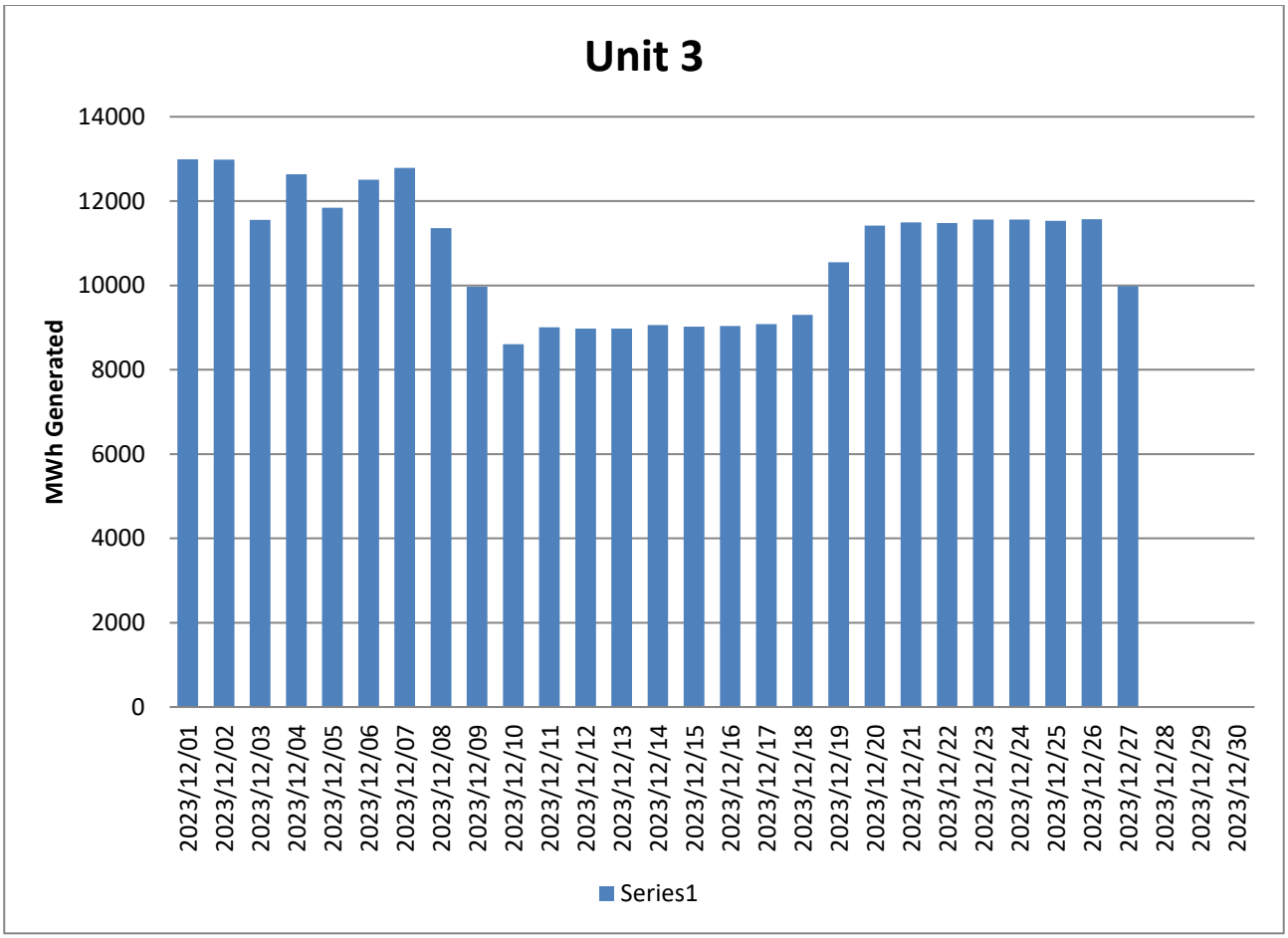

Figure 17: Unit 3 daily generated power in MWh for the month of December 2023

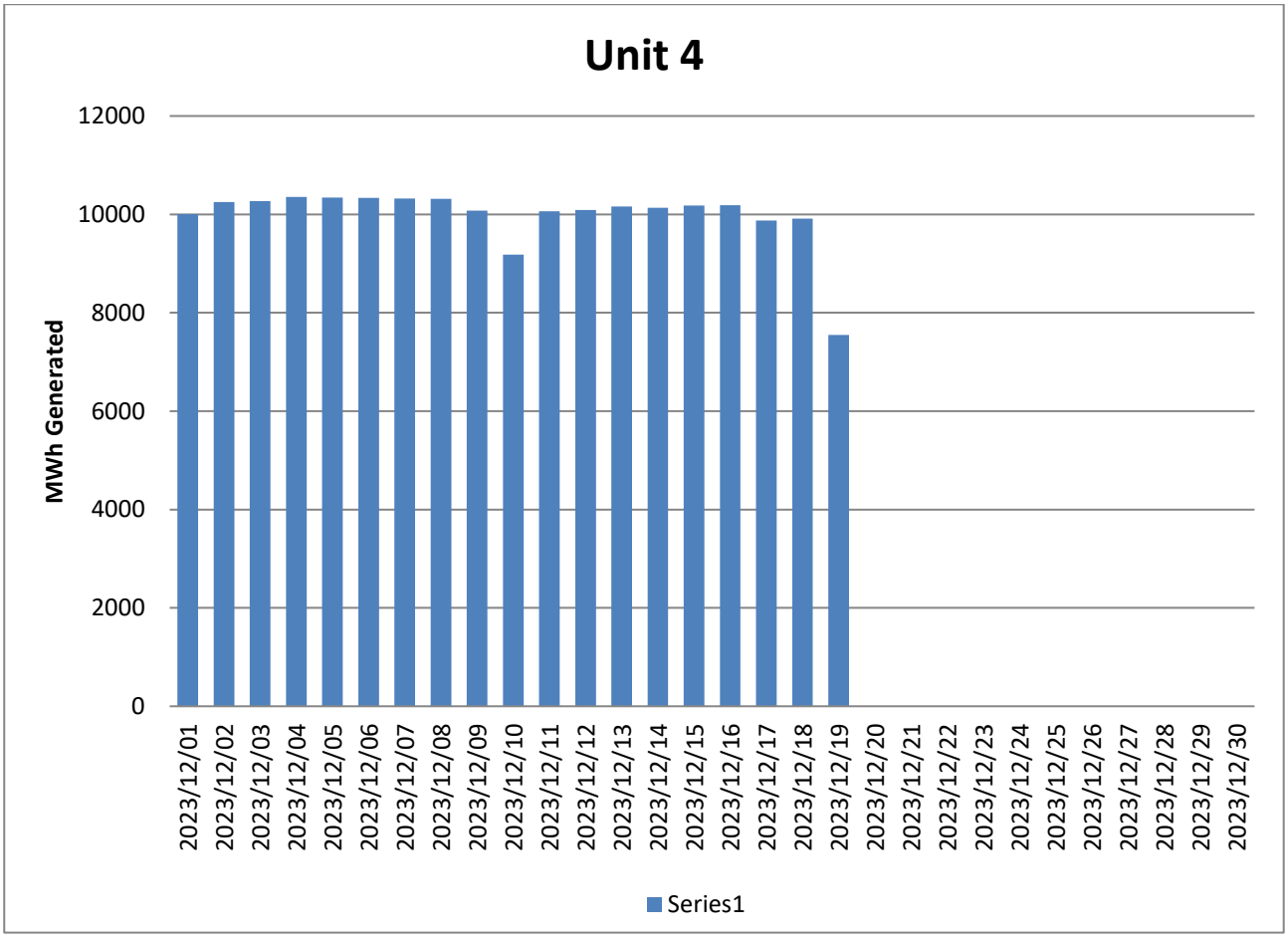

Figure 18: Unit 4 daily generated power in MWh for the month of December 2023

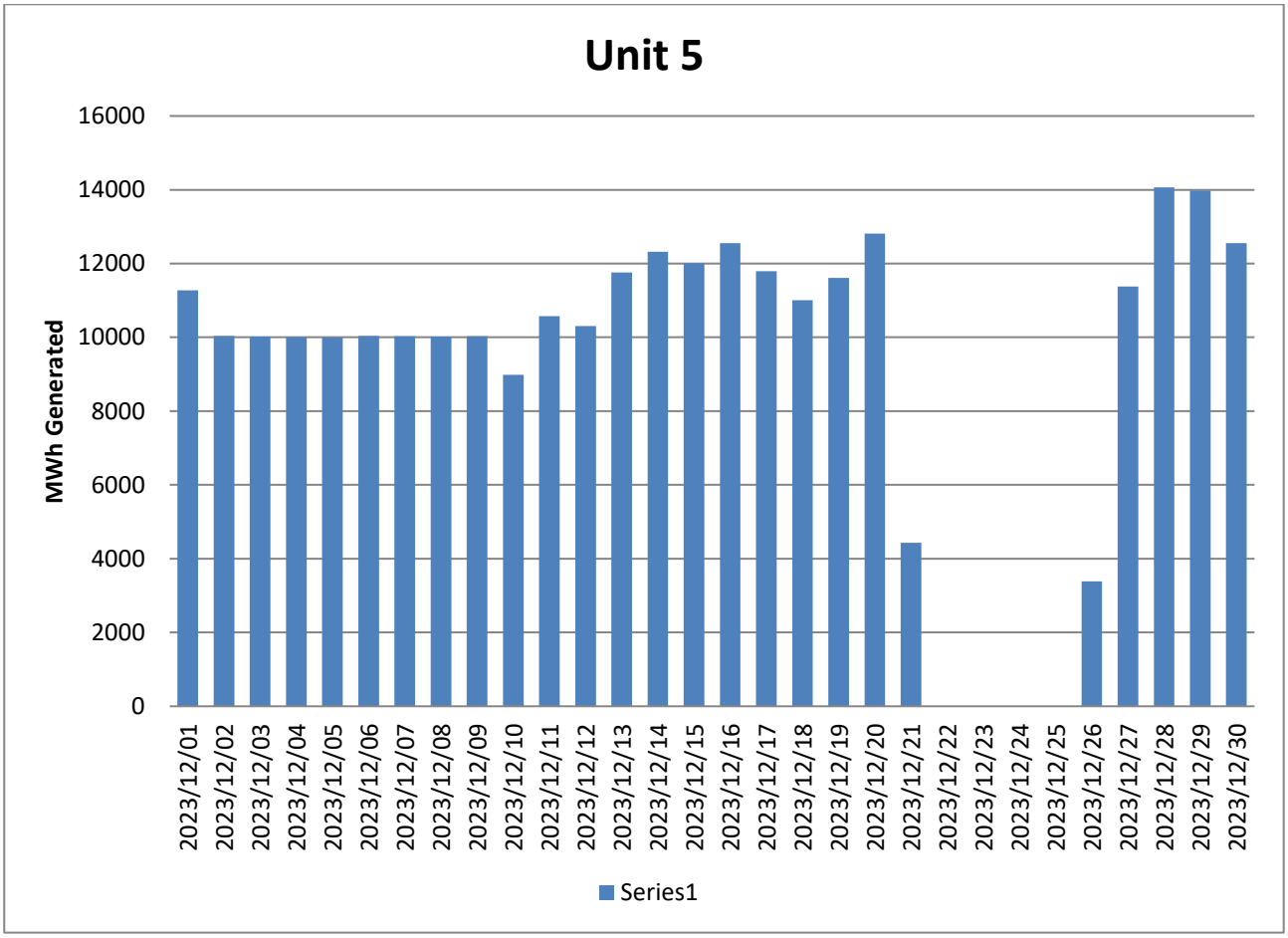

Figure 19: Unit 5 daily generated power in MWh for the month of December 2023

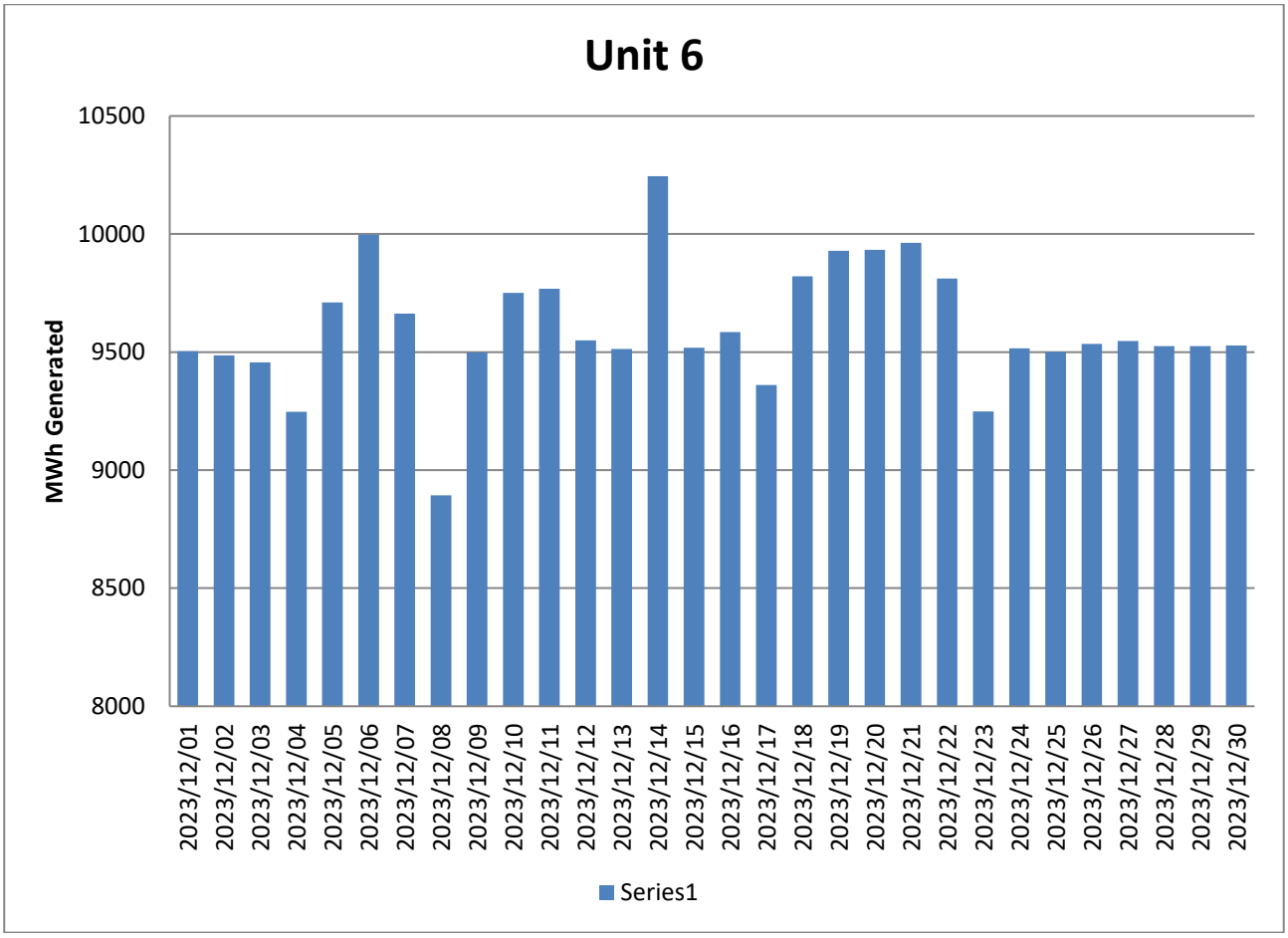

Figure 20: Unit 6 daily generated power in MWh for the month of December 2023

2.5 Pollutant Tonnages

The emitted pollutant tonnages for December2023 are provided in table 6.

Table 6: Pollutant tonnages for the month of December2023

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	51.9	3 926.0	461.7
Unit 2	Off	Off	Off
Unit 3	71.4	4 722.7	887.8
Unit 4	119.6	2 621.6	544.0
Unit 5	82.0	2 729.9	484.2
Unit 6	42.8	3 086.8	584.7
SUM	367.6	17 086.9	2 962.4

2.6 Operating days in compliance to PM AEL Limit

Table 7: Operating days in compliance with PM AEL limit of December 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm^3)
Unit 1	21	1	0	0	1	35.5
Unit 2	Off	Off	Off	Off	Off	Off
Unit 3	22	5	0	0	5	35.9
Unit 4	0	2	0	17	39	98.5
Unit 5	14	4	0	8	0	51.0
Unit 6	29	2	0	0	2	29.1
SUM	**86**	**14**	**0**	**25**	**47**	

2.7 Operating days in compliance to SOx AEL Limit

Table 8: Operating days in compliance with SOx AEL limit of December 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm^3)
Unit 1	22	0	0	0	0	2 669.3
Unit 2	Off	Off	Off	Off	Off	Off
Unit 3	27	0	0	0	0	2 491.3
Unit 4	19	0	0	0	0	2 171.1
Unit 5	27	0	0	0	0	1 621.9
Unit 6	31	0	0	0	0	2 099.2
SUM	**126**	**0**	**0**	**0**	**0**	

2.8 Operating days in compliance to NOx AEL Limit

Table 9: Operating days in compliance with NOx AEL limit of December 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	22	0	0	0	0	315.1
Unit 2	Off	Off	Off	Off	Off	Off
Unit 3	27	0	0	0	0	462.9
Unit 4	19	0	0	0	0	450.7
Unit 5	27	0	0	0	0	287.4
Unit 6	31	0	0	0	0	398.1
SUM	**126**	**0**	**0**	**0**	**0**	

2.9 Reference values

Table 10: Reference values for data provided, December 2023

Compound / Parameter	Units of Measure	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Oxygen	%	6.48	Off	7.64	6.91	6.57	10.77
Moisture	%	4.24	Off	3.76	3.27	4.16	2.04
Velocity	m/s	23.8	Off	26.5	22.6	22.7	25.3
Temperature	oC	137.9	Off	132.1	127.4	127.1	162.0
Pressure	mBar	923.6	Off	917.0	928.4	942.0	908.4

2.10 Continuous Emission Monitors

2.10.1 Reliability

Continuous emission monitors were available for more than 80% of the reporting period. The emitted pollutant tonnages for December 2023 are provided in table 6.

Table 11: Average percentage (%) availability of monitors for the month of December 2023.

Associated Unit/Stack	PM	SO_2	NO
Unit 1	100.0	100.0	100.0
Unit 2	Off	Off	Off
Unit 3	100.0	100.0	100.0
Unit 4	100.0	85.5	84.9
Unit 5	100.0	90.3	89.5
Unit 6	99.5	100.0	100.0

2.10.2 Changes, downtime, and repairs

Unit 1

- No adjustments done on the CEMs.
- No downtime or repairs done on the particulate monitors
- Repairs done during shut down.

Unit 2

- Unit off load

Unit 3

- No adjustments done on the CEMs.
- No downtime or repairs done on the particulate monitors
- Repairs done during shut down

Unit 4

- No adjustments done on the CEMs.
- No downtime or repairs done on the particulate monitors

Unit 5

- No adjustments done on the CEMs.
- No downtime or repairs done on the particulate monitors

Unit 6

- No adjustments done on the CEMs.
- No downtime or repairs done on the particulate monitors

2.10.3 Sampling dates and times

Table 12: 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

Note: The CEMS verification tests for PM, SO_2 and NOx were performed in October 2022 and failed. The spot tests were done in August 2023.

Dates of last conducted CEMS Spot verification tests for PM, SO_2 and NOx

Name of service provider:		Levego Environmental services		
Address of service provider:		Building R6 Pineland site Ardeer Road Modderfontein 1645		
Stack/ Unit	**PM**	**SO_2**	**NOx**	**CO_2**
1	2020/09/30 06h04	2023/08/01 19:33	2023/08/01 19:33	2023/08/01 19:33
2	2021/01/26 04h52	2023/07/29 21:17	2023/07/29 21:17	2023/07/29 21:17
3	2021/08/10 12h05	2023/08/06 03:00	2023/08/06 03:00	2023/08/06 03:00
4	2021/07/13 14h31	2023/08/04 19:39	2023/08/04 19:39	2023/08/04 19:39
5	2020/10/06 05h39	2023/08/05 07:30	2023/08/05 07:30	2023/08/05 07:30
6	2020/09/09 06h41	2023/08/05 15:52	2023/08/05 15:52	2023/08/05 15:52

Note: The CEMS Spot verification tests for PM, SO_2 and NOx were performed in August 2023. PM spot verification test results for all units does not meet the requirements outlined in the Eskom emission calculation Methodology and were not applied.

2.11 Units Start-up information

Table 13: Start-up information

Unit	5	
Fires in	2023/12/26	05h32
Synchronization with Grid	2023/12/26	15h33
Emissions below limit	2023/12/28	09h01
Fires in, to synchronization	10.1	HOURS
Synchronization to < Emission limit	41,28	HOURS

2.12 Emergency generation

Table 14: Emergency generation

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Emergency Generation hours declared by national Control	744	Off	744	744	744	744
Emergency Hours declared including hours after standing down	744	744	744	744	744	744
Days over the Limit during Emergency Generation	1	Off	5	19	12	2

During the period under review all Units were on emergency generation in force from 01 December 2023 until 31 December 2023.

2.13 Complaints register.

Table 15: 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					

2.14 Air quality improvements and social responsibility conducted.

2.14.1 Air quality improvements

None

2.14.2 Social responsibility conducted.

None

2.15 Ambient air quality monitoring

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

2.16 Electrostatic precipitator and Sulphur plant status

Unit 1

- 9 fields out of service, will be repaired during next opportunity.
- No abnormalities on the SO3 plant. Preventive maintenance done during the month.
- Repairs done during shut down

Unit 2

- Unit off

Unit 3

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

Unit 4

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

Unit 5

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

Unit 6

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

SO3 common plant

- No abnormalities on the sulphur storage plant.

2.17 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

pp GENERAL MANAGER: MATIMBA POWER STATION