Eskom

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Date:
24 November 2023

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Dear Ms. Nompumelelo Simelane

Ref: Kendal Power Station AEL (17/4/AEL/MP312/11/15)

KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF OCTOBER 2023.

This is a monthly report required in terms of Section 7.4 in the Kendal Power Station's Atmospheric Emission License. The emissions are for Eskom Kendal Power Station.

Compiled by:

Irene Motswenyane
ENVIRONMENTAL OFFICER- KENDAL POWER STATION

Date: 24/11/2023

Supported by:

Solly Chokoe
ENVIRONMENTAL MANAGER- KENDAL POWER STATION

Date: 24/11/2023

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KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF OCTOBER 2023

Verified by:

Jacob Zwane Date: 24/11/2023
BOILER ENGINEERING: SENIOR SYSTEM ENGINEER- KENDAL POWER STATION

Validated by:

Tendani Rasivhetshele Date: 2023/12/04
BOILER ENGINEERING MANAGER-KENDAL POWER STATION

Supported by:

Malibongwe Mabizela Date: 11/12/2023
ENGINEERING MANAGER-KENDAL POWER STATION

Approved by:

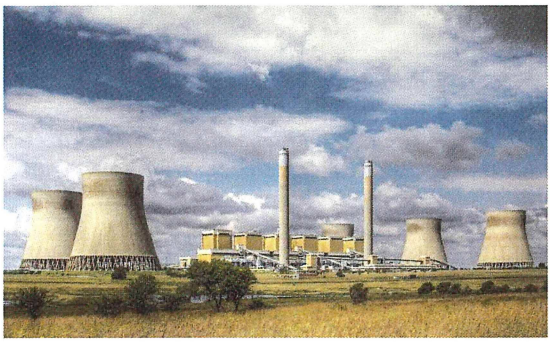
Kobus Steyn Date: 11 Dec 2023
GENERAL MANAGER-KENDAL POWER STATION

Eskom

OCTOBER 2023

KENDAL POWER STATION MONTHLY EMISSIONS REPORT

Atmospheric Emission License 17/4/AEL/MP312/11/15



1 RAW MATERIALS AND PRODUCTS

Raw Materials and Products	Raw Material Type	Units	Maximum Permitted Consumption Rate	Consumption Rate Oct-2023
	Coal	Tons	2 260 000	617 390
	Fuel Oil	Tons	5 000	8757.650
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Indicative Production Rate Oct-2023
	Energy	GWh	3 062.304	1 015.205
	Ash	Tons	770 000	201 022.184
	RE Ash	kg/MWh	not specified	1.831

Note: Maximum energy rate is as per the maximum capacity stated in the AEL: [4 116 MW] x 24 hrs x days in Month/1000 to convert to GWh

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
CV Content	MJ/kg	16-24 (MJ/kg)	18.530
Sulphur Content	%	<1 (%)	0.890
Ash Content	%	40 (%)	32.560

3 EMISSION LIMITS (mg/Nm³)

Associated Unit/Stack	PM	SO_2	NOx
Unit 1	100	3500	1100
Unit 2	100	3500	1100
Unit 3	100	3500	1100
Unit 4	100	3500	1100
Unit 5	100	3500	1100
Unit 6	100	3500	1100

4 ABATEMENT TECHNOLOGY (%)

Associated Unit/Stack	Technology Type	Efficiency Oct-2023	Technology Type	SO_3 Utlization Oct-2023
Unit 1	*ESP + SO_3*	*98.760%*	*SO_3*	*91.7%*
Unit 2	*ESP + SO_3*	*99.198%*	*SO_3*	*66.1%*
Unit 3	*ESP + SO_3*	*Off-line*	*SO_3*	*Off-line*
Unit 4	*ESP + SO_3*	*98.582%*	*SO_3*	*0.0%*
Unit 5	*ESP + SO_3*	*98.814%*	*SO_3*	*51.3%*
Unit 6	*ESP + SO_3*	*98.916%*	*SO_3*	*45.0%*

***Note**: ESP plant does not have bypass mode operation, hence plant 100% Utilised.*

SO3 steam supply was lost across the units
SO3 kept on tripping on convertor inlet temp high
SO3 Plant is not injecting
SO3 common plant is out for 48hrs steam leak repairs
So3 off due to steam temp low
SO3 plant was still off due to mass flow meter that wass blocked

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	*99.0*	*80.4*	*81.5*	*97.8*
Unit 2	*31.7*	*99.7*	*72.5*	*56.0*
Unit 3	*Off*	*Off*	*Off*	*Off*
Unit 4	*93.7*	*100.0*	*100.0*	*100.0*
Unit 5	*97.5*	*98.8*	*95.6*	*100.0*
Unit 6	*98.5*	*86.6*	*98.3*	*87.7*

Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2
Note: Unit 2 dust monitors realiability is low due to monitors maxing out. Unit 2 O2 monitors reliability low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of October 2023

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	426.6	3 198	1 163
Unit 2	157.7	1 052	391
Unit 3	Off	Off	Off
Unit 4	300.1	708	284
Unit 5	541.8	1 500	646
Unit 6	432.9	932	691
SUM	1 859.12	7 389	3 175

Please note the reported figures in tonnage calculation are an under estimate since the station did not use the Maxing out PM monitor quantification exercise which is the use of "surrogate values" on days when the monitor maxed out.

Table 6.2: Operating days in compliance to PM AEL Limit - October 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	6	10	0	9	19	319.6
Unit 2	0	2	0	13	15	256.8
Unit 3	Off	Off	Off	Off	Off	Off
Unit 4	0	2	0	13	15	634.7
Unit 5	8	6	0	11	17	486.1
Unit 6	0	2	0	26	28	292.9
SUM	**14**	**22**	**0**	**72**	**94**	

Table 6.3: Operating days in compliance to SO_2 AEL Limit - October 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	27	0	0	0	0	1 466.1
Unit 2	16	0	0	0	0	2 340.6
Unit 3	Off	Off	Off	Off	Off	Off
Unit 4	18	0	0	0	0	1 672.6
Unit 5	25	0	0	0	0	1 461.2
Unit 6	30	0	0	0	0	840.0
SUM	**116**	**0**	**0**	**0**	**0**	

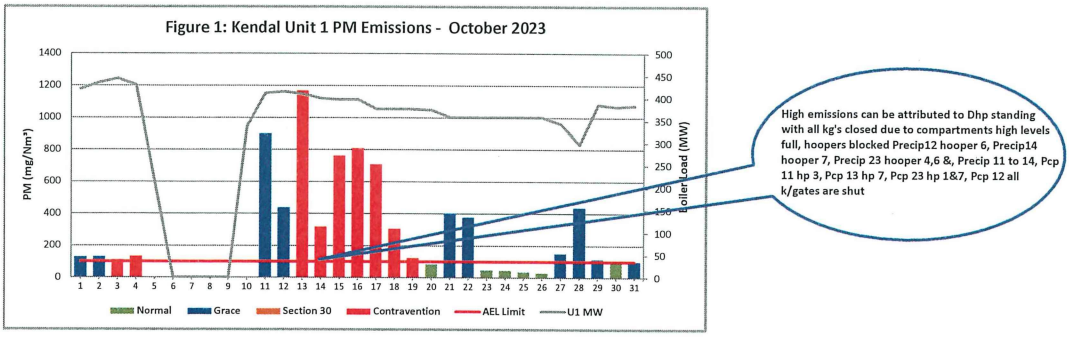
Table 6.4: Operating days in compliance to NOx AEL Limit - October 2023

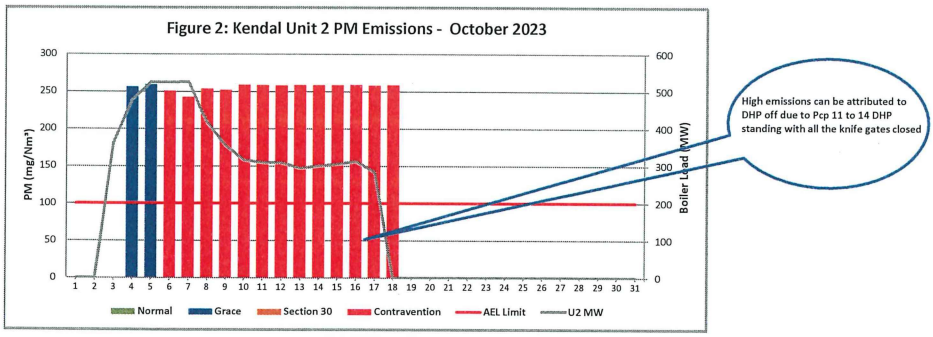
Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	27	0	0	0	0	533.7
Unit 2	16	0	0	0	0	887.4
Unit 3	Off	Off	Off	Off	Off	Off
Unit 4	18	0	0	0	0	671.4
Unit 5	25	0	0	0	0	627.4
Unit 6	30	0	0	0	0	618.3
SUM	116	0	0	0	0	

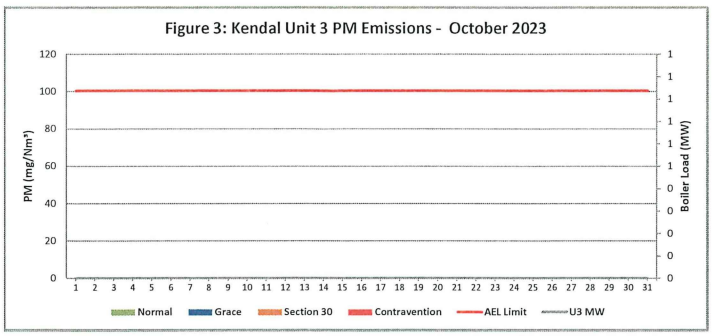
Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2

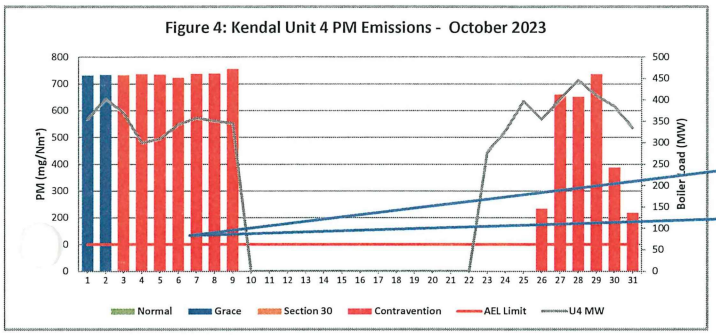
Table 6.5: Legend Description

Condition	Colour	Description
Normal	GREEN	Emissions below Emission Limit Value (ELV)
Grace	BLUE	Emissions above the ELV during grace period
Section 30	ORANGE	Emissions above ELV during a NEMA S30 incident
Contravention	RED	Emissions above ELV but outside grace or S30 incident conditions

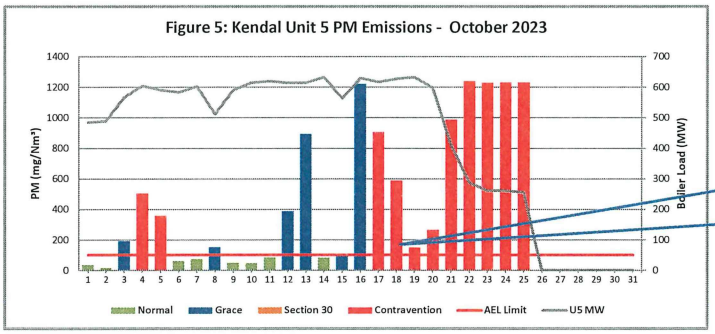




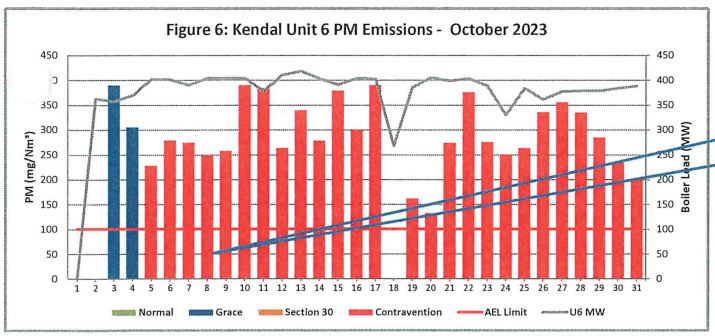




High PM emissions can be attributed to fuel oil support C and E elvation running with left hand site draught group and steam flow low, SO3 kept on tripping on convertor inlet temp high, Stream 2 bucket elevator that has blown the fusible plug and topping of oil fusible plug replacement .S1 bucket elevator coupling was leaking,
no ashing on the DHP due to S1 not available. closed all knife gates because of the second collector failure to run, DHP precip conveyors 11 to 14 standing due to stream 1 second collector conveyor faulty. precip conveyors started 11,14, and 21-24 all knife gates closed. Precip conveyors 12 and 13 chocked
Ashing onto stream 1. Stream 2 B/E standing and 1st collector chocked, DHP standing and all knife gates cback-end temps are very low at 110 and 109 degrees hence the SO3 Plant is not injecting any sulphur. losed due to both S1 and S2 bucket elevators chocked



High PM emissions can be attributed to Dhp standing due to issues at top bunker. Pcp 21 to 24 DHP standing the 1st collecting conv is suspected of a coupling fault, all knife gates are fully shut, PCP 21_24 first collector stream 2 triped. DHP plant was standing with some ash backlogs due to compartment levels that were high and low flow on the SO3 plant. SO3 common plant is out for 48hrs steam leak repairs



High PM emissions can be attributed to precip 11 to 14 standing, knife gates closed, compartments levels high, So3 off due to steam temp low, SO3 plant was still off due to mass flow meter that wass blocked

Figure 7: Kendal Unit 1 SO_2 Emissions - October 2023

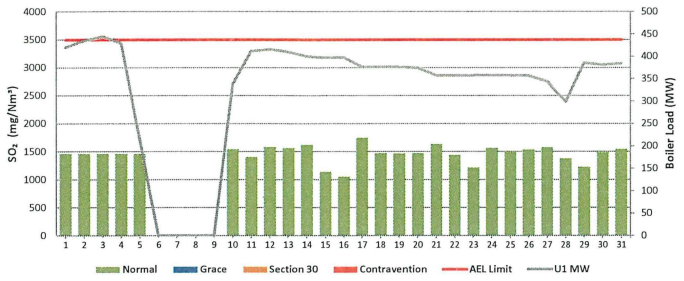


Figure 8: Kendal Unit 2 SO_2 Emissions - October 2023

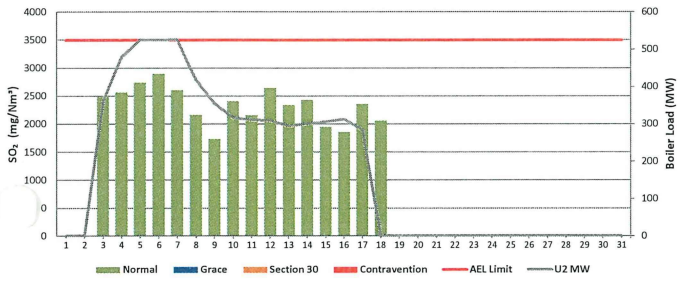
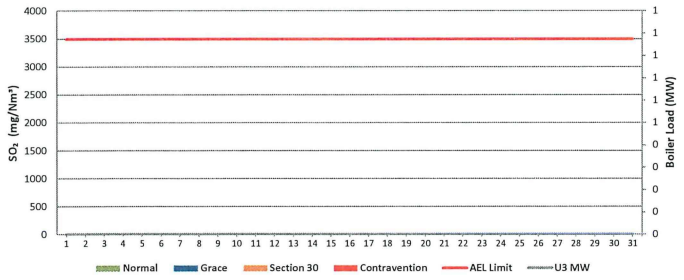


Figure 9: Kendal Unit 3 SO_2 Emissions - October 2023



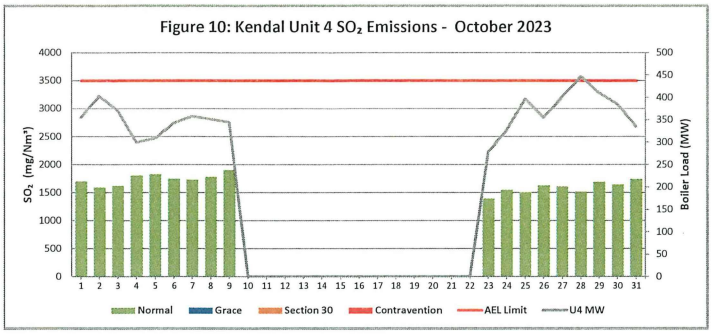


Figure 10: Kendal Unit 4 SO_2 Emissions - October 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW

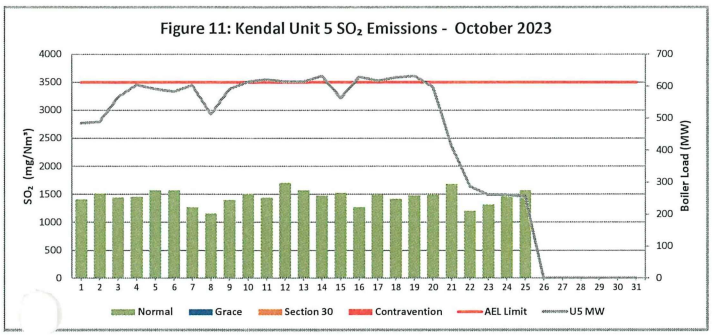


Figure 11: Kendal Unit 5 SO_2 Emissions - October 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

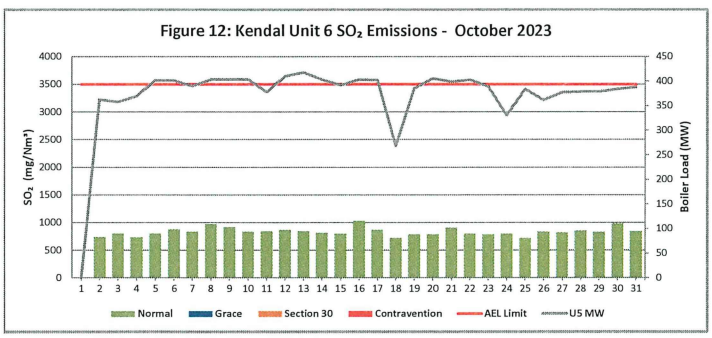


Figure 12: Kendal Unit 6 SO_2 Emissions - October 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

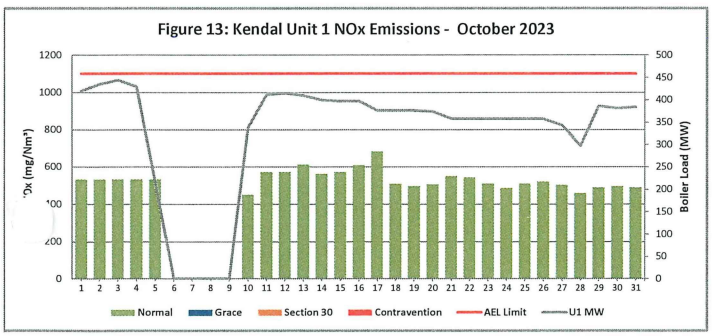


Figure 13: Kendal Unit 1 NOx Emissions - October 2023
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

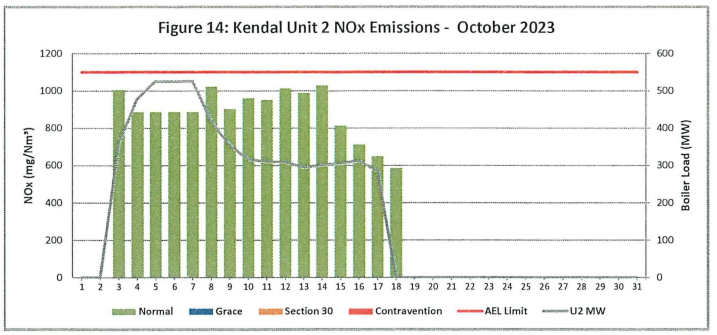


Figure 14: Kendal Unit 2 NOx Emissions - October 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW

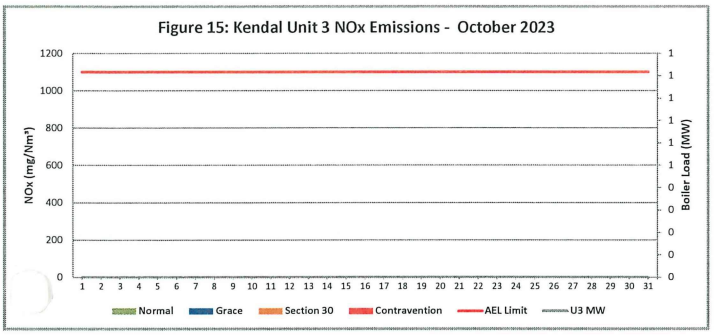


Figure 15: Kendal Unit 3 NOx Emissions - October 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

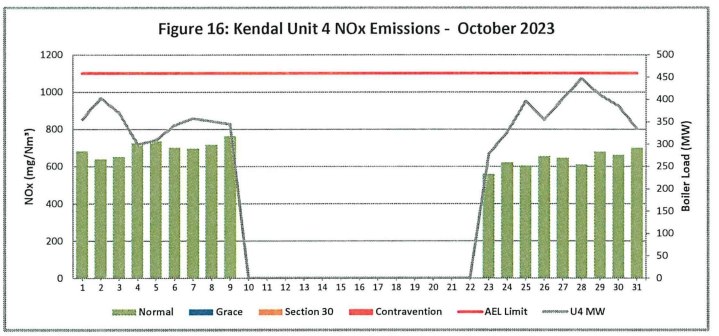


Figure 16: Kendal Unit 4 NOx Emissions - October 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW

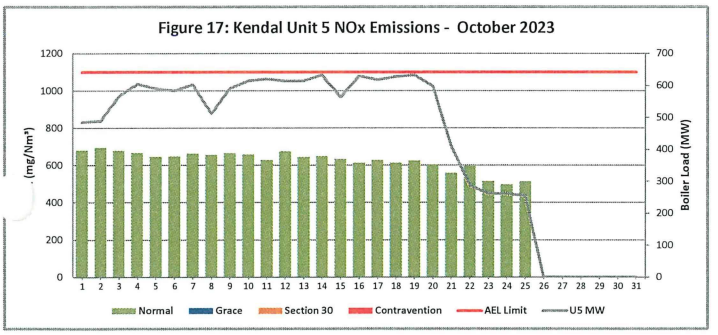


Figure 17: Kendal Unit 5 NOx Emissions - October 2023
(mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

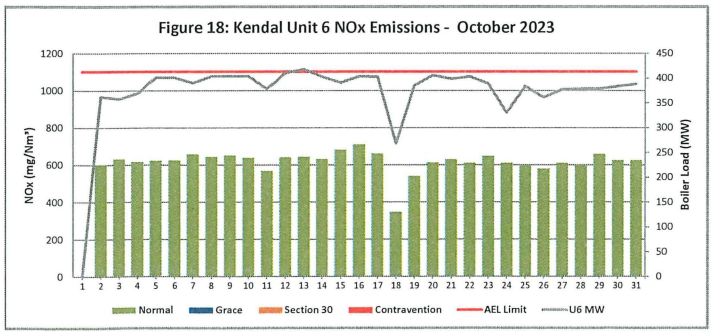


Figure 18: Kendal Unit 6 NOx Emissions - October 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U6 MW

7 COMPLAINTS

There were no complaints for this months

Source Code / Name	Root Cause Analysis	Calculation of Impacts / emissions associated	Dispersion modeling of pollutants where applicable	Measures implemented to prevent reoccurrence

ADDENDUM TO MONTHLY EMISSIONS REPORT

Abatement Technology-Table 4

In order to achieve the required operational dust removal efficiency based on measured values, several assumptions such as
- Coal ash content (%) and burnt rate mass
- Fly : Coarse ash ratio of 80:20 - 80% of fly-ash mass obtained from burnt coal goes to ESP
- Measurement of dust emission by Dust Monitor over a period of time (monthly)

Operational Dust Removal Efficiency

$\eta = (1 - (Output/Input)) \times 100$

$\eta = 1 - \frac{(DustEmissionFromAQR\ ReportDustMonitor(tons)}{(CoalBurnt(tons) * \%AshContent * 80\%)} \times 100$

Monitor Reliability-Table 5

In terms of the minimum emissions standard, the requirement is that a monitor should be 80% reliable on a monthly average.
The **monitor reliability** refers to **data reliability** because the assumed value of 99.325% reliability is compared to the dust concentration signal. If the dust concentration signal is above 99.325% opacity,the data information is no longer reliable because the monitor reading is out of its maximum reading range. The data reliability looks at how many times did the dust concentration signal go above 98% over a period of time e.g 24hours
The formula is as follows:
= (1 – (count hours above 99.325%/24hours))x 100

Emissions Performance:

- Average velocity values from the latest correlation report were used on the gaseous emissions on Unit 1, 2,4,5 &6 due to defective CEMS monitors and velocity correction factors were set M=1 and C=0
- Unit 5 Monitor still using the old monitor correlation. After new correlations are done, new correlation factors will be implemeted and backfitted to the date of monitor installation.
- U1 and 2 monitors maxed out, meaning the emission were higher than what the monitor was correlated for. In which case we use surrogate values. This is attributted to abnormal plant conditions during the period.
  The following are the days when the monitor was maxing out: Unit 1 on the 13th, Unit 2 04th to 17th. Figures will be restated based on updated upset testing and surrogate value determination that Kendal will conduct
- Avarage emeissions for unit 1 SOx and NOx from the 1st to the 9th and flow for the entire month were used from the QAL2 repor, DCS module for those signals had failed and it has been replaced.
- Avarage emissions for unit 4 Pressure for the whole month were used from the QAL 2 report as the monitors were defective.
- Avarage emissions for unit 2 NOx from the 4th to 7th monitors were defective data was deleted and the tool will avarage it self.
- Avarage emissions for unit 3 CO2 and O2 were taken from QAL2 report as the CO2 and O2 as the monitors were not operating adequately.

- Unit 1
- Findings: The high emissions can be attributed to Dhp standing with all kg's closed due to compartments high levels full, hoopers blocked Precip12 hooper 6, Precip14 hooper 7, Precip 23 hooper 4,6 &, Precip 11 to 14, Pcp 11 hp 3, Pcp 13 hp 7, Pcp 23 hp 1&7, Pcp 12 all k/gates are shut
- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to DHP off due to Pcp 11 to 14 DHP standing with all the knife gates closed
- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to
- Resolution: Palnt repaired.

- Unit 4
- Findings: High PM emissions can be attributed to fuel oil support C and E elvation running with left hand site draught group and steam flow low, SO3 kept on tripping on convertor inlet temp high, Stream 2 bucket elevator that has blown the fusible plug and topping of oil fusible plug replacement .S1 bucket elevator coupling was leaking, no ashing on the DHP due to S1 not available. closed all knife gates because of the second collector failure to run, DHP precip conveyors 11 to 14 standing due to stream 1 second collector conveyor faulty. precip conveyors started 11,14, and 21-24 all knife gates closed. Precip conveyors 12 and 13 chocked, Ashing onto stream 1. Stream 2 B/E standing and 1st collector chocked, DHP standing and all knife gates cback-end temps are very low at 110 and 109 degrees hence the SO3 Plant is not injecting any sulphur. losed due to both S1 and S2 bucket elevators chocked.
  Resolution: Plant repaired.

- Unit 5
- Findings: High PM emissions can be attributed to Dhp standing due to issues at top bunker. Pcp 21 to 24 DHP standing the 1st collecting conv is suspected of a coupling fault, all knife gates are fully shut, PCP 21_24 first collector stream 2 triped. DHP plant was standing with some ash backlogs due to compartment levels that were high and low flow on the SO3 plant. SO3 common plant is out for 48hrs steam leak repairs.
- Resolution: Plant repaired.

- Unit 6
- Findings: High PM emissions can be attributed to precip 11 to 14 standing, knife gates closed, compartments levels high, So3 off due to steam temp low, SO3 plant was still off due to mass flow meter that wass blocked.
- Resolution: Plant repaired.