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 AUGUST 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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ENVIRONMENTAL MANAGER- KENDAL POWER STATION

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

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2024 | 04 | 22

Eskom

AUGUST 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 Aug-2023
	Coal	Tons	2 260 000	761 543
	Fuel Oil	Tons	5 000	8456.590
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Indicative Production Rate Aug-2023
	Energy	GWh	3 062.304	878.105
	Ash	Tons	770 000	234 707.553
	RE Ash	kg/MWh	not specified	2.362

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
CV Content	MJ/kg	16-24 (MJ/kg)	19.110
Sulphur Content	%	<1 (%)	0.700
Ash Content	%	40 (%)	30.820

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 Aug-2023	Technology Type	SO_3 Utilization Aug-2023
Unit 1	*ESP + SO_3*	*97.193%*	*SO_3*	*0.0%*
Unit 2	*ESP + SO_3*	*99.822%*	*SO_3*	*0.0%*
Unit 3	*ESP + SO_3*	*99.590%*	*SO_3*	*0.0%*
Unit 4	*ESP + SO_3*	*Off-line*	*SO_3*	*Off-line*
Unit 5	*ESP + SO_3*	*96.711%*	*SO_3*	*0.0%*
Unit 6	*ESP + SO_3*	*99.445%*	*SO_3*	*0.0%*

SO3 plant in service and was injecting however the station was unable to archive the information to our PI system. It is the failure of the station's very old and obsolete

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	*93.0*	*86.8*	*76.5*	*75.6*
Unit 2	*100.0*	*88.5*	*88.9*	*1.1*
Unit 3	*39.4*	*100.0*	*100.0*	*33.1*
Unit 4	*OFF*	*0.0*	*0.0*	*40.0*
Unit 5	*82.7*	*92.7*	*97.9*	*99.8*
Unit 6	*88.4*	*97.0*	*96.5*	*13.1*

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

Note: Unit 1 and 3 dust monitors realiability is low due to monitors maxing out. Unit 2 SO2 and Nox,Unit 4 O2, Unit 5 SO2 and Nox and Unit 6 O2 monitors reliability low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of August 2023

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	927.7	3 155	1 400
Unit 2	78.4	0	0
Unit 3	98.3	704	254
Unit 4	OFF	0	0
Unit 5	804.0	1 713	754
Unit 6	165.9	689	413
SUM	2 074.29	7 307	3 193

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	1	4	0	18	22	744.5
Unit 2	9	7	0	0	7	97.9
Unit 3	0	0	0	7	7	201.5
Unit 4	OFF	OFF	OFF	OFF	Exempt	Exempt
Unit 5	1	5	0	20	25	503.6
Unit 6	3	3	0	6	9	246.8
SUM	**14**	**19**	**0**	**51**	**70**	

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	24	0	0	0	0	2 001.1
Unit 2	19	0	0	0	0	2 740.3
Unit 3	7	0	0	0	0	1 949.4
Unit 4	0	0	0	0	0	
Unit 5	27	0	0	0	0	1 649.6
Unit 6	12	0	0	0	0	1 499.6
SUM	**86**	**0**	**0**	**1**	1	

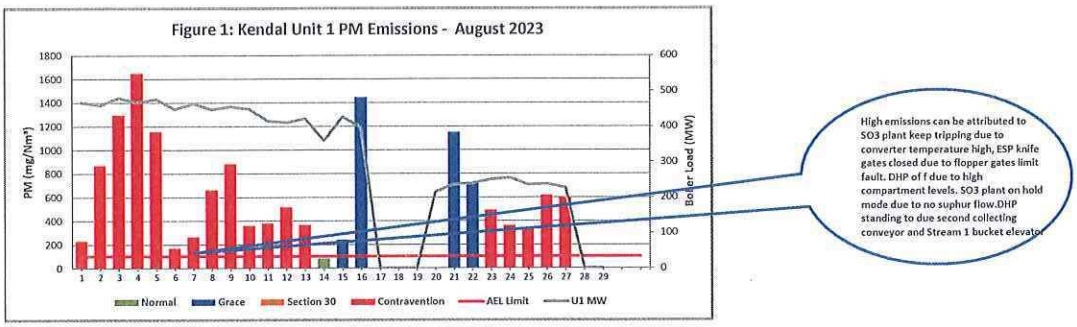
Table 6.4: Operating days in compliance to NOx AEL Limit - August 2023

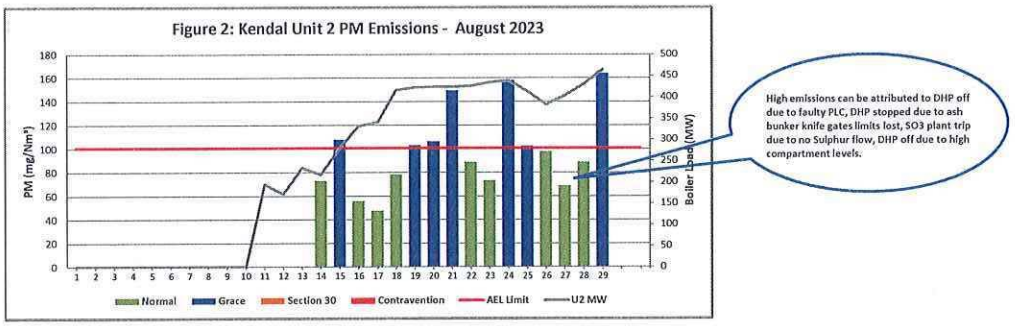
Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	20	0	0	4	4	887.7
Unit 2	19	0	0	0	0	1 027.1
Unit 3	7	0	0	0	0	699.3
Unit 4	0	0	0	0	0	
Unit 5	27	0	0	0	0	720.0
Unit 6	11	0	0	1	1	899.9
SUM	70	0	0	17	17	

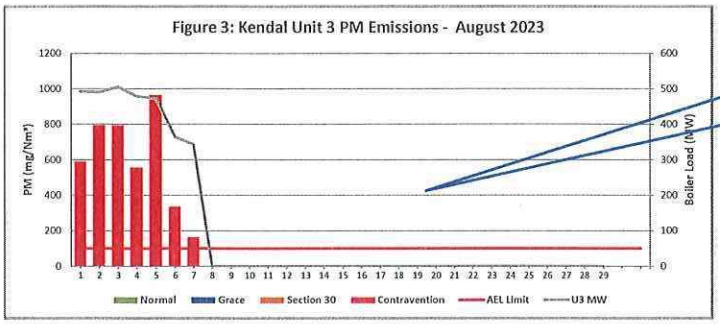
Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2

Table 6.5: Legend Description

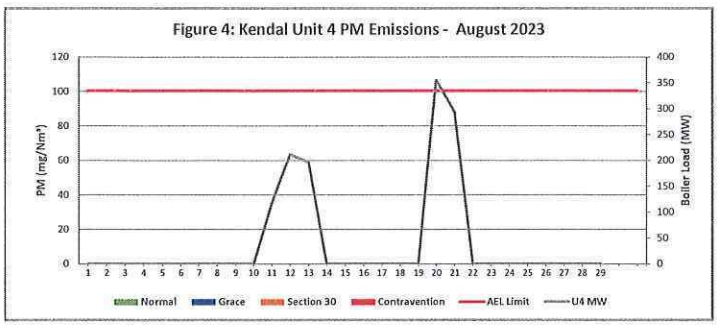
Condition	Colour	Description
Normal	GREEN	Emissions below Emission Limit Value (ELV)
Grace	BLUE	Emissions above the ELV during grace period
Section 30	ORANGE	Emissions above ELV during a NEMA S30 incident
Contravention	RED	Emissions above ELV but outside grace or S30 incident conditions

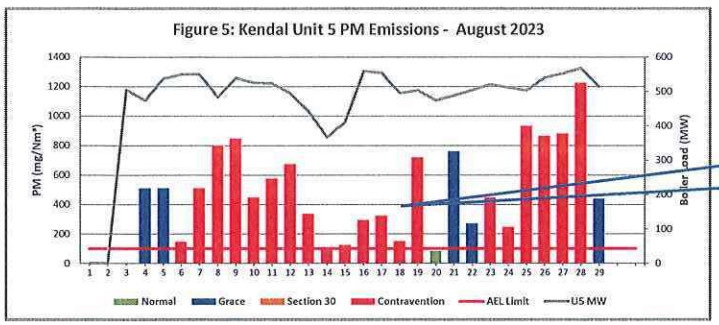




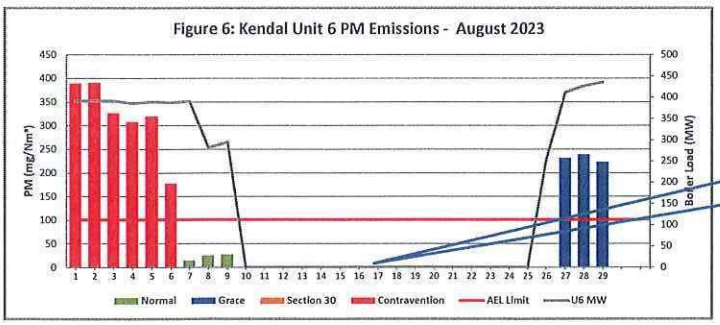


High PM emissions can be attributed to ESP fields 11,15,24,27,41,42& 43 O/C, DHP trip due to high compartment levels, ESP chain conveyor 13,14 & 23 choked, DHP ash back log, SO3 plant out of service.





High PM emissions can be attributed to SO3 plant off due to no steam fow, DHP off due to compartments level high, ESP conveyor 11 t0 14 tripped.



High PM emissions can be attributed to DHP trips due to high compartment levels. SO3 off due to no Suphur flow. DHP off bucket elevetor stream 1 discharge chute blocked.

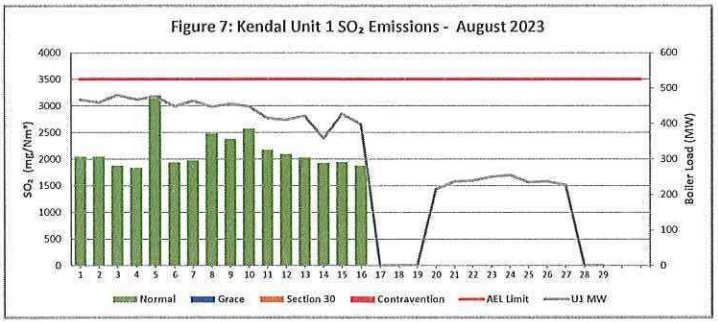


Figure 7: Kendal Unit 1 SO_2 Emissions - August 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

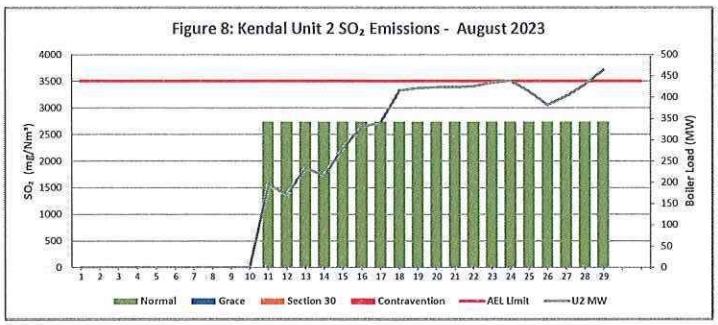


Figure 8: Kendal Unit 2 SO_2 Emissions - August 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW

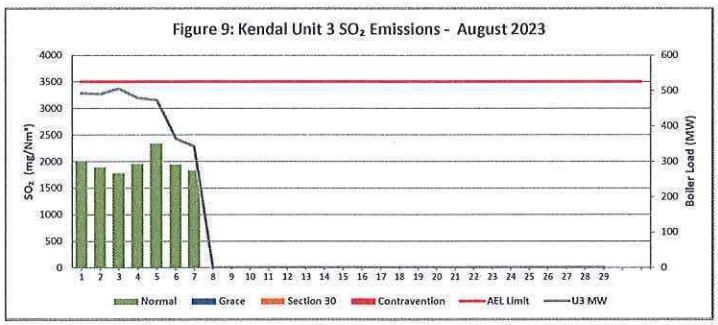
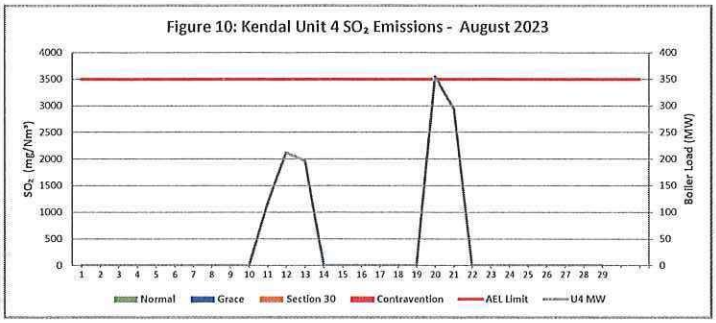
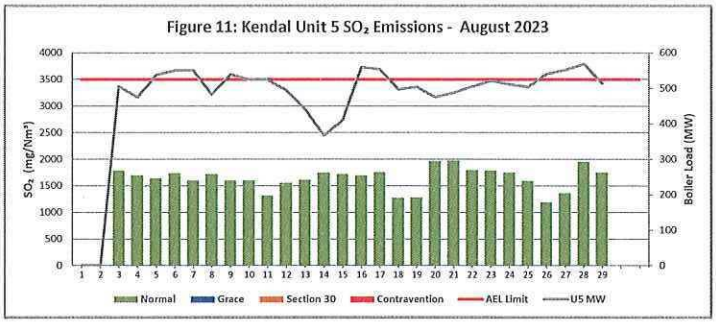
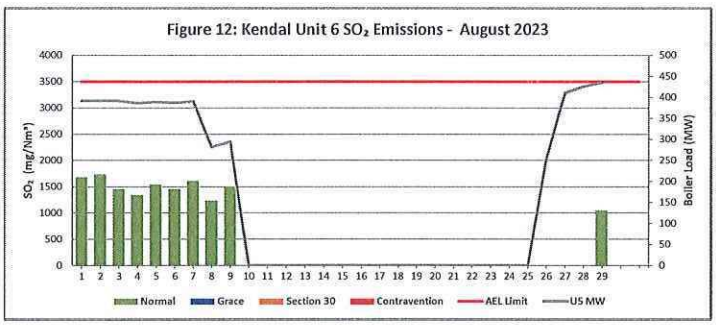
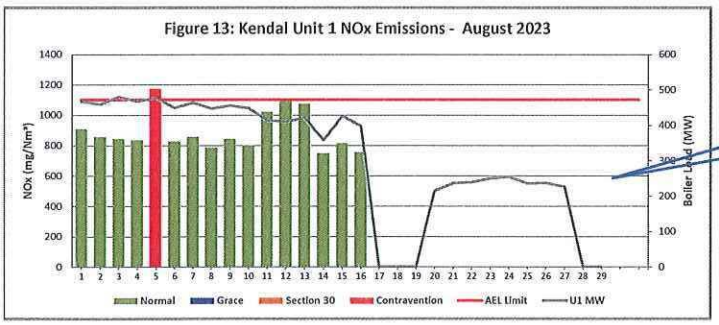


Figure 9: Kendal Unit 3 SO_2 Emissions - August 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW









High NOx emissions can be attributed to unbalanced conditions of combustion resulting in high flame temperature and consenquentially high NOX.

Figure 14: Kendal Unit 2 NOx Emissions - August 2023

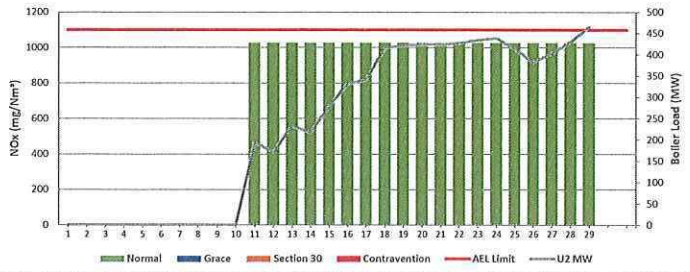


Figure 15: Kendal Unit 3 NOx Emissions - August 2023

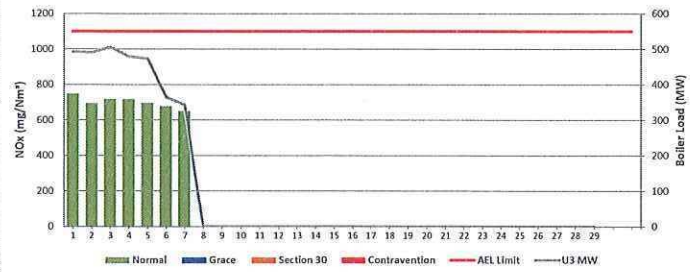


Figure 16: Kendal Unit 4 NOx Emissions - August 2023

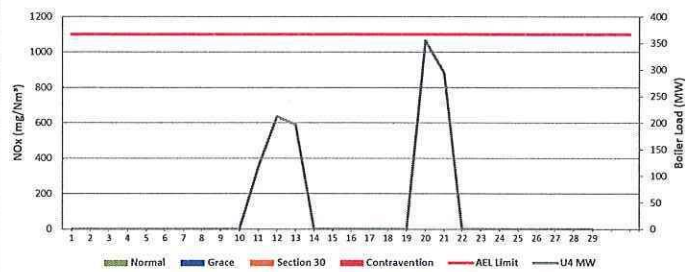


Figure 17: Kendal Unit 5 NOx Emissions - August 2023

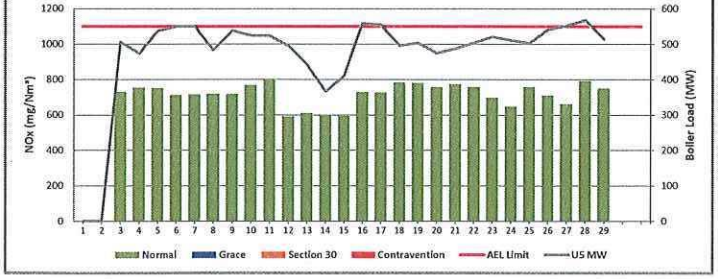
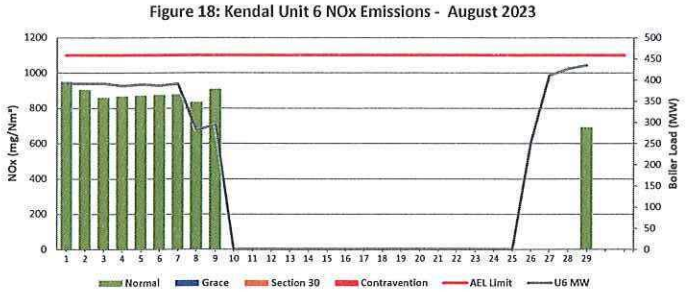


Figure 18: Kendal Unit 6 NOx Emissions - August 2023



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.
- Unit 4 dust monitor output 2 is faulty. where output 1 is greater or equal to 87.5, output 1 readings were copied to output 2.
- Unit 1 dust monitor output 1 was defective from the 22nd to the 24th, Output 2 readings were copied to Output 1.
- Average emeissions for unit 1 SOx and NOx from the the 21st to the 24th, Unt 2 SOx and NOx from the 1st to the 10th were used from the available data as the monitors were defective.
- Average emissions for Unit 2 SOx were used from the QAL2 report as the monitor was defective.
- Average emissions for Unit 5 SOx and NOx for for the whole month were used from the QAL 2 report as the monitors were defective.
- Average emissions for Unit 3 CO2 and O2 were taken from QAL2 report as the CO2 and O2 as the monitors were not operating adequately.
- U1 and 3 monitors maxed out, meaning the emission were higher than what the monitor was correlated for. In which case we use surrogate values.
- 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 1st & 2nd, 4th -7th, 10th&11th, 18th, 24th, 28th and 29th. Unit 3 1st to the 8th. Figures were restated based on the surrogate value determination that Kendal conducted.

- Unit 1
- Findings: The high emissions can be attributed to SO3 plant off due to SO3 plant keep tripping due to converter temperature high, ESP knife gates closed due to flopper gates limit fault. DHP of f due to high compartment levels, SO3 plant on hold mode due to no suphur flow, DHP standing due to second collecting conveyor and Stream 1 bucket elevator pulling high Amps.
- High NOx emissions can be attributed to unbalanced conditions of combustion resulting in high flame temperature and consenquentially high NOX. The unbalanced conditions of combustion were caused by various issues on mills.

- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to DHP off due to faulty PLC, DHP stopped due to ash bunker knife gates limits lost, SO3 plant trip due to no Sulphur flow and DHP off due to high compartment levels.
- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to ESP fields 11,15,24,27,41,42& 43 O/C, DHP trip due to high compartment levels, ESP chain conveyor 13,14 & 23 choked, DHP ash back log and SO3 plant out of service.
- Resolution: Palnt repaired.

- Unit 4
- Unit off
- Unit 5
- Findings: High PM emissions can be attributed to SO3 plant off due to no steam fow, DHP off due to compartments level high and ESP conveyor 11 to 14 tripped.
- Resolution: Plant repaired.

- Unit 6
- Findings: High PM emissions can be attributed to DHP trips due to high compartment levels. SO3 off due to no Suphur flow. DHP off bucket elevetor stream 1 discharge chute blocked.
- Resolution: Plant repaired.