Eskom

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Date:
03 April 2024

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Dear Ms. Nompumelelo Simelane

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

RESUBMISSION OF KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF SEPTEMBR 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.

Resubmission is made due to the engineering's analysis that was made on the reports to utilize Deutsch equation where monitors maxed out to get the surrogation value and this resulted in an increase in tonnages.

Compiled by:

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

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2024/04/22

Eskom

SEPTEMBER 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 Sep-2023
	Coal	Tons	2 260 000	517 030
	Fuel Oil	Tons	5 000	11271.100
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Indicative Production Rate Sep-2023
	Energy	GWh	2 963.520	823.623
	Ash	Tons	770 000	175 376.576
	RE Ash	kg/MWh	not specified	2.328

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
CV Content	MJ/kg	16-24 (MJ/kg)	18.310
Sulphur Content	%	<1 (%)	0.880
Ash Content	%	40 (%)	33.920

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 Sep-2023	Technology Type	SO_3 Utlization Sep-2023
Unit 1	$ESP + SO_3$	98.223%	SO_3	86.4%
Unit 2	$ESP + SO_3$	97.866%	SO_3	62.1%
Unit 3	$ESP + SO_3$	Off-line	SO_3	Off-line
Unit 4	$ESP + SO_3$	98.886%	SO_3	0.0%
Unit 5	$ESP + SO_3$	99.186%	SO_3	0.8%
Unit 6	$ESP + SO_3$	99.127%	SO_3	37.3%

SO3 flow is fluctuating on the units, SO3 plant got no sulphure flow, SO3 plant kept on tripping, SO3 plant not stable due to oil leak on sulphur block valve & converter outlet stage temp very erratic,SO3 Pplant unstable due to converter outlet temp high.

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

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	88.8	99.5	95.8	100.0
Unit 2	45.1	100.0	100.0	15.6
Unit 3	OFF	OFF	OFF	OFF
Unit 4	95.2	0.0	0.0	37.3
Unit 5	99.7	100.0	91.1	100.0
Unit 6	93.8	95.1	100.0	83.0

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

Note: Unit 1 and 2 dust monitors realiability is low due to monitors maxing out. Unit 2,4 and 6 O2 monitors reliability low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of September 2023

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	474.7	1 663	633
Unit 2	663.9	1 371	552
Unit 3	OFF	OFF	OFF
Unit 4	330.3	0	0
Unit 5	177.2	785	349
Unit 6	271.0	690	487
SUM	1 917.22	4 509	2 020

Please note the reported figures in tonnage calculation are an under estimate since the station did not use the Maxing out PM monitor quantification excersice 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 - September 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	6	4	0	5	9	550.9
Unit 2	1	3	0	16	19	616.5
Unit 3	OFF	OFF	OFF	OFF	OFF	OFF
Unit 4	0	3	0	18	21	562.5
Unit 5	2	7	0	6	13	482.5
Unit 6	0	4	0	16	20	328.9
SUM	9	21	0	61	82	

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	17	0	0	0	0	1 707.0
Unit 2	20	0	0	1	1	2 714.2
Unit 3	OFF	OFF	OFF	OFF	OFF	OFF
Unit 4	0	0	0	0	0	
Unit 5	16	0	0	0	0	1 524.8
Unit 6	24	0	0	0	0	876.8
SUM	77	0	0	1	1	

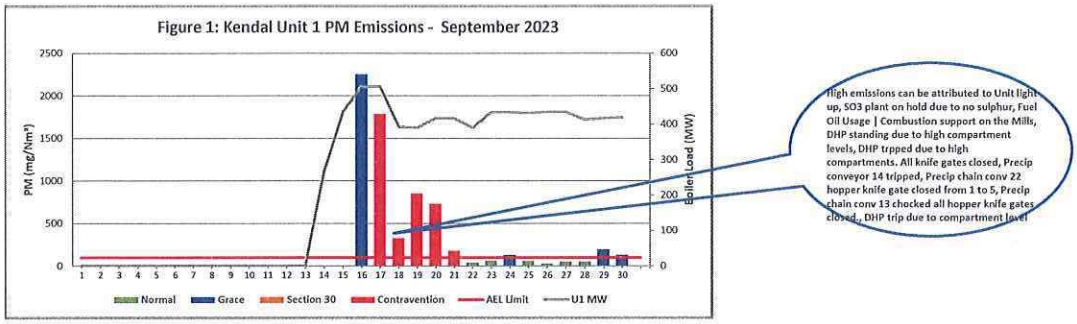
Table 6.4: Operating days in compliance to NOx AEL Limit - September 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	17	0	0	0	0	631.2
Unit 2	10	0	0	11	11	1 081.1
Unit 3	OFF	OFF	OFF	OFF	OFF	OFF
Unit 4	0	0	0	0	0	
Unit 5	16	0	0	0	0	688.6
Unit 6	24	0	0	0	0	610.6
SUM	67	0	0	11	11	

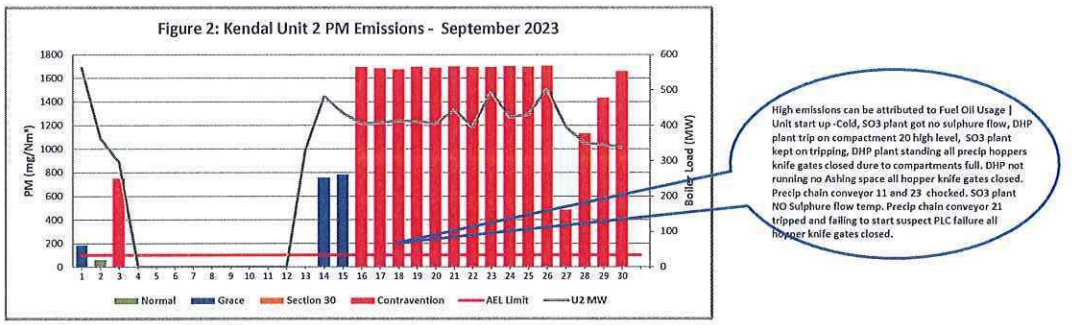
Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2

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



Unit 1 monitor maxed out on the 16th-17th and 19th - 20th



Unit 2 monitor maxed out on the 14th - 27th and 29th- 30th

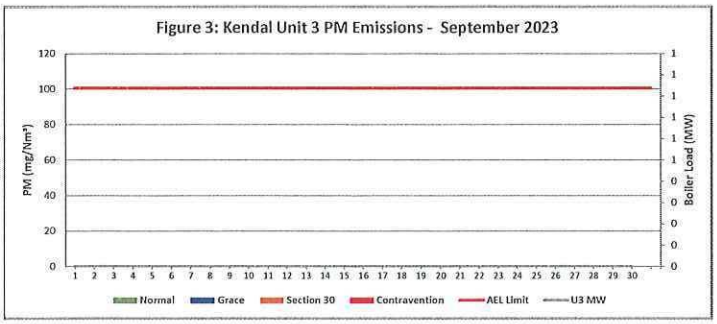


Figure 3: Kendal Unit 3 PM Emissions - September 2023
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

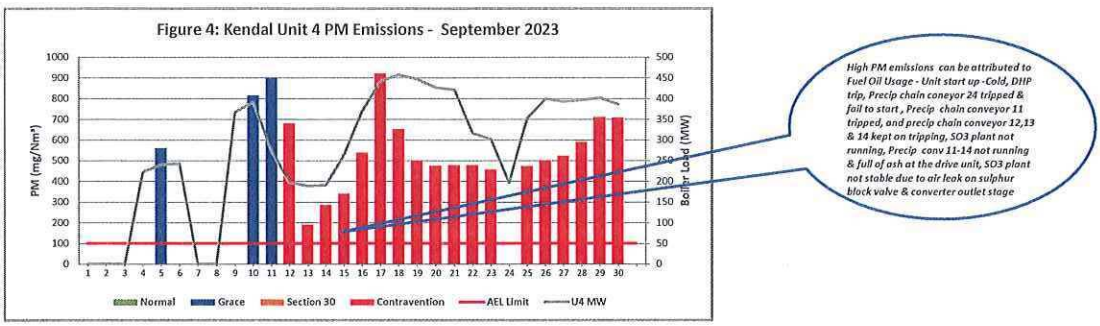


Figure 4: Kendal Unit 4 PM Emissions - September 2023
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW
High PM emissions can be attributed to Fuel Oil Usage - Unit start up -Cold, DHP trip, Precip chain coneyor 24 tripped & fail to start , Precip chain conveyor 11 tripped, and precip chain conveyor 12,13 & 14 kept on tripping, SO3 plant not running, Precip conv 11-14 not running & full of ash at the drive unit, SO3 plant not stable due to air leak on sulphur block valve & converter outlet stage

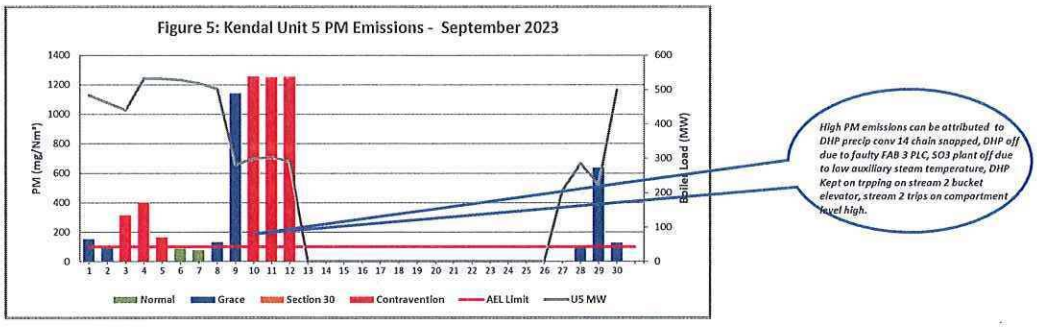


Figure 5: Kendal Unit 5 PM Emissions - September 2023
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW
High PM emissions can be attributed to DHP precip conv 14 chain snapped, DHP off due to faulty FAB 3 PLC, SO3 plant off due to low auxiliary steam temperature, DHP Kept on trpping on stream 2 bucket elevator, stream 2 trips on compartment level high.

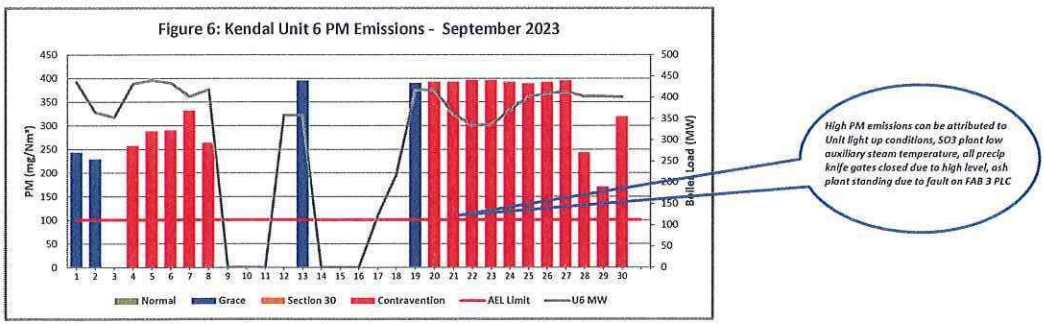


Figure 6: Kendal Unit 6 PM Emissions - September 2023
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U6 MW
High PM emissions can be attributed to Unit light up conditions, SO3 plant low auxiliary steam temperature, all precip knife gates closed due to high level, ash plant standing due to fault on FAB 3 PLC

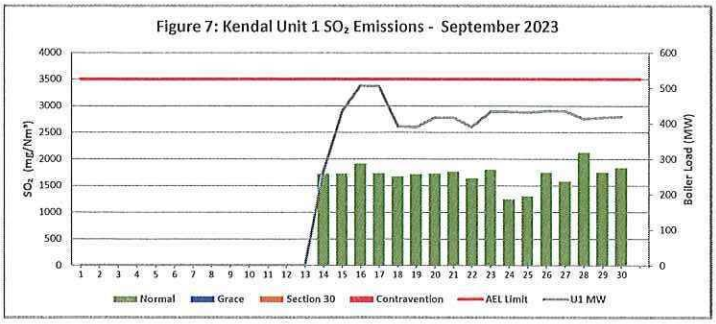


Figure 7: Kendal Unit 1 SO_2 Emissions - September 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

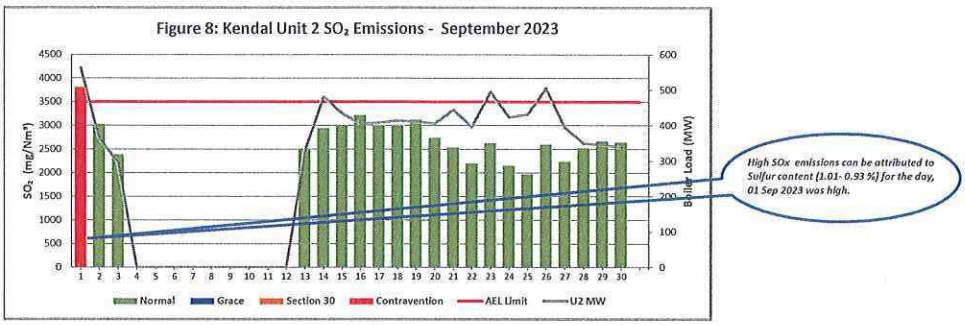


Figure 8: Kendal Unit 2 SO_2 Emissions - September 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW
High SOx emissions can be attributed to Sulfur content (1.01- 0.93 %) for the day, 01 Sep 2023 was high.

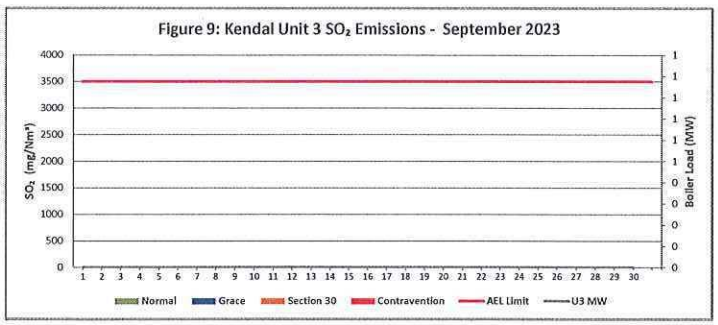


Figure 9: Kendal Unit 3 SO_2 Emissions - September 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

Figure 10: Kendal Unit 4 SO_2 Emissions - September 2023

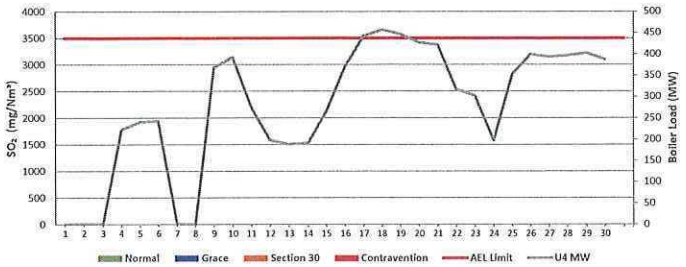


Figure 11: Kendal Unit 5 SO_2 Emissions - September 2023

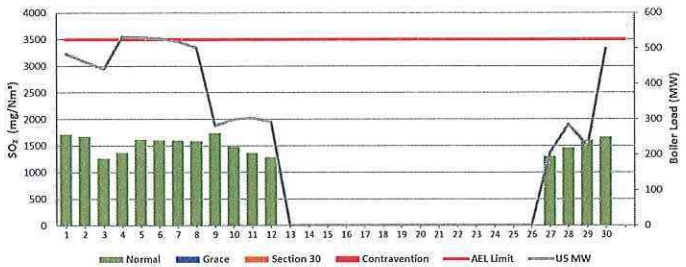


Figure 12: Kendal Unit 6 SO_2 Emissions - September 2023

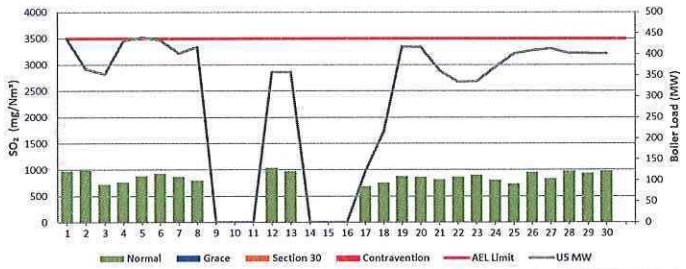


Figure 13: Kendal Unit 1 NOx Emissions - September 2023

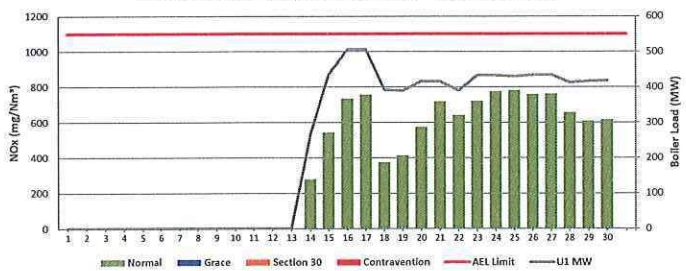
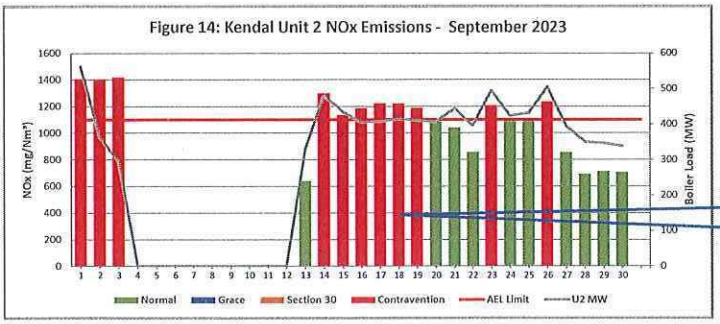


Figure 14: Kendal Unit 2 NOx Emissions - September 2023



High NOx emissions can be attributed to Boiler components were analyzed and monitored and found defective

Figure 15: Kendal Unit 3 NOx Emissions - September 2023

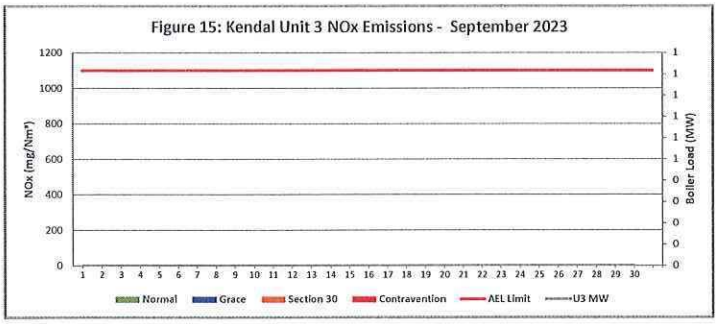


Figure 16: Kendal Unit 4 NOx Emissions - September 2023

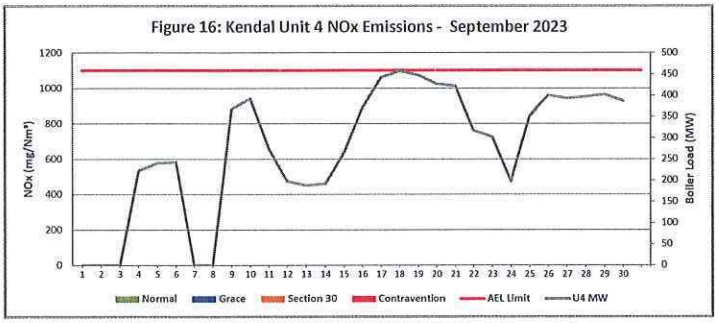


Figure 17: Kendal Unit 5 NOx Emissions - September 2023

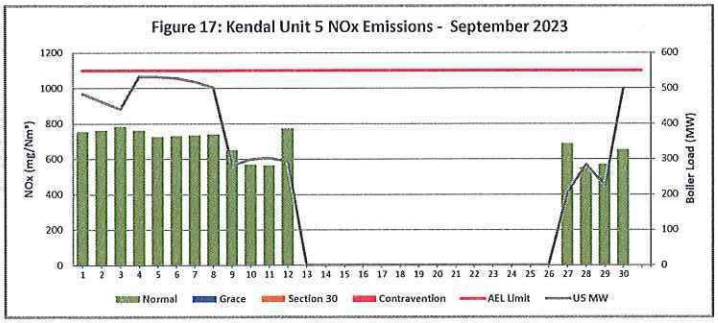
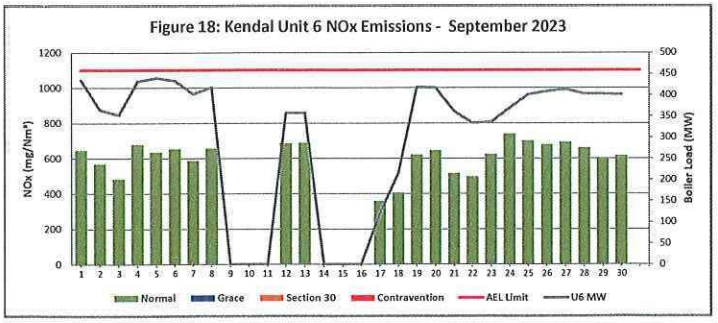


Figure 18: Kendal Unit 6 NOx Emissions - September 2023



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

η = (1 – $(Output/Input)$)x 100

η = 1 - $\frac{(DustEmissionFromAQR\ ReportDustMonitor(tons)}{(CoalBurnt(tons)*\%AshContent*80\%)}$ X 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 monitor maxed out, meaning the the emissions were higher than what the monitor was correlated for. In which case we use surrogate values. This is attributted to abnormal plant conditions.
- Please note the reported figures in tonnage calculation are the figures after the station used 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 16th&17th, 19th &20th, U2 on the 14th - 27th & 29th&30th. Figures were restated based on the surrogate value determination that Kendal conducted.
- Unit 1
- Findings: The high emissions can be attributed to Unit light up, SO3 plant on hold due to no sulphur, Fuel Oil Usage | Combustion support on the Mills, DHP standing due to high compartment levels, DHP trpped due to high compartments. All knife gates closed, Precip conveyor 14 tripped, Precip chain conv 22 hopper knife gate closed from 1 to 5, Precip chain conv 13 chocked all hopper knife gates closed., DHP trip due to compartment level HI HI level
- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to Fuel Oil Usage | Unit start up -Cold, SO3 plant got no sulphure flow, DHP plant trip on compactment 20 high level, SO3 plant kept on tripping, DHP plant standing all precip hoppers knife gates closed dure to compartments full. DHP not running no Ashing space all hopper knife gates closed. Precip chain conveyor 11 and 23 chocked. SO3 plant NO Sulphure flow temp. Precip chain conveyor 21 tripped and failing to start suspect PLC failure all hopper knife gates closed.
- Resolution: Plant repaired.

- Unit 3
- Unit off
- Unit 4
- Findings: High PM emissions can be attributed to Fuel Oil Usage - Combustion Support| Unit start up -Cold, DHP trip, Precip chain coneyor 24 tripped & fail to start , Precip chain conveyor 11 tripped, and precip chain conveyor 12,13 & 14 kept on tripping, SO3 plant not running, Precip conv 11-14 not running & full of ash at the drive unit, SO3 plant not stable due to oil leak on sulphur block valve & converter outlet stage temp very erratic,SO3 Pplant unstable due to converter outlet temp hi.
- Resolution: Plant repaired.

- Unit 5
- Findings: High PM emissions can be attributed to DHP precip conv 14 chain snapped, DHP off due to faulty PLS, SO3 plant off due to low stream remp, DHP Kept on trpping on stream 2 bucket elevator, stream 2 trips on compartment level high.
- Resolution: Plant repaired.

- Unit 6
- Findings: High PM emissions can be attributed to Unit light up conditions, SO3 plant low stream temp, all precip knife gates closed due to high level, ash plant standing due to fault on FAB 3 PIC.
- Resolution: Plant repaired.