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 JUNE 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 efficiency 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 JUNE 2023

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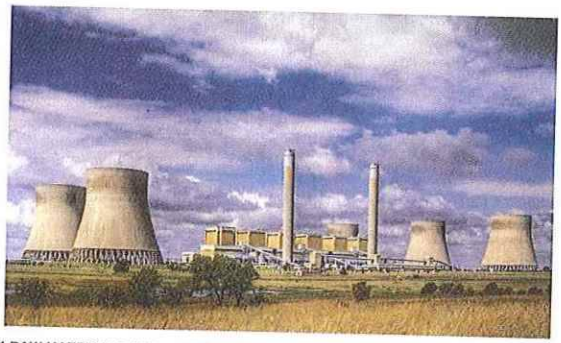
2024/04/22

Eskom

JUNE 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 Jun-2023
	Coal	Tons	2 260 000	869 711
	Fuel Oil	Tons	5 000	5855.650

Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Indicative Production Rate Jun-2023
	Energy	GWh	2 963.520	1 841.916
	Ash	Tons	770 000	309 617.152
	RE Ash	kg/MWh	not specified	1.656

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)	17.610
Sulphur Content	%	<1 (%)	0.850
Ash Content	%	40 (%)	35.600

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 Jun-2023	Technology Type	SO_3 Utlization Jun-2023
Unit 1	$ESP + SO_3$	97.050%	SO_3	78.5%
Unit 2	$ESP + SO_3$	99.351%	SO_3	77.6%
Unit 3	$ESP + SO_3$	99.368%	SO_3	7.8%
Unit 4	$ESP + SO_3$	Off-line	SO_3	0.0%
Unit 5	$ESP + SO_3$	98.546%	SO_3	67.5%
Unit 6	$ESP + SO_3$	99.422%	SO_3	42.3%

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

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

SO3 plant trip, S03 tripped due to sulfur inlet steam temp low, So3 plant trips due to in sufficient flow,SO3 plant on hold convertor second stage temp to hihg, top bunker conveyor tripped and conveyor tripped, SO3 off due to aux steam inlet temp low,SO3 plant trip due to convector DA control v/v stuck in one position

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	78.8	99.8	99.8	99.0
Unit 2	80.2	96.7	96.7	0.0
Unit 3	66.1	99.8	99.8	65.7
Unit 4	0.0	0.0	0.0	0.0
Unit 5	100.0	100.0	99.2	99.8
Unit 6	85.7	69.3	66.0	56.2

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, & 3 O2, Unit 6 PM, SO2, NOx and O2 monitors reliability low due to defective monitors.

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of June 2023

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	1 368.7	2 261	967
Unit 2	421.0	0	0
Unit 3	285.4	2 030	729
Unit 4	0.0	0	0
Unit 5	741.9	1 837	726
Unit 6	232.5	2 131	1 321
SUM	3 049.45	8 259	3 744

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	0	4	0	21	25	952.4
Unit 2	1	6	0	20	26	223.8
Unit 3	0	3	0	21	24	236.4
Unit 4	0	0	0	0	0	
Unit 5	3	6	0	15	21	505.0
Unit 6	6	7	0	13	20	225.2
SUM	10	26	0	90	116	

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	26	0	0	0	0	1 809.0
Unit 2	0	0	0	0	0	
Unit 3	26	0	0	0	0	1 805.9
Unit 4	0	0	0	0	0	
Unit 5	25	0	0	0	0	1 679.6
Unit 6	30	0	0	0	0	1 438.2
SUM	107	0	0	0	0	

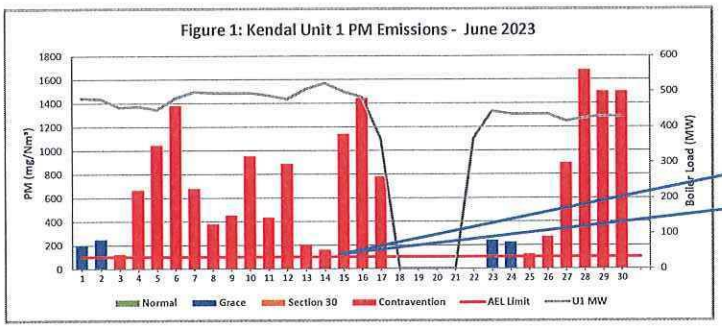
Table 6.4: Operating days in compliance to NOx AEL Limit - June 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	26	0	0	0	0	778.8
Unit 2	0	0	0	0	0	
Unit 3	26	0	0	0	0	651.1
Unit 4	0	0	0	0	0	
Unit 5	25	0	0	0	0	670.2
Unit 6	28	0	0	2	2	889.6
SUM	105	0	0	2	2	

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

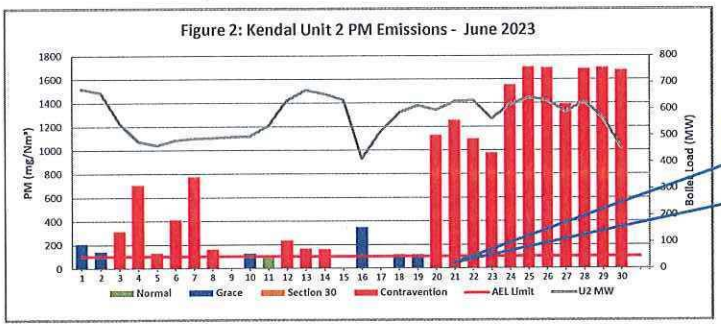
Table 6.5: Legend Description

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



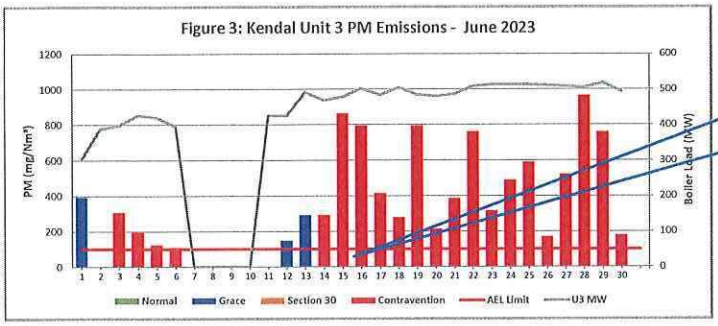
High emissions can be attributed to Primary conveyor 12 keeps tripping, SO3 plant trip, S03 tripped due to sulfur inlet steam temp low, Primary conveyor 13 keeps tripping, So3 plant trips due to in sufficient flow,SO3 plant on hold convertor second stage temp to hihg, top bunker conveyor tripped and conveyor tripped, SO3 off due to aux steam inlet temp low,SO3 plant trip due to convector DA control v/v stuck in one

Unit 1 monitor maxed ou the the following days 04th - 07th, 10th, 12th-16th and 27th - 30th.



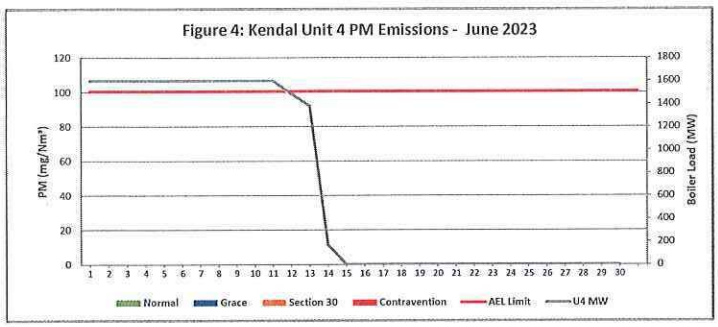
High emissions can be attributed to SO3 plant on hold mode due to no sulphure flow, DHP top chain conveyor and bucket elevator tripped, DHP off due to compartments full, All precip hoppers Knife gates are closed, SO3 plant on hold mode due to Aux steam temp low, SO3 plant off, steam Isolated, Precip chain conveyor keep on tripping, knife gates closed, DHP tripped on Compartment 20 levels high, Stream 1 first collector keeps on tripping and suspected speed

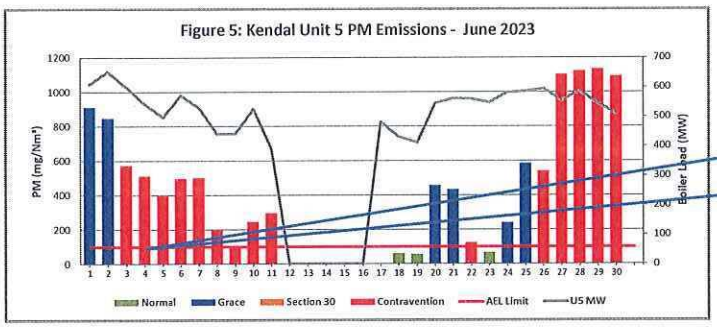
Unit 2 monitor maxed out on the following days 1st, 15th & 16th, 24th - 30th.



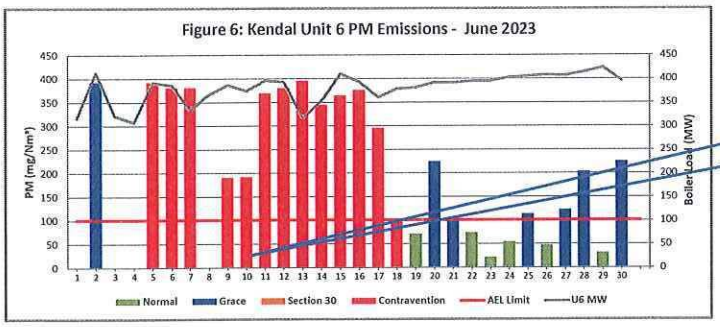
High PM emissions can be attributed to unit light up So3 plant on hold mode - Sulphur flow low. SO3 plant on hold mode and precip fields casttlet on start up mode, SO3 plant tripped due to sulfur block valve, Precip Conveyor standing falls to start, Knif gates closed, Stream 1 Bucket elevator tripped, Precip 13 is tripping, Precip conv 12 tripped and fail to start

Unit 3 monitor maxed out on the following dates 1st, 3rd &4th, 13th - 25th, 27th - 29th.





High PM emissions can be attributed to DHP trippined due to spiked FAB 3compartment 20, SO3 plant off due to no flow, Precip conveyor 13 kept on tripping,DHP tripped due to compartment 20 full, SO3 plant off due to low back end temps, 1st collecting conveyor trip,Preclp conveyor 13 is offwith knife gates closed, DHP off, Compat high level, HP off due to FAB 3 faulty high level switches of compat 10 & 20.



High PM emissions can be attributed to Unit light up, Fuel oil usage, DHP stream 2 bucket elevator elevator speed switch faulty. DHP off all compartments full. Knife gates closed.

Figure 7: Kendal Unit 1 SO_2 Emissions - June 2023

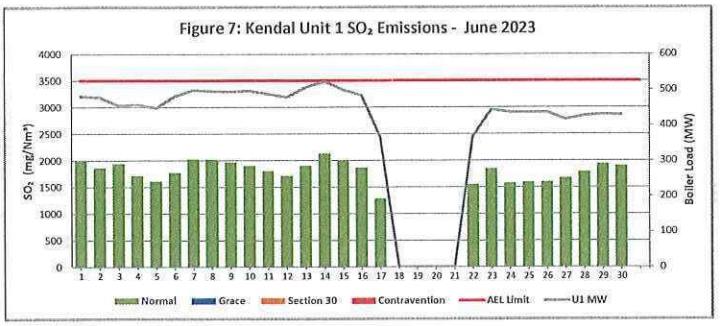


Figure 8: Kendal Unit 2 SO_2 Emissions - June 2023

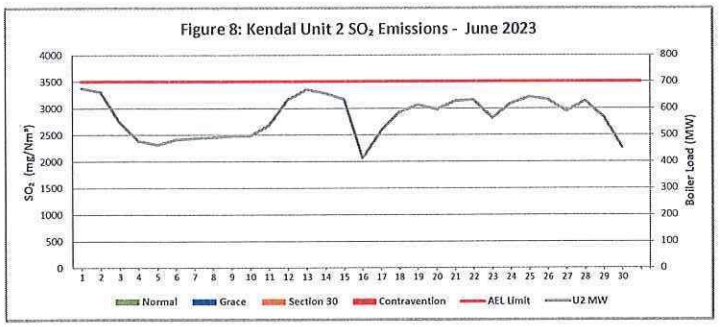


Figure 9: Kendal Unit 3 SO_2 Emissions - June 2023

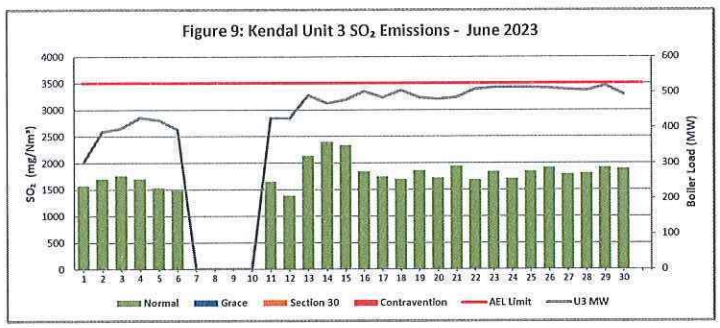


Figure 10: Kendal Unit 4 SO_2 Emissions - June 2023

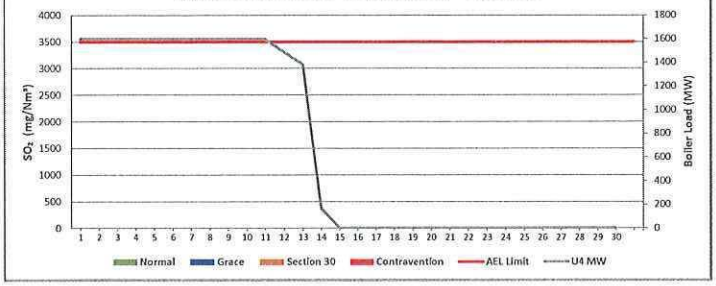


Figure 11: Kendal Unit 5 SO_2 Emissions - June 2023

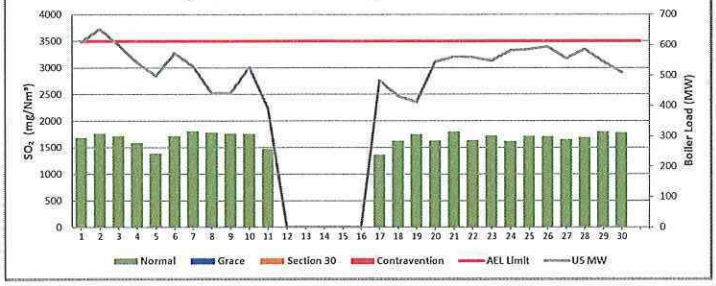


Figure 12: Kendal Unit 6 SO_2 Emissions - June 2023

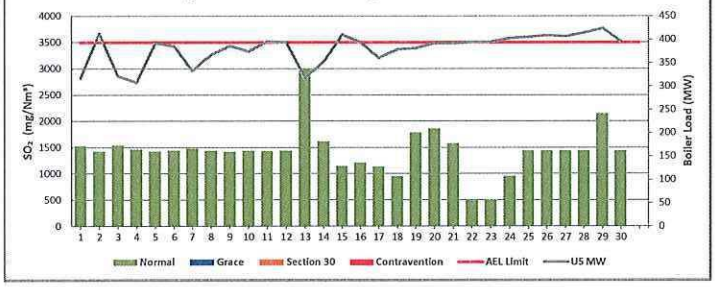


Figure 13: Kendal Unit 1 NOx Emissions - June 2023

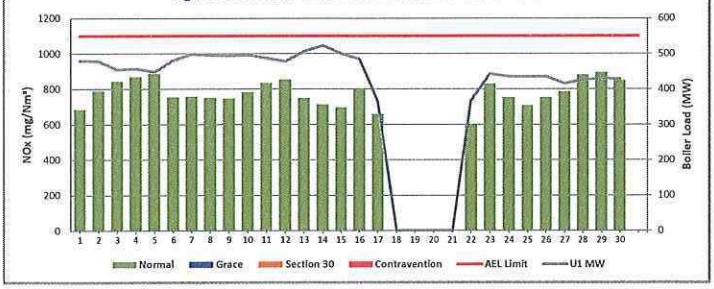


Figure 14: Kendal Unit 2 NOx Emissions - June 2023

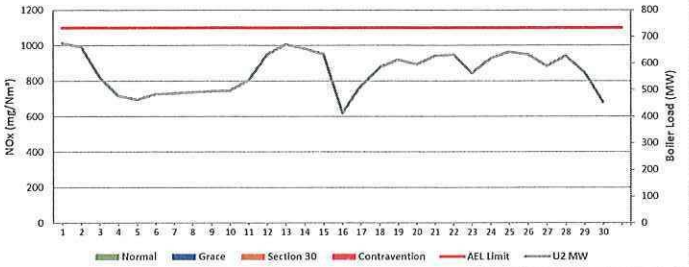


Figure 15: Kendal Unit 3 NOx Emissions - June 2023

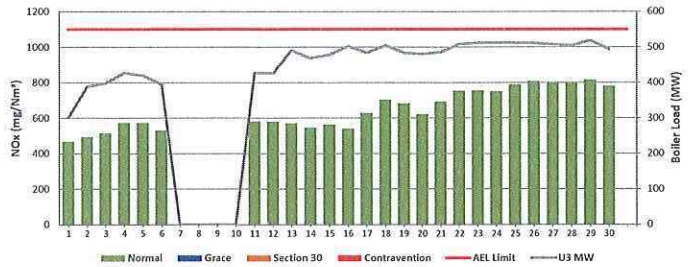


Figure 16: Kendal Unit 4 NOx Emissions - June 2023

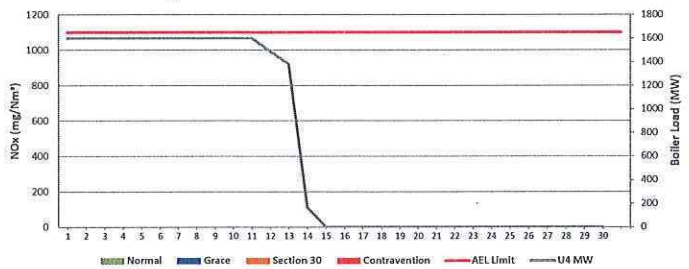


Figure 17: Kendal Unit 5 NOx Emissions - June 2023

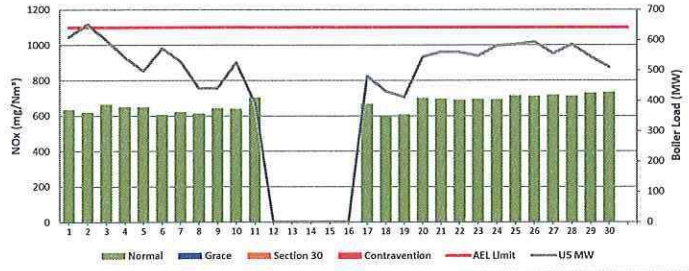
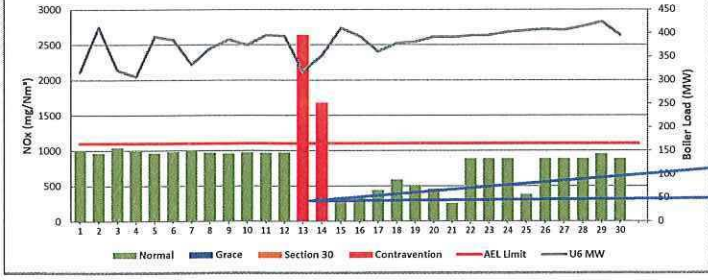


Figure 18: Kendal Unit 6 NOx Emissions - June 2023



High NOx emissions can be attributed to Boiler conditions /faulty components/system /subsystem disturbing flame temperatures at the boiler chamber
Instrument for NOx (CEMS) lost signal from the 02/06
Mills performance was not adequate
Defective areas affecting the NOx exceedance

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
- U1, 2 and 3 monitors maxed out, meaning 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 including no DHP and No SO3 plant during the period.
- Please note the reported figures in tonnage calculation are the tonnage 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 4th - 7,10th,12th&13th, 15th&16th and 27th - 30th, U2 on the 1st, 15th,16th & 24th - 30th, Unit 3 form the 1st, 3rd, 4th, and the 13th -29th. Figures were restated based on surrogate value determination that Kendal conducted.
- Average emissions for Unit 6 SOx from the 1st to the 12th were used from the QAL2 report due to Faulty instruments for SO2 (SOx) where CEMS lost connection several times.
- Boiler conditions (faulty components/system /subsystem disturbing flame temperatures at the boiler chamber
- Instrument for NOx (CEMS) lost signal from the 02/06
- Mills performance was not adequate
- Defective areas affecting the NOx exceedance

- Unit 1
- Findings: The high emissions can be attributed to Primary conveyor 12 keeps tripping, SO3 plant trip, S03 tripped due to sulfur inlet steam temp low, Primary conveyor 13 keeps tripping, So3 plant trips due to in sufficient flow, SO3 plant on hold convertor second stage temp to hihg, top bunker conveyor tripped and conveyor trippedoff due to aux steam inlet temp low, SO3 plant trip due to convector DA control v/v stuck in one position, Fuel oil support for D mill tripped due to mail mill motor lub oil pressure low.
- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to SO3 plant on hold mode due to no sulphure flow, DHP top chain conveyor and bucket elevator tripped, DHP off due to compartments full, All precip hoppers Knife gates are closed, SO3 plant on hold mode due to Aux steam temp low, SO3 plant off, steam isolated, Precip chain conveyor keep on tripping, knife gates closed, DHP tripped on Compartment 20 levels high, Stream 1 first collector keeps on tripping and suspected speed switch sensor faulty, Primary conveyor 23 chocked, knife gates closed, Strem 1 first collector tripped and failed to start, Precip chain conveyor 12 cked and 13 tripped.

- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to unit light up So3 plant on hold mode - Sulphur flow low. SO3 plant on hold mode and precip fields casttlet on start up mode, SO3 plant tripped due to sulfur block valve, Precip Conveyor standing fails to start, Knif gates closed, Stream 1 Bucket elevator tripped, Precip 13 is tripping, Precip conv 12 tripped and fail to start
- Resolution: Palnt repaired.

- Unit 4: OFF

- Unit 5
- Findings: High PM emissions can be attributed to DHP trippined due to spiked FAB 3compartment 20, SO3 plant off due to no flow, Precip conveyor 13 kept on tripping,DHP tripped due to compartment 20 full, SO3 plant off due to low back end temps, 1st collecting conveyor trip,Precip conveyor 13 is offwith knife gates closed, DHP off, Compat high level, HP off due to FAB 3 faulty high level switches of compat 10 & 20.
- Resolution: Plant repaired.

- Unit 6
- Findings: High PM emissions can be attributed to Unit light up, Fuel oil usage, DHP stream 2 bucket elevator elevator speed switch faulty. DHP off all compartments full. Knife gates closed
- Resolution: Plant repaired.