Eskom

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Date:
06 September 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 MAY 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:

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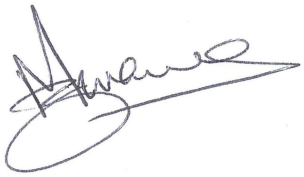
KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF MAY 2023

Verified by:



Jacob Zwane
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GENERAL MANAGER-KENDAL POWER STATION

Eskom

MAY 2023

KENDAL POWER STATION MONTHLY EMISSIONS REPORT

Atmospheric Emission License 17/4/AEL/MP312/11/15

1 RAW MATERIALS AND PRODUCTS

	Raw Material Type	Units	Maximum Permitted Consumption Rate	Consumption Rate May-2023
Raw Materials and Products	Coal	Tons	2 260 000	732 537
	Fuel Oil	Tons	5 000	10292.73

	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Production Rate May-2023
Production Rates	Energy	GWh(MW)	(3,153,600)4380	1 199 907.00
	Ash	Tons	770 000	261 662.3
	RE Ash	kg/MWh	not specified	2.970

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
Sulphur Content	%	<1 (%)	0.730
Ash Content	%	40 (%)	35.720

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 May-2023	Technology Type	SO_3 Utlization May-2023
Unit 1	*ESP + SO_3*	*99.408%*	*SO_3*	*97.4%*
Unit 2	*ESP + SO_3*	*99.704%*	*SO_3*	*67.7%*
Unit 3	*ESP + SO_3*	*99.230%*	*SO_3*	*0.0%*
Unit 4	*ESP + SO_3*	*Off-line*	*SO_3*	*0.0%*
Unit 5	*ESP + SO_3*	*97.805%*	*SO_3*	*83.9%*
Unit 6	*ESP + SO_3*	*99.128%*	*SO_3*	*100.0%*

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 no Sulphur flow
SO3 plant on hold mode due to steam temp low
So3 plant tripped - Steam temperature dropped down to 120 deg/c

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	*89.9*	*84.9*	*83.3*	*82.4*
Unit 2	*91.7*	*87.2*	*87.2*	*96.8*
Unit 3	*64.6*	*93.3*	*90.2*	*25.9*
Unit 4	*0.0*	*0.0*	*0.0*	*0.0*
Unit 5	*95.8*	*88.1*	*87.9*	*96.2*
Unit 6	*0.0*	*42.6*	*100.0*	*0.0*

Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2
Note: Unit 3 and 6 dust monitors realiability is low due to monitors maxing out. Unit 2 SO2, Nox and O2,Unit 1 Nox and O2, Unit 6 SO2 and Nox and O2 monitor reliability low due to defective monitors

6 EMISSION PERFORMANCE

T[illegible]1: Monthly tonnages for the month of May 2023

As[illegible]ted Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	330.6	3 989	1 596
Unit 2	197.8	2 818	1 204
Unit 3	258.9	1 775	506
Unit 4	0.0	0	0
Unit 5	1 080.4	1 876	713
Unit 6	32.3	0	0
SUM	1 900.01	10 458	4 019

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	8	6	1	14	21	221.6
Unit 2	22	5	0	4	9	94.2
Unit 3	3	4	0	15	19	261.1
Unit 4	0	0	0	0	0	
Unit 5	1	4	0	17	21	860.1
Unit 6	0	1	0	0	1	299.3
SUM	**34**	**20**	**1**	**50**	**71**	

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

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	31	0	0	0	0	2 041.7
Unit 2	28	0	0	0	0	1 771.2
Unit 3	27	0	0	0	0	1 640.5
Unit 4	0	0	0	0	0	
Unit 5	23	0	0	0	0	1 481.9
[illegible]	0	0	0	0	0	
SUM	**109**	**0**	**0**	**0**	**0**	

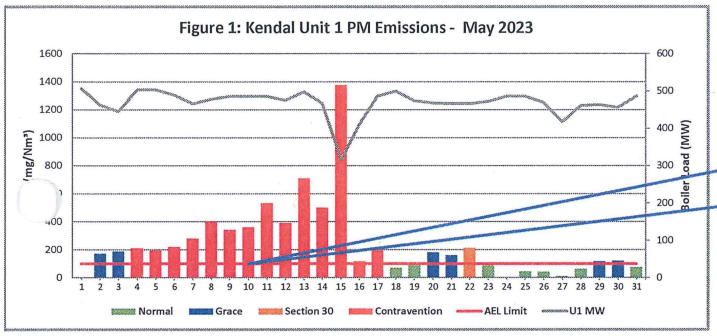
Table 6.4: Operating days in compliance to NOx AEL Limit - May 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	31	0	0	0	0	793.5
Unit 2	28	0	0	0	0	760.4
Unit 3	27	0	0	0	0	459.6
Unit 4	0	0	0	0	0	
Unit 5	23	0	0	0	0	566.8
Unit 6	0	0	0	0	0	
SUM	109	0	0	0	0	

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

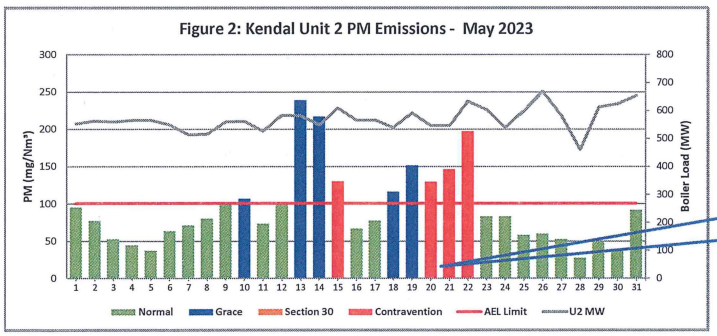
Table 6.5: Legend Description

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



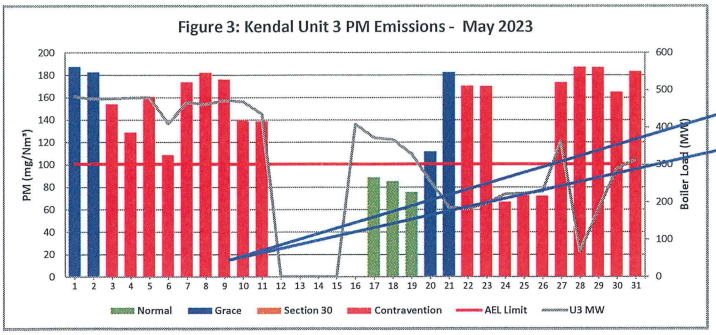
High emissions can be attributed to Light up conditions with oil support, Compartment 10 and 20 full, causing DHP to trip. Closing knife gate, SO3 plant off due to no flow. SO3 plant on hold mode due to steam temp low. DHP 1st collecting conveyor stream 1 tripped, DHP stop due to high level on compartments and all precip conv hoopers closed. SO3 plant off due to low steam temp. DHP standing due to Top chain conveyor gearbox oil level low and compartment. SO3 plant off du to low steam temp.

Unit 1 monitor maxed out on the 13th - 10th ,



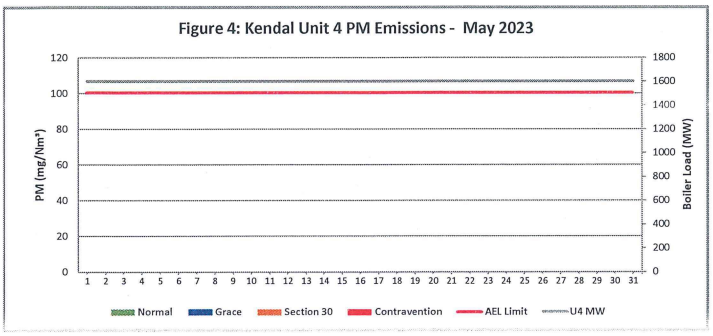
High emissions can be attributed to SO3 plant on hold mode, no Sulphur flow, DHP tripped on PLC failure, DHP precip chain conv 11 & 23 choked.

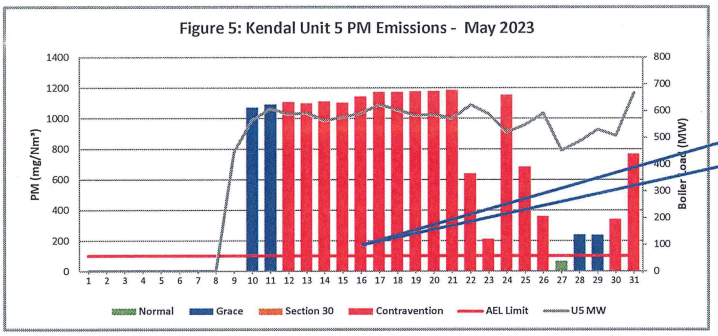
Unit 2 monitor maxed ot on the 13th & 22nd



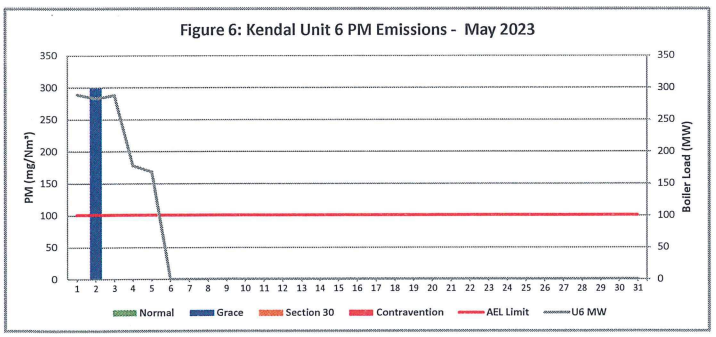
High PM emissions can be attributed to So3 plant trippin - Raining and water falling onto pipe work, Precip conveyors 23 and 24 tripped on overload, knife gates closed. So3 plant tripped - Steam temperature dropped down to 120 deg/c, Fuel Oil Usage for Combustion support

Unit 3 maxed out form the 01st -03rd, 07th -09th and the 20th -24th, 29th-31st





High PM emissions can be attributed to DHP tripping due to full compartments. Could not ash with 21 -24 due to sream 2 first conveyor that kept on tripping



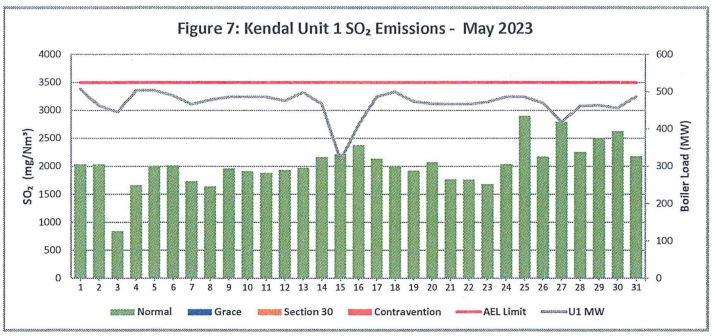


Figure 7: Kendal Unit 1 SO_2 Emissions - May 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

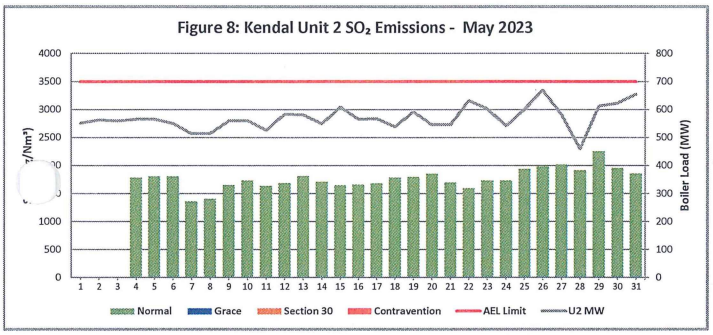


Figure 8: Kendal Unit 2 SO_2 Emissions - May 2023
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW

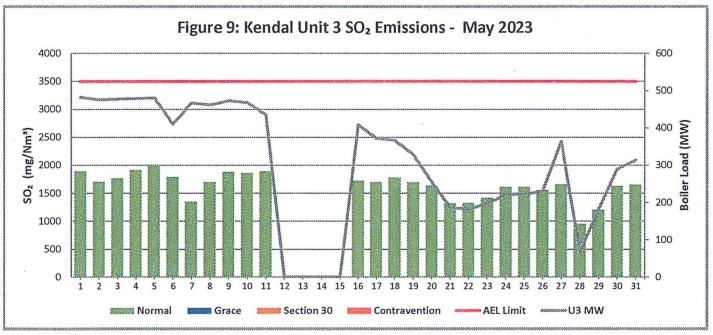


Figure 9: Kendal Unit 3 SO_2 Emissions - May 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

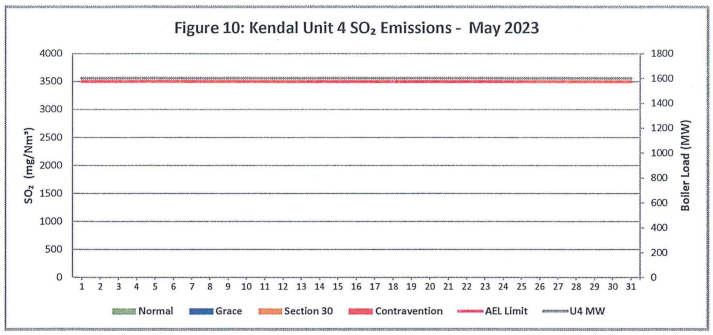


Figure 10: Kendal Unit 4 SO_2 Emissions - May 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW

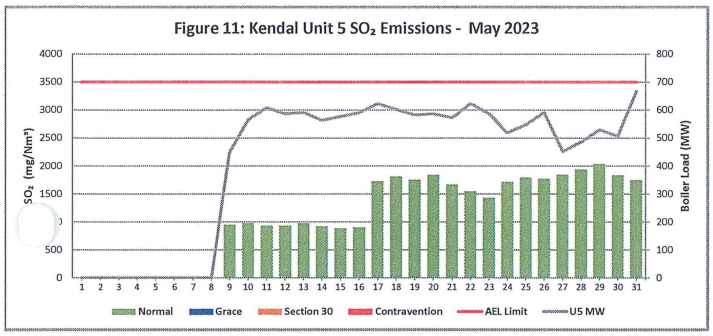


Figure 11: Kendal Unit 5 SO_2 Emissions - May 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

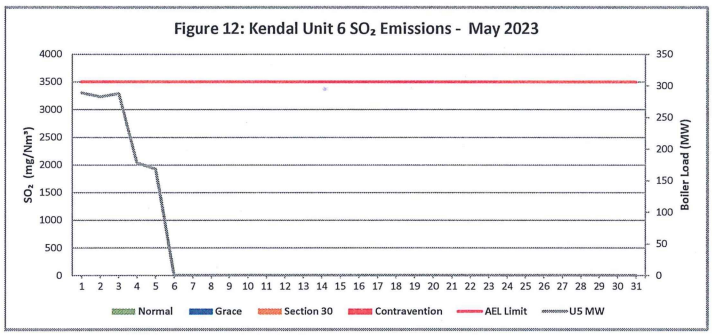


Figure 12: Kendal Unit 6 SO_2 Emissions - May 2023
SO_2 (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

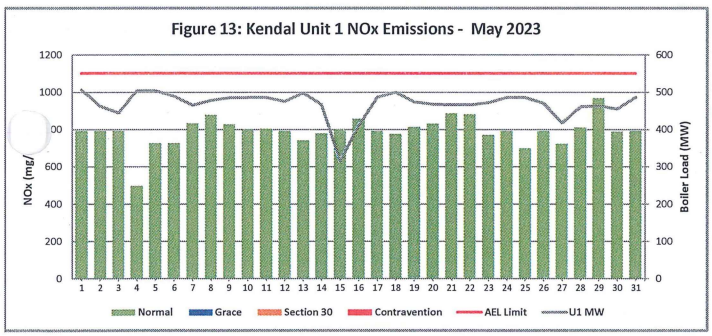


Figure 13: Kendal Unit 1 NOx Emissions - May 2023
NOx (mg/
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

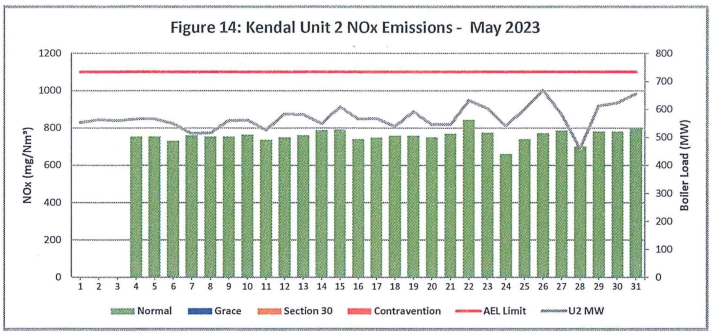


Figure 14: Kendal Unit 2 NOx Emissions - May 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW

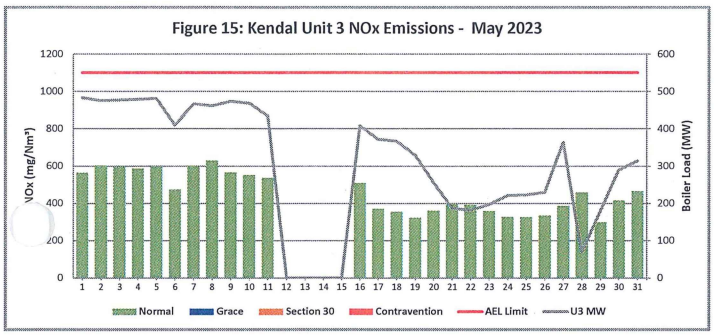


Figure 15: Kendal Unit 3 NOx Emissions - May 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

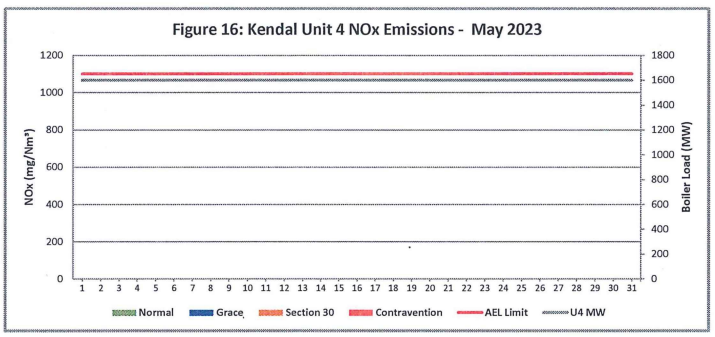


Figure 16: Kendal Unit 4 NOx Emissions - May 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW

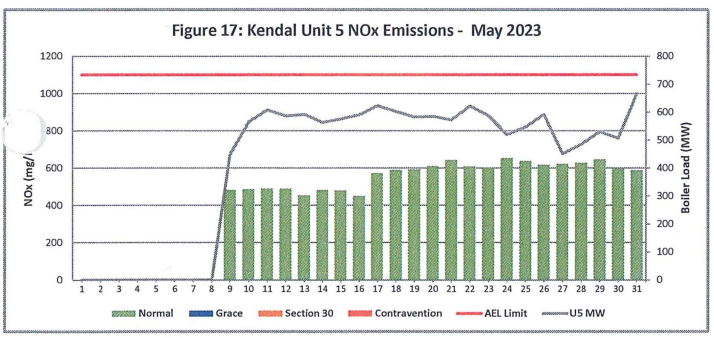


Figure 17: Kendal Unit 5 NOx Emissions - May 2023
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

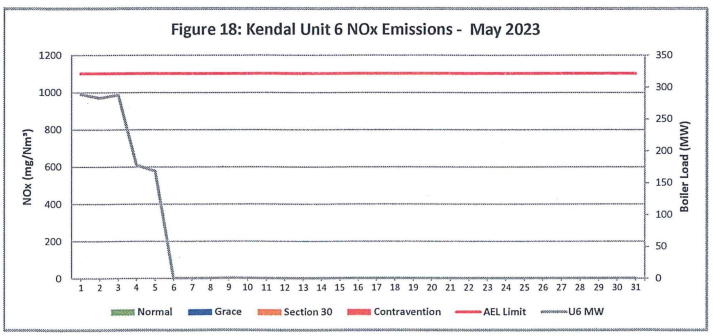


Figure 18: Kendal Unit 6 NOx Emissions - May 2023
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U6 MW

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 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 attributted to abnormal plant conditions including Unavailability of the DHP and No SO3.
- 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 on the 13th - 10th, U2 on the 13th & 22nd, Unit 3 form the 01st -03rd, 07th -09th and the 20th -24th, 29th-31st. Figures will be restated based on updated upset testing and surrogate value determination as soon as the station is done with the tests.
- Unit 5 SOx and NOx on the 16th and 17th data was deleted due to defective monitors, the tool has avaraged itself.
- Unit 2 O2 for the entire month was replaced from QAL 2 report due to defective monitor.
- Note: Some of the data was lost during to the Operational Technology Network failure.
-
- Unit 1
- Findings: The high emissions can be attributed to Light up conditions with oil support, Compartment 10 and 20 full, causing DHP to trip. Closing knife gate, SO3 plant off due to no flow. SO3 plant on hold mode due to steam temp low. DHP 1st collecting conveyor stream 1 tripped, DHP stop due to high level on compartments and all precip conv hoopers closed. SO3 plant off due to low steam temp. DHP standing due to Top chain conveyor gearbox oil level low and compartment. SO3 plant off du to low steam temp.
- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to SO3 plant on hold mode, no Sulphur flow, DHP tripped on PLC failure, DHP precip chain conv 11 & 23 choked
- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to So3 plant trippin - Raining and water falling onto pipe work, Precip conveyors 23 and 24 tripped on overload, knife gates closed. So3 plant tripped - Steam temperature dropped down to 120 deg/c, Fuel Oil Usage for Combustion support
- Resolution: Palnt repaired.

- Unit 4 Off

Unit 5
- Findings: High PM emissions can be attributed to DHP tripping due to full compartments. Could not ash with 21 -24 due to sream 2 first conveyor that kept on tripping
- Resolution: Plant repaired.

- Unit 6 the unit was on for only 3 days on the days where the data was lost.
- Findings: Resolution: Plant repaired.