



Ms Nompumelelo Simelane
Nkangala District
P.O Box 437
MIDDLEBERG
1050
By email: Simelanenl@nkangaladm.gov.za

Date:
09 October 2023

Enquiries: S Chokoe
Tel +27 13 647 6970

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 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.

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

Generation Division
(Kendal Power Station)
N12 Balmoral Off Ramp, Emalahleni
Private Bag x7272, Emalahlani 1035 SA
Tel +27 13 647 6970 Fax +27 13 647 6904 www.eskom.co.za

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

Verified by:



Jacob Zwane
BOILER ENGINEERING: SENIOR SYSTEM ENGINEER- KENDAL POWER STATION

Date: 11/10/2023

Validated by:



Tendani Rasivhetshele
BOILER ENGINEERING MANAGER-KENDAL POWER STATION

Date: 16-10-2023

Supported by:



Malibongwe Mabizela
ENGINEERING MANAGER-KENDAL POWER STATION

Date: 18/10/2023

Approved by:



Kobus Steyn
GENERAL MANAGER-KENDAL POWER STATION

Date: 20 Oct '23

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	1 041.916
Ash	Tons	770 000	309 617.152	
RE Ash	kg/MWh	not specified	1.999	

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	NO _x
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 ₂ Utilization Jun-2023
Unit 1	ESP + SO ₂	98.176%	SO ₂	78.5%
Unit 2	ESP + SO ₂	97.443%	SO ₂	77.6%
Unit 3	ESP + SO ₂	99.549%	SO ₂	7.8%
Unit 4	ESP + SO ₂	Off-line	SO ₂	0.0%
Unit 5	ESP + SO ₂	98.546%	SO ₂	67.5%
Unit 6	ESP + SO ₂	99.422%	SO ₂	42.3%

SO₂ 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 trip, SO₃ tripped due to sulfur inlet steam temp low, SO₃ plant trips due to insufficient flow, SO₃ plant on hold convertor second stage temp to high, top bunker conveyor tripped and conveyor tripped, SO₃ off due to aux steam inlet temp low, SO₃ plant trip due to convector DA control vlv 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	68.0	56.2

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

Note: Unit 1, 2 and 3 dust monitors reliability 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	846.2	2 261	967
Unit 2	1 658.0	0	0
Unit 3	203.8	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	3 682.45	8 259	3 744

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

Associated Unit/Stack	Normal	Grace	Section 30	Contra-vention	Total Exceedance	Average PM (mg/Nm ³)
Unit 1	0	4	0	21	25	595.1
Unit 2	0	7	0	20	27	867.5
Unit 3	0	3	0	21	24	170.1
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	9	27	0	90	117	

Table 6.3: Operating days in compliance to SO₂ AEL Limit - June 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contra-vention	Total Exceedance	Average SO ₂ (mg/Nm ³)
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	

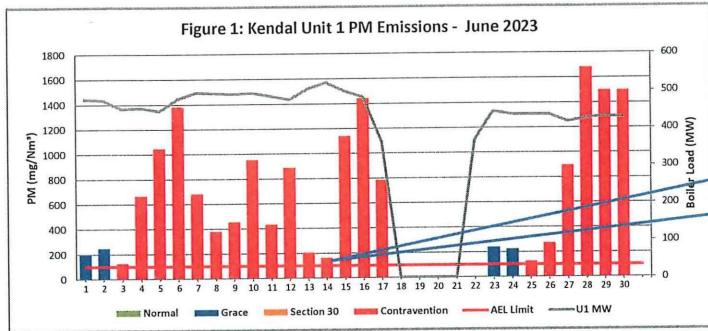
Table 6.4: Operating days in compliance to NOx AEL Limit - June 2023

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 NO₂

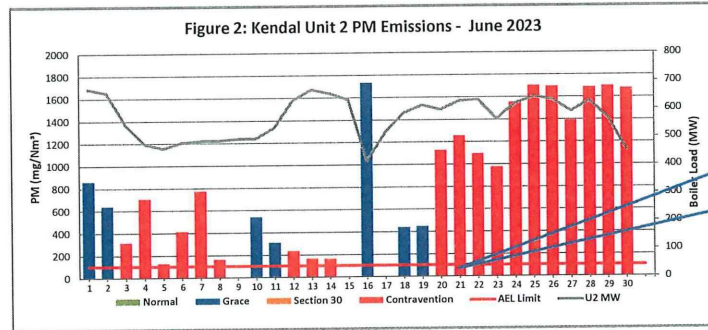
Table 6.5: Legend Description

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



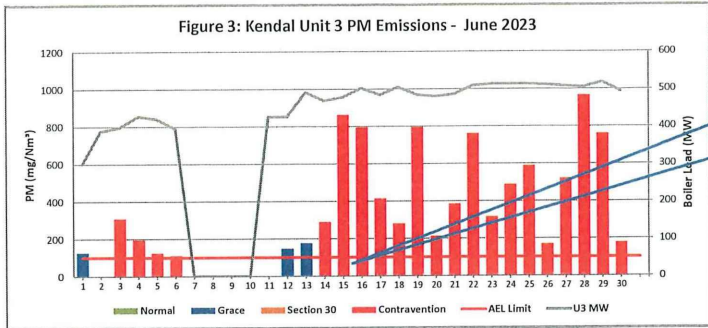
High emissions can be attributed to Primary conveyor 12 keeps tripping, SO3 plant trip, SO3 tripped due to sulfur inlet steam temp low, Primary conveyor 13 keeps tripping, SO3 plant trips due to insufficient flow, SO3 plant on hold conveyor second stage temp to high, top bunker conveyor tripped and conveyor tripped, SO3 off due to aux steam inlet temp low, SO3 plant trip due to conveyor DA control v/v stuck in one position, Fuel oil support for D mill tripped due to mill motor lub oil pressure low.

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



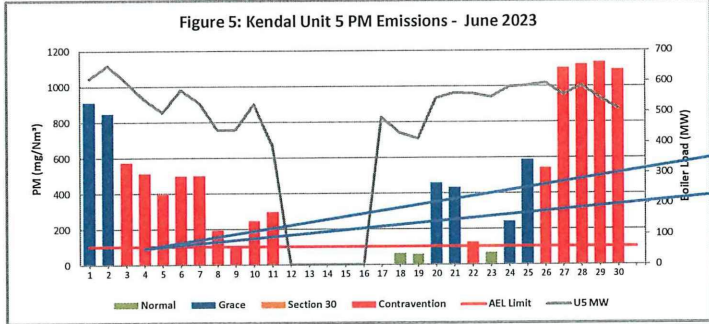
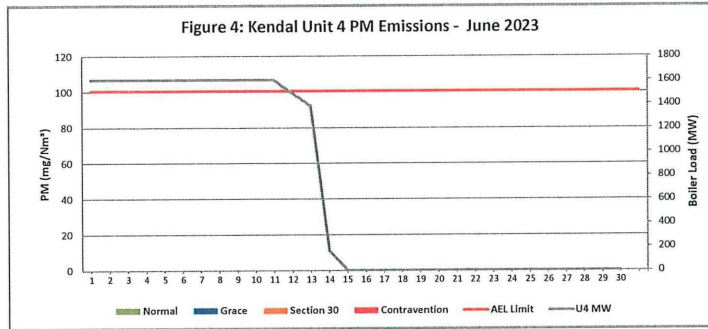
High emissions can be attributed to SO3 plant on hold mode due to no sulphure flow, DHP top chain conveyor and bucket elevator tripped, DHP off due to compartments full, All precip hoppers Knife gates are closed, SO3 plant on hold mode due to Aux steam temp low, SO3 plant off, steam isolated, Precip 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 switch sensor faulty, Primary conveyor 23 chocked, knife gates closed, Stream 1 first collector tripped and failed to start, Precip chain conveyor 12 cked and 13 tripped.

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

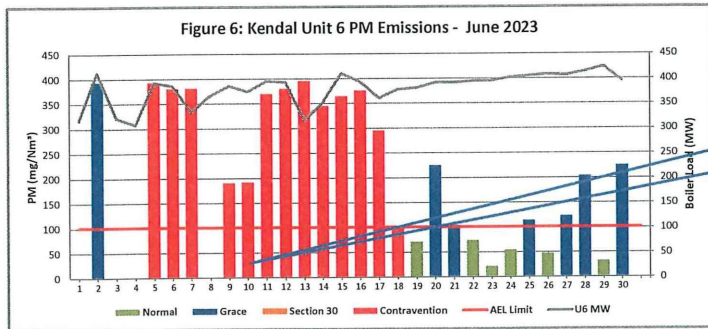


High PM emissions can be attributed to unit light up So3 plant on hold mode - Sulphur flow low. SO3 plant on hold mode and precip fields castlet on start up mode, SO3 plant tripped due to sulfur block valve, Precip Conveyor standing falls to start, Knife gates closed, Stream 1 Bucket elevator tripped, Precip 13 is tripping, Precip conv 12 tripped and fall 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 tripped due to spilled FAB 3 compartment 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 off with knife gates closed, DHP off, Comp high level, HP off due to FAB 3 faulty high level switches of comp 10 & 20.



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

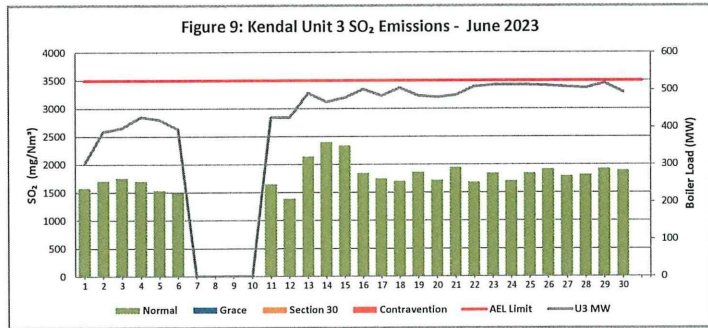
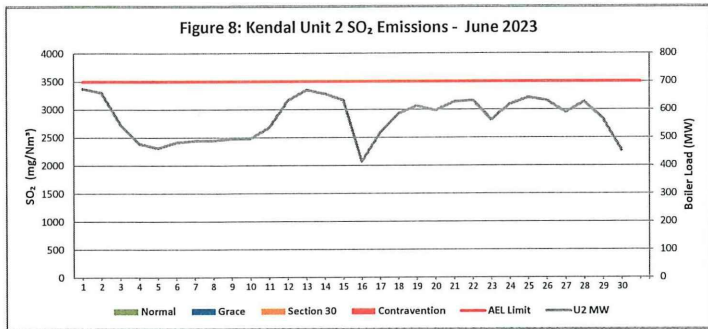
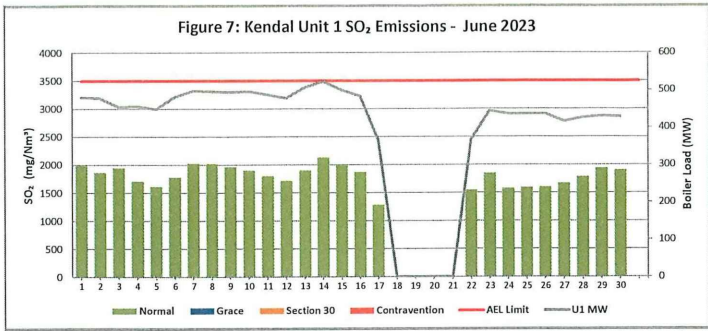


Figure 10: Kendal Unit 4 SO₂ Emissions - June 2023

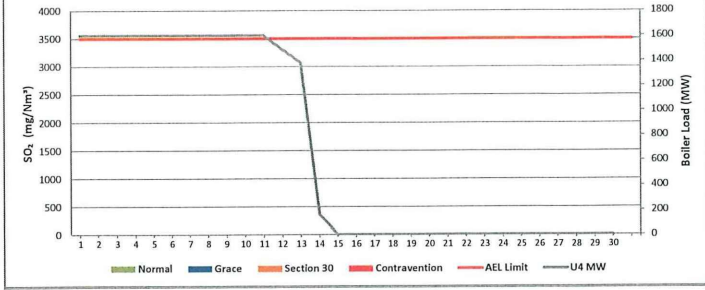


Figure 11: Kendal Unit 5 SO₂ Emissions - June 2023

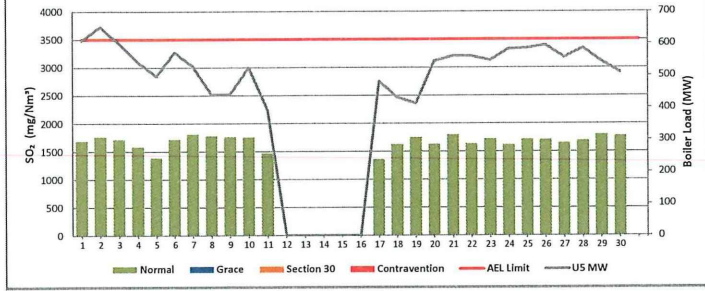


Figure 12: Kendal Unit 6 SO₂ Emissions - June 2023

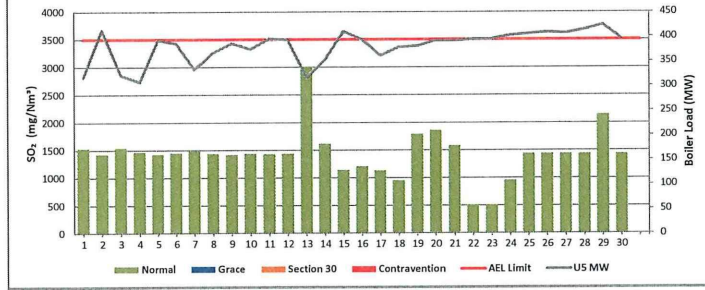


Figure 13: Kendal Unit 1 NO_x Emissions - June 2023

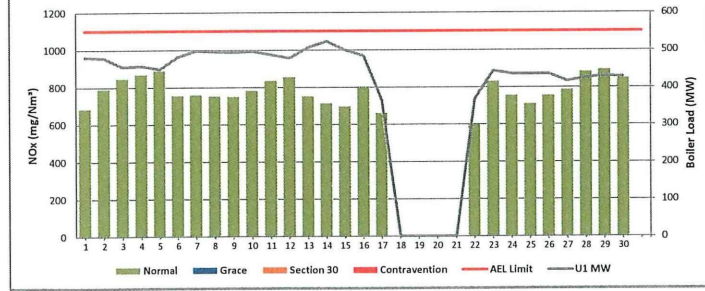


Figure 14: Kendal Unit 2 NOx Emissions - June 2023

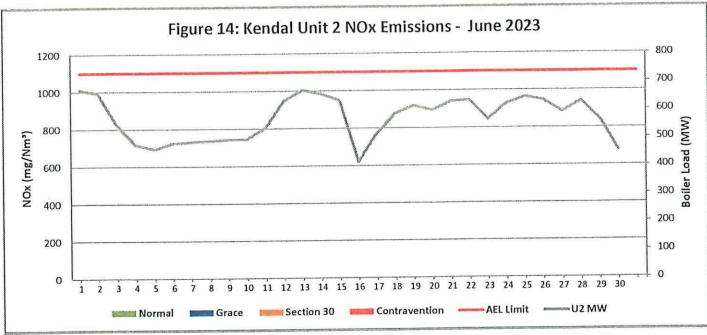


Figure 15: Kendal Unit 3 NOx Emissions - June 2023

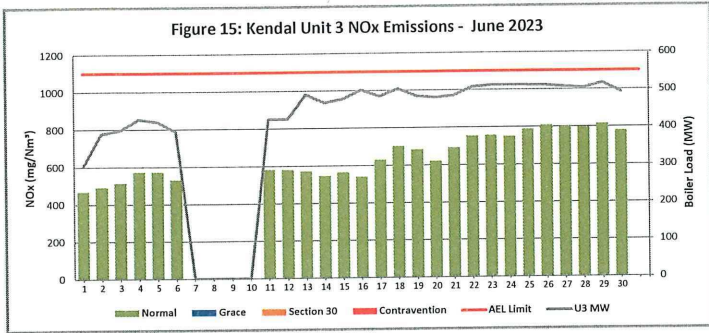


Figure 16: Kendal Unit 4 NOx Emissions - June 2023

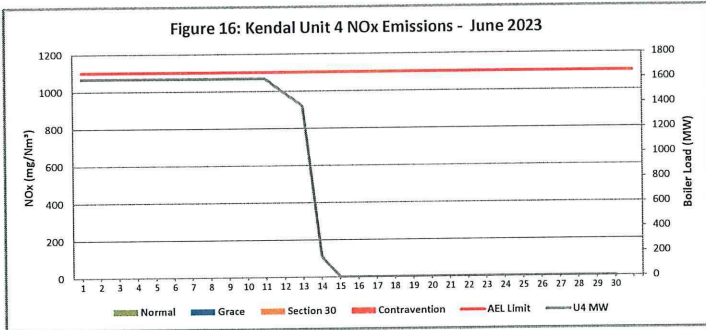


Figure 17: Kendal Unit 5 NOx Emissions - June 2023

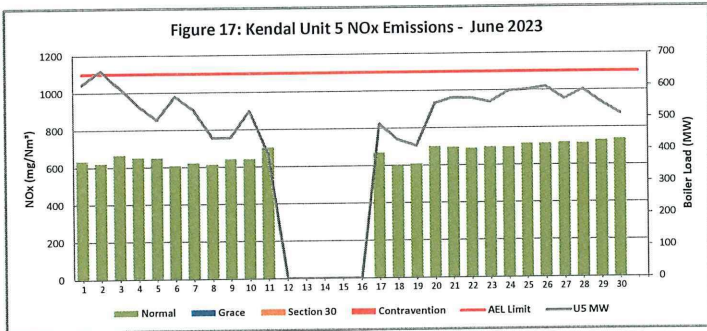
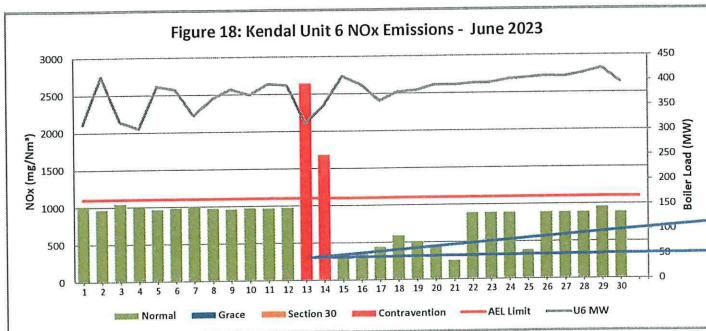


Figure 18: Kendal Unit 6 NOx Emissions - June 2023



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

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

$$\eta = 1 - \frac{(\text{Dust Emission From AQR Report Dust Monitor (tons)} \times 100)}{(\text{Coal Burnt (tons)} \times \% \text{Ash Content} \times 80\%)}$$

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 24 hours

The formula is as follows:

$$= (1 - (\text{count hours above } 99.325\% / 24 \text{ hours})) \times 100$$

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 emission were higher than what the monitor was correlated for. In which case we use surrogate values. This is attributed 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 4th - 7,10th,12th -16th and 27th - 30th, U2 on the 1st, 15th,16th & 24th - 30th, Unit 3 from the 1st, 2nd, 3rd, and the 13th -29th. Figures will be restated based on updated upset testing and surrogate value determination that Kendal will conduct in September- October.
- 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, SO3 tripped due to sulfur inlet steam temp low, Primary conveyor 13 keeps tripping, So3 plant trips due to insufficient flow, SO3 plant on hold convertor second stage temp to high, top bunker conveyor tripped and conveyor tripped off due to aux steam inlet temp low, SO3 plant trip due to conveyor DA control v/v stuck in one position, Fuel oil support for D mill tripped due to 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, Stream 1 first collector tripped and failed to start, Precip chain conveyor 12 ckd 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 castlet on start up mode, SO3 plant tripped due to sulfur block valve, Precip Conveyor standing fails to start, Knife 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 tripped due to spiked FAB 3 compartment 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 off with 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 speed switch faulty. DHP off all compartments full. Knife gates closed
- Resolution: Plant repaired.