Eskom

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Date:
09 October 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 JULY 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: 09/10/2023

Supported by:

Solly Chokoe
ENVIRONMENTAL MANAGER- KENDAL POWER STATION

Date: 09/10/2023

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

Verified by:

Jacob Zwane Date: 11/10/2023
BOILER ENGINEERING: SENIOR SYSTEM ENGINEER- KENDAL POWER STATION

Validated by:

Tendani Rasivhetshele Date: 16-10-2023
BOILER ENGINEERING MANAGER-KENDAL POWER STATION

Supported by:

Malibongwe Mabizela Date: 18/10/2023
ENGINEERING MANAGER-KENDAL POWER STATION

Approved by:

Kobus Steyn Date: 20 Oct 2023
GENERAL MANAGER-KENDAL POWER STATION

Eskom

JULY 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 Jul-2023
	Coal	Tons	2 260 000	764 043
	Fuel Oil	Tons	5 000	11343.880
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Indicative Production Rate Jul-2023
	Energy	GWh	3 062.304	1 243.968
	Ash	Tons	770 000	278 570.088
	RE Ash	kg/MWh	not specified	2.727

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
CV Content	MJ/kg	16-24 (MJ/kg)	17.340
Sulphur Content	%	<1 (%)	0.850
Ash Content	%	40 (%)	36.460

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 Jul-2023	Technology Type	SO_3 Utlization Jul-2023
Unit 1	*ESP + SO_3*	*Off-line*	*SO_3*	*39.2%*
Unit 2	*ESP + SO_3*	*96.098%*	*SO_3*	*50.3%*
Unit 3	*ESP + SO_3*	*99.618%*	*SO_3*	*0.0%*
Unit 4	*ESP + SO_3*	*Off-line*	*SO_3*	*Off-line*
Unit 5	*ESP + SO_3*	*97.324%*	*SO_3*	*28.4%*
Unit 6	*ESP + SO_3*	*99.034%*	*SO_3*	*2.8%*

SO3 plant for Unit 3 was in service and was injecting as required however the station was unable to archive the information to our PI system. It is the failure of the stations very old and obsolete windows 97 SCADA system which the station is looking to replace during the next GO outage on unit 3.

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

SO3 plant on hold mode due to aux steam temp low, So3 plant off due to the inlet steam temp low, SO3 plant tripped due to low back end temps, SO3 plant on hold mode sulphur flow meter faulty reading. SO3 plant off, DHP PLC off, SO3 plant heater that fail to reset.

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	*55.8*	*90.3*	*93.1*	*97.6*
Unit 2	*51.6*	*94.0*	*94.6*	*0.0*
Unit 3	*45.0*	*100.0*	*100.0*	*86.7*
Unit 4	*OFF*	*OFF*	*OFF*	*OFF*
Unit 5	*98.7*	*99.7*	*100.0*	*100.0*
Unit 6	*93.1*	*68.7*	*67.1*	*100.0*

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

Note: Unit 1, 2 and 3 dust monitors realiability is low due to monitors maxing out. Unit 2 O2, Unit 6 Sox, Nox and O2 monitors reliability low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of July 2023

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	0.0	3 508	1 372
Unit 2	1 444.3	1 769	690
Unit 3	184.3	2 344	825
Unit 4	OFF	OFF	OFF
Unit 5	1 456.1	2 097	813
Unit 6	308.0	1 289	742
SUM	3 392.69	11 008	4 442

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	1	4	0	26	30	735.8
Unit 2	0	4	0	20	24	1 262.1
Unit 3	0	4	0	19	23	171.6
Unit 4	OFF	OFF	OFF	OFF	OFF	OFF
Unit 5	0	2	0	24	26	941.9
Unit 6	0	6	0	17	23	393.0
SUM	**1**	**20**	**0**	**106**	**126**	

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	31	0	0	0	0	1 760.4
Unit 2	26	0	0	0	0	1 910.1
Unit 3	26	0	0	0	0	1 973.2
Unit 4	OFF	OFF	OFF	OFF	OFF	OFF
Unit 5	28	0	0	0	0	1 830.0
Unit 6	27	0	0	0	0	1 346.7
SUM	**138**	**0**	**0**	**0**	**0**	

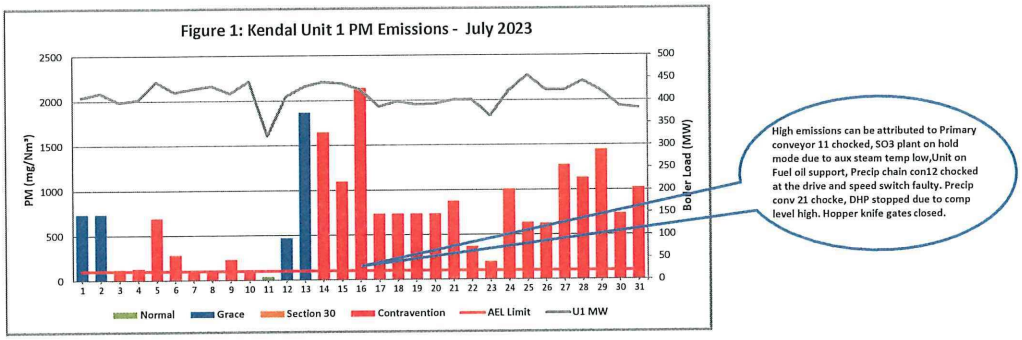
Table 6.4: Operating days in compliance to NOx AEL Limit - July 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	31	0	0	0	0	695.9
Unit 2	26	0	0	0	0	733.0
Unit 3	26	0	0	0	0	689.0
Unit 4	OFF	OFF	OFF	OFF	OFF	OFF
Unit 5	28	0	0	0	0	705.5
Unit 6	27	0	0	0	0	770.6
SUM	138	0	0	0	0	

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

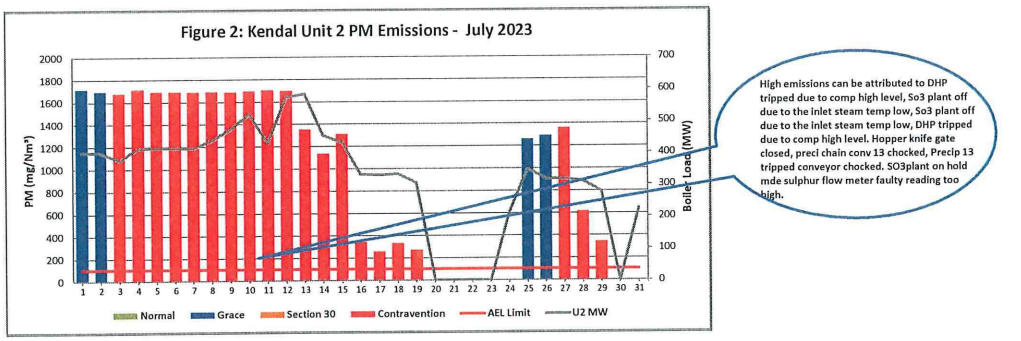
Table 6.5: Legend Description

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



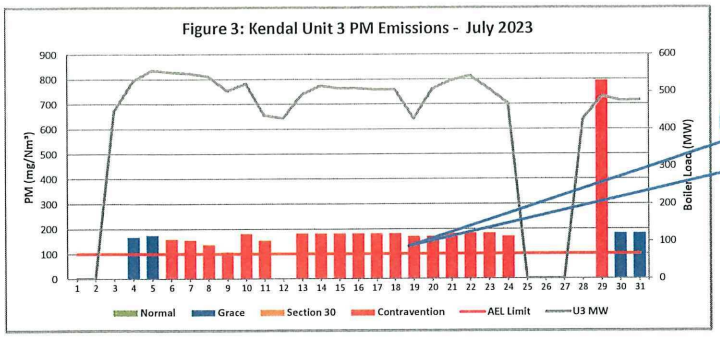
High emissions can be attributed to Primary conveyor 11 chocked, SO3 plant on hold mode due to aux steam temp low,Unit on Fuel oil support, Precip chain con12 chocked at the drive and speed switch faulty. Precip conv 21 chocke, DHP stopped due to comp level high. Hopper knife gates closed.

Unit 1 Monitor maxed out on the following days Unit 1 from the 1st - 3rd, 12th -21st and 26th - 31st.



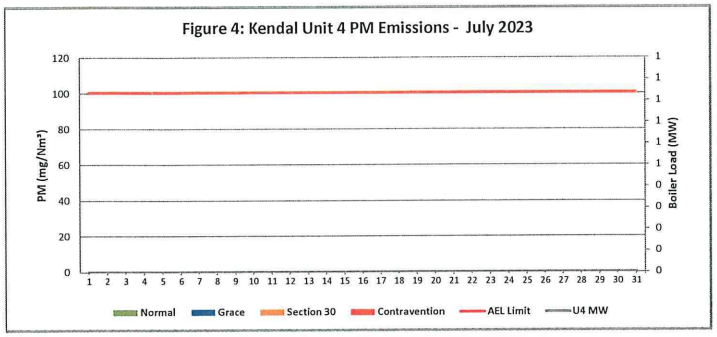
High emissions can be attributed to DHP tripped due to comp high level, So3 plant off due to the inlet steam temp low, So3 plant off due to the inlet steam temp low, DHP tripped due to comp high level. Hopper knife gate closed, preci chain conv 13 chocked, Precip 13 tripped conveyor chocked. SO3plant on hold mde sulphur flow meter faulty reading too high.

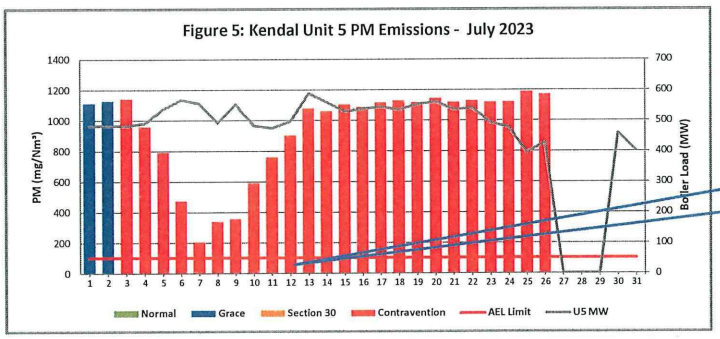
Unit 2 Monitor maxed out of the U2 on the 1st - 13th & 25th -28th.



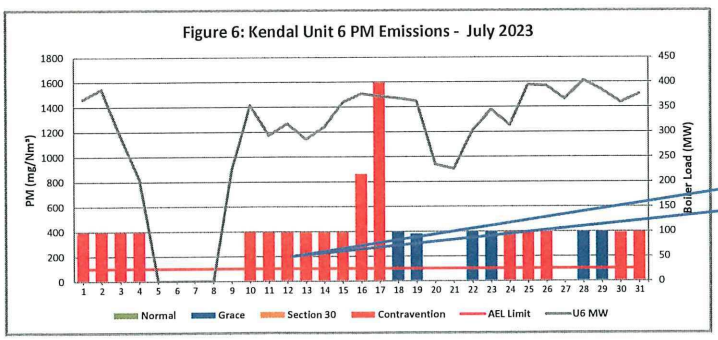
High PM emissions can be attributed to top bunker conveyor tripping - hopper knife gates closed on all precip conveyors. Precip conveyor 12 tripped and fails to start from the control room, Precip conveyor 24 tripped - Conveyor chocked, Foil oil usage - Unit light up (cold start).

Unti 3 monitor maxed out on the 10th -11th, 13th - 24th and the 29th -31st.



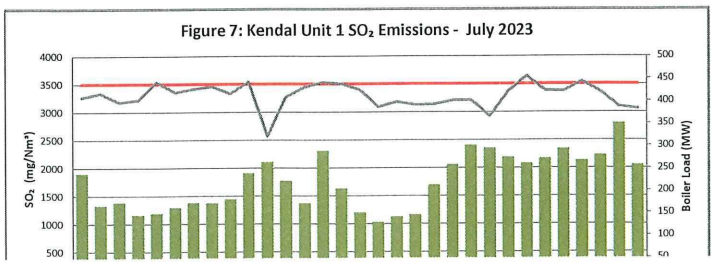


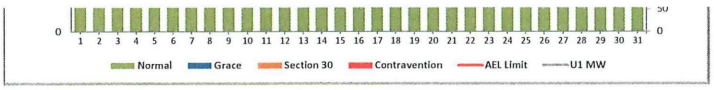
High PM emissions can be attributed to Precip chain conveyors tripping and chocking, SO3 plant tripped due to low back end temps, DHP stopped due to faulty comp, Knife gates closed.



High PM emissions can be attributed to DHP tripped due to top bunkers high levels, fuel oil support, SO3 plant off, DHP PLC off. Fuel oil used to start up the unit. SO3 plant heater that fail to reset.

Unit 6 on the 2nd and the 18th -19th




0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

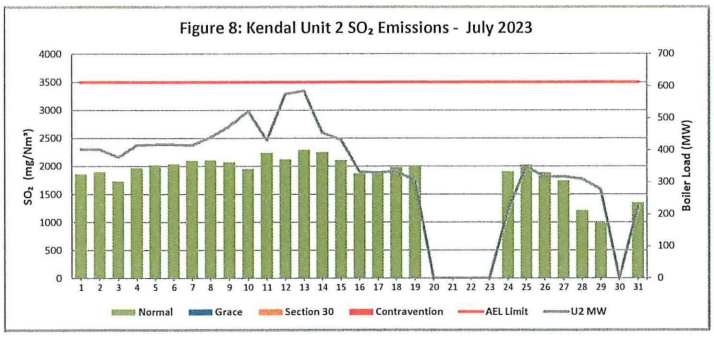


Figure 8: Kendal Unit 2 SO_2 Emissions - July 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
4000
3500
3000
2500
2000
1500
1000
500
0
700
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW

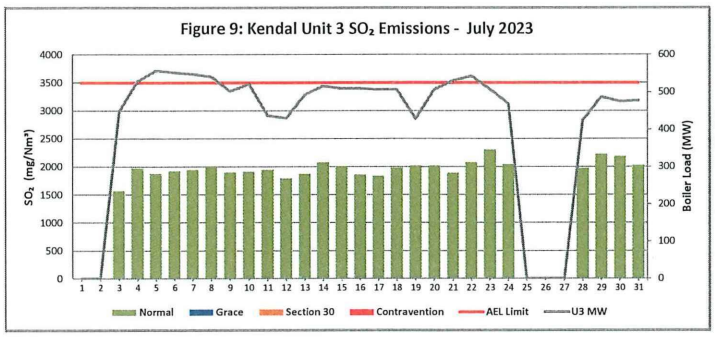


Figure 9: Kendal Unit 3 SO_2 Emissions - July 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
4000
3500
3000
2500
2000
1500
1000
500
0
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

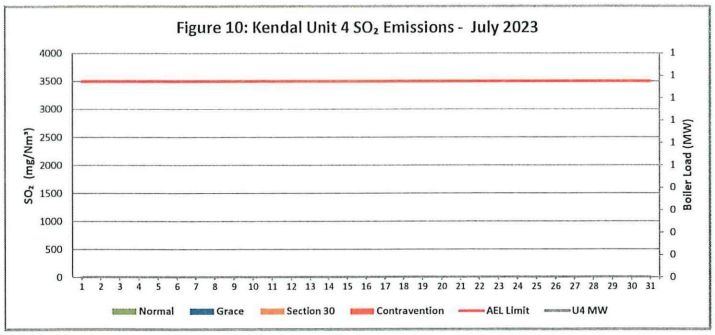


Figure 10: Kendal Unit 4 SO_2 Emissions - July 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW

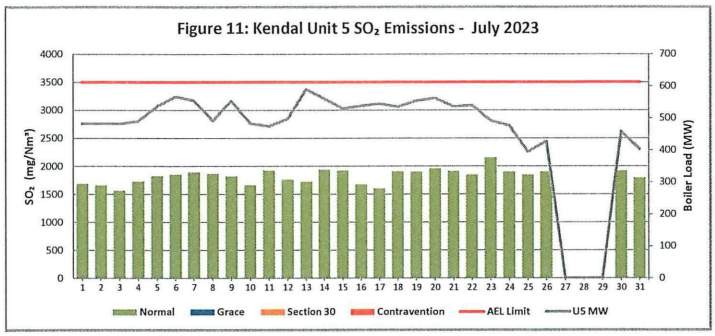


Figure 11: Kendal Unit 5 SO_2 Emissions - July 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

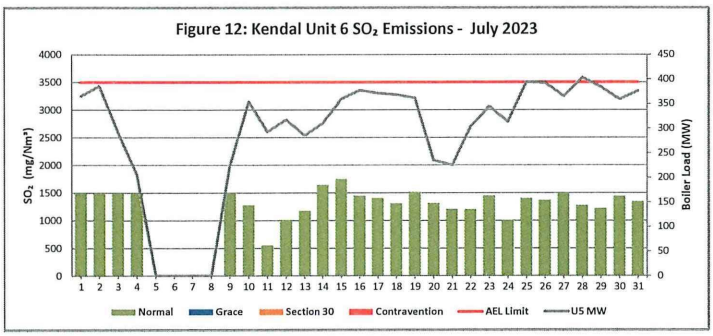


Figure 12: Kendal Unit 6 SO_2 Emissions - July 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

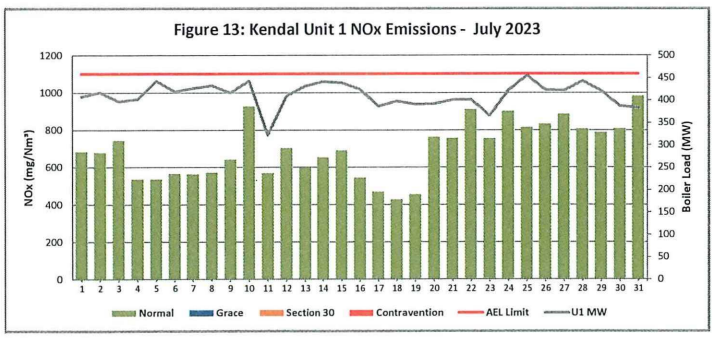


Figure 13: Kendal Unit 1 NOx Emissions - July 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

Figure 14: Kendal Unit 2 NOx Emissions - July 2023

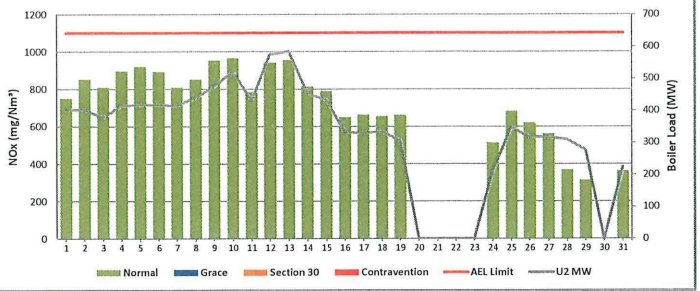


Figure 15: Kendal Unit 3 NOx Emissions - July 2023

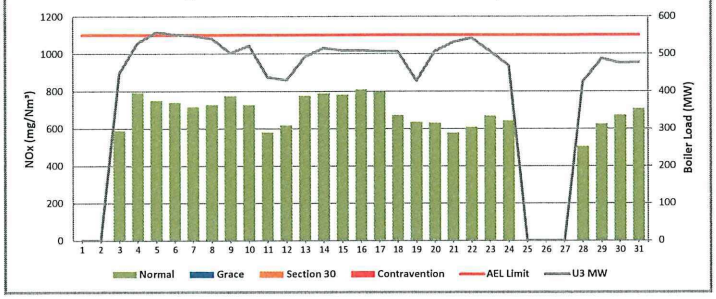


Figure 16: Kendal Unit 4 NOx Emissions - July 2023

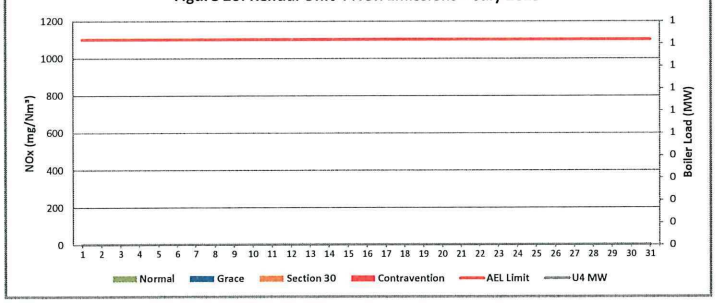


Figure 17: Kendal Unit 5 NOx Emissions - July 2023

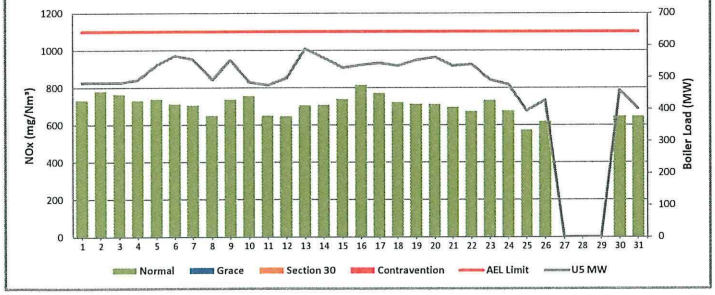
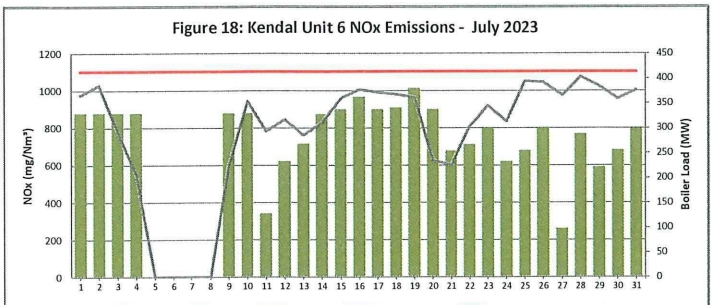


Figure 18: Kendal Unit 6 NOx Emissions - July 2023



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

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, 2, 3 and 6 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 including no DHP and No SO3 plant during the period.
- 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. The following are the days when the monitor was maxing out: Unit 1 from the 1st - 3rd, 12th -21st and 26th - 31st, U2 on the 1st - 13th & 25th -28th, Unit 3 form the 10th - 11th, 13th - 24th and the 29th -31st, Unit 6 on the 2nd and the 18th -19th. Figures will be restated based on updated upset testing and surrogate value determination that Kendal will conduct in September- October.
- Unit 6 O2 gas Monitor was defective, substituted with QAL 2 SRM value for for the entire month.
- Unit 1 NOx on the 1st to the 11th, 21st -22nd,27th,30th,31st monitor was defective, data was deleted the tool will avarage itself.

- Unit 1
- Findings: The high emissions can be attributed to Primary conveyor 11 chocked, SO3 plant on hold mode due to aux steam temp low,Unit on Fuel oil support, Precip chain con12 chocked at the drive and speed switch faulty. Precip conv 21 chocke, DHP stopped due to comp level high. Hopper knife gates closed.
- Resolution: Plant repaired.

- Unit 2
- Findings: The high emissions can be attributed to DHP tripped due to comp high level, So3 plant off due to the inlet steam temp low, DHP tripped due to comp high level. Hopper knife gate closed, preci chain conv 13 chocked, Precip 13 tripped conveyor chocked. SO3plant on hold mde sulphur flow meter faulty reading too high.
- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to top bunker conveyor tripping - hopper knife gates closed on all precip conveyors. Precip conveyor 12 tripped and fails to start from the control room, Precip conveyor 24 tripped - Conveyor chocked, Foil oil usage - Unit light up (cold start).
- Resolution: Palnt repaired.

- Unit 4
- Findings: R
- esolution: Plant repaired.

- Unit 5
- Findings: High PM emissions can be attributed to Precip chain conveyors tripping and chocking, SO3 plant tripped due to low back end temps, DHP stopped due to fualty comp, Knife gates closed.
- Resolution: Plant repaired.

- Unit 6
- Findings: High PM emissions can be attributed to Precip chain conveyors tripping and chocking, SO3 plant tripped due to low back end temps, DHP stopped due to fualty comp, Knife gates closed.
- Resolution: Plant repaired.