Eskom

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Date:
09 October 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 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.

Compiled by:

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ENVIRONMENTAL OFFICER- KENDAL POWER STATION

Date: 09/10/2023

Supported by:

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ENVIRONMENTAL MANAGER- KENDAL POWER STATION

Date: 09/10/2023

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

Verified by:

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Validated by:

Tendani Rasivhetshele Date: 16-10-2023
BOILER ENGINEERING MANAGER-KENDAL POWER STATION

Supported by:

Malibongwe Mabizela Date: 18/10/2023
ENGINEERING MANAGER-KENDAL POWER STATION

Approved by:

Kobus Steyn Date: 20 Oct 2023
GENERAL MANAGER-KENDAL POWER STATION

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	547 601
	Fuel Oil	Tons	5 000	12310.450
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	190 236.587
	RE Ash	kg/MWh	not specified	2.464

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
CV Content	MJ/kg	16-24 (MJ/kg)	18.060
Sulphur Content	%	<1 (%)	0.880
Ash Content	%	40 (%)	34.740

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 Utlization Aug-2023
Unit 1	*ESP + SO_3*	*97.885%*	*SO_3*	*73.2%*
Unit 2	*ESP + SO_3*	*98.890%*	*SO_3*	*77.9%*
Unit 3	*ESP + SO_3*	*99.456%*	*SO_3*	*0.0%*
Unit 4	*ESP + SO_3*	*Off-line*	*SO_3*	*Off-line*
Unit 5	*ESP + SO_3*	*98.354%*	*SO_3*	*26.9%*
Unit 6	*ESP + SO_3*	*99.206%*	*SO_3*	*40.3%*

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

SO3 trip due to burner out let temp high, SO3 plant on hold mode due to low steam temperature, SO3 plant tripped due to steam inlet.

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.

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	*93.0*	*86.8*	*73.2*	*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 3 dust monitors realiability is low due to monitors maxing out. Unit 2 SO2 & Nox,Unit 1,2,3,4 and 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	759.5	3 159	1 212
Unit 2	276.4	1 259	459
Unit 3	86.7	779	276
Unit 4	OFF	60	15
Unit 5	875.2	1 713	754
Unit 6	165.9	751	455
SUM	2 163.84	7 720	3 171

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	6	0	18	24	571.1
Unit 2	0	3	0	13	16	373.1
Unit 3	0	2	0	7	9	178.5
Unit 4	OFF	OFF	OFF	OFF	Exempt	Exempt
Unit 5	1	4	0	21	25	549.9
Unit 6	3	6	0	5	11	246.8
SUM	**5**	**21**	**0**	**64**	**85**	

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	26	0	0	0	0	1 983.7
Unit 2	19	0	0	0	0	1 536.2
Unit 3	9	0	0	0	0	1 860.3
Unit 4	5	0	0	0	0	1 761.1
Unit 5	27	0	0	0	0	1 649.6
Unit 6	15	0	0	0	0	1 327.6
SUM	**101**	**0**	**0**	**0**	**0**	

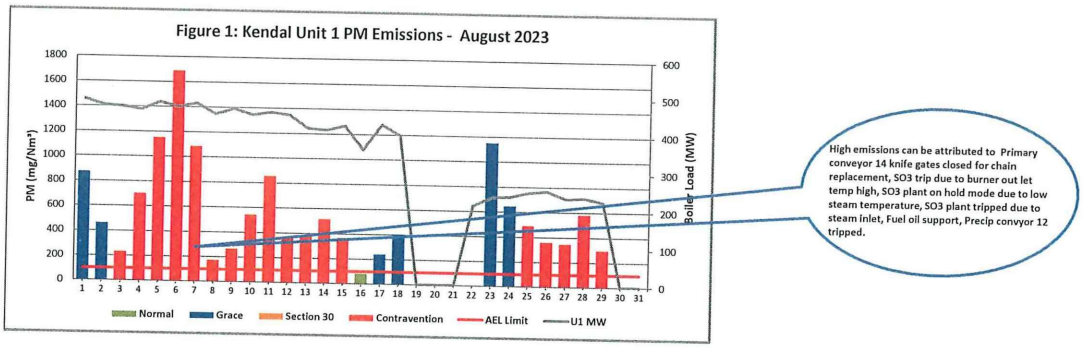
Table 6.4: Operating days in compliance to NOx AEL Limit - August 2023

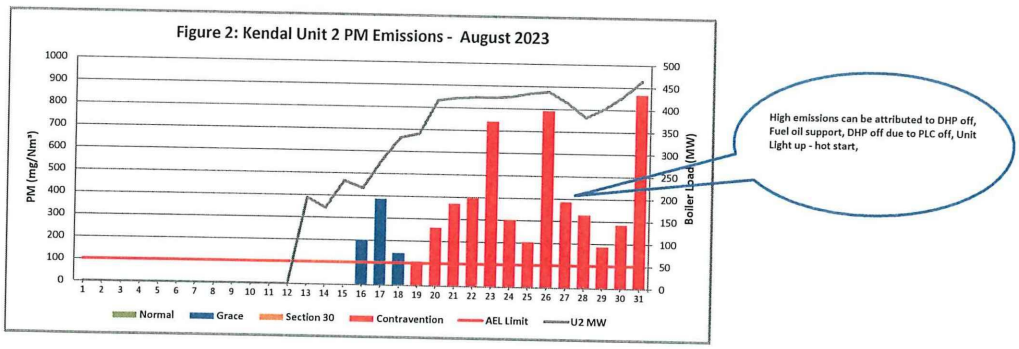
Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	26	0	0	0	0	763.7
Unit 2	19	0	0	0	0	566.5
Unit 3	9	0	0	0	0	656.4
Unit 4	5	0	0	0	0	452.6
Unit 5	27	0	0	0	0	720.0
Unit 6	15	0	0	0	0	802.6
SUM	101	0	0	0	0	

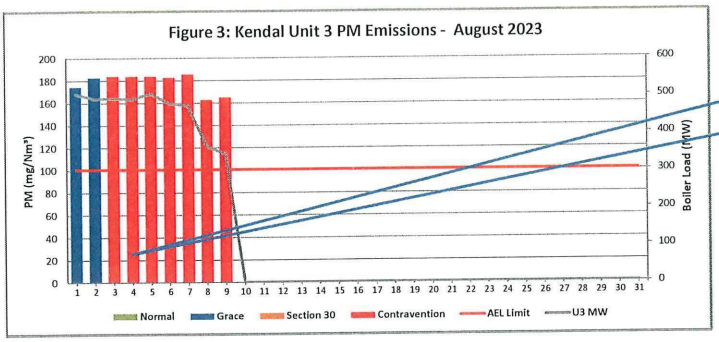
Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2

Table 6.5: Legend Description

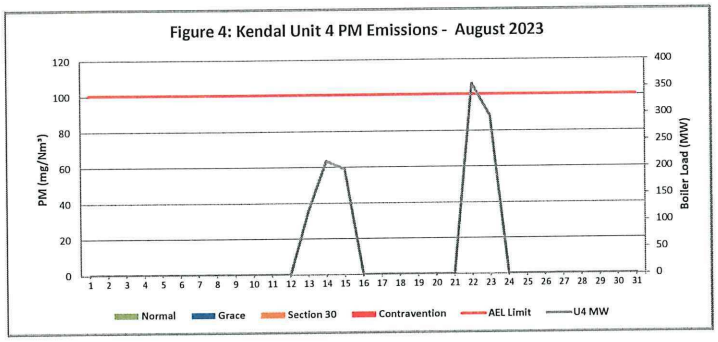
Condition	Colour	Description
Normal	GREEN	Emissions below Emission Limit Value (ELV)
Grace	BLUE	Emissions above the ELV during grace period
Section 30	ORANGE	Emissions above ELV during a NEMA S30 incident
Contravention	RED	Emissions above ELV but outside grace or S30 incident conditions

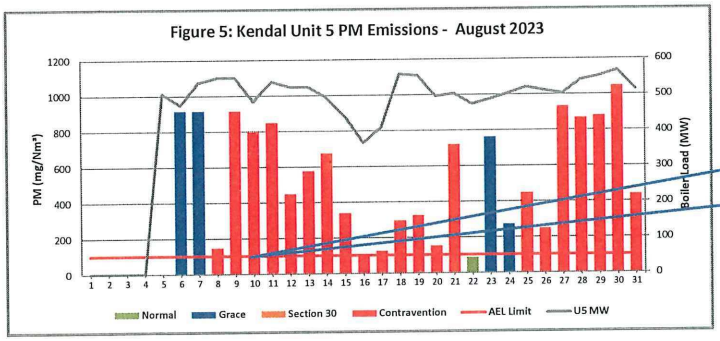




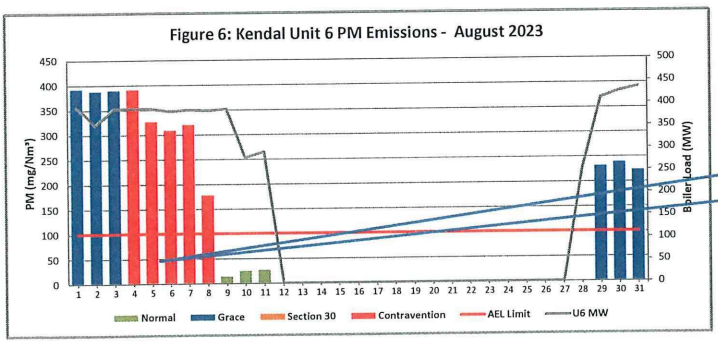


High PM emissions can be attributed to DHP off, Fuel oil support,Top bunker conveyor off awaiting for spares, First 5 hopper knife gates on precip conveyors 11 - 24 shut - No conditioners available for compartment 10. Stream 1 dust handling plant tripped - Compartment 10 level high - All precip hopper knife gates shut. DHP plant stopped due to compartment full.





High PM emissions can be attributed to Fuel oil support Light up condition - Hot start, Precip field 11,12,21,22,24,26,36,43 and 45 falling out and fails to reset, SO3 plant had no flow due to lower steam temperature, DHP stopped due high compartment levels.Preclp conv 14 still keeps tripping, DHP off stream 2, second collector conveyor faulty, DHP stopped due high compartment levels, DHP tripped due to high FAB 3 compartments - all hoppers knife gates fully shut,DHP stream 1 trips due to compartments full.



High PM emissions can be attributed to High PM emissions can be attributed to fuel oil support, SO3 plant had no flow due to lower steam temperature, DHP stopped due high compartment levels precip field faulty.

Figure 7: Kendal Unit 1 SO_2 Emissions - August 2023

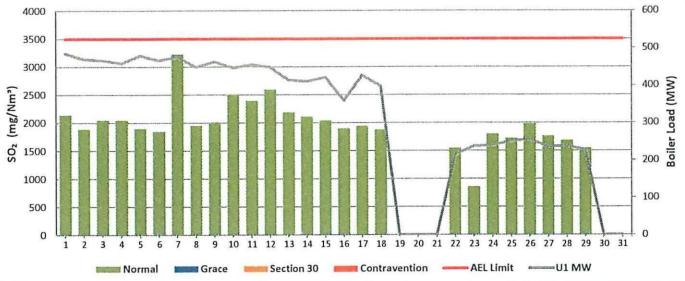


Figure 8: Kendal Unit 2 SO_2 Emissions - August 2023

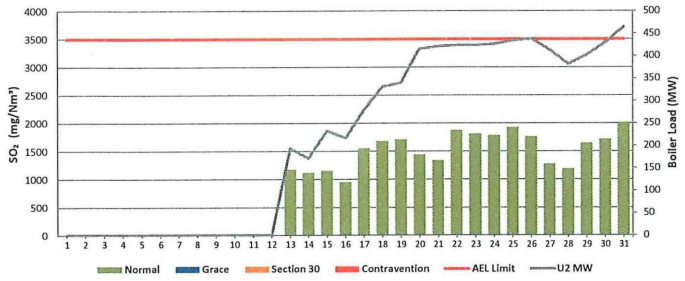


Figure 9: Kendal Unit 3 SO_2 Emissions - August 2023

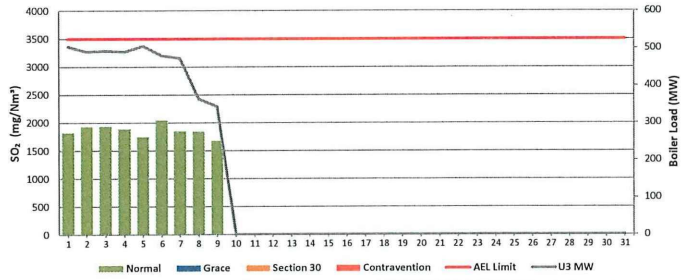


Figure 10: Kendal Unit 4 SO_2 Emissions - August 2023

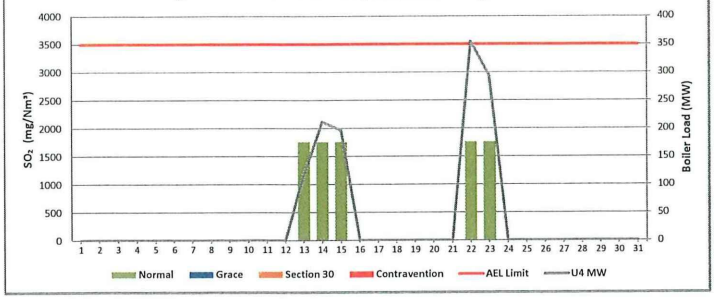


Figure 11: Kendal Unit 5 SO_2 Emissions - August 2023

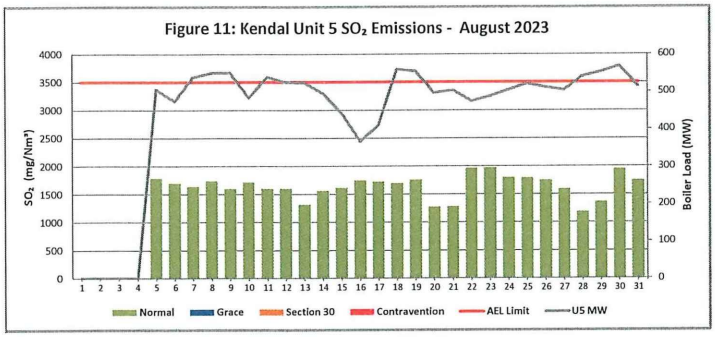


Figure 12: Kendal Unit 6 SO_2 Emissions - August 2023

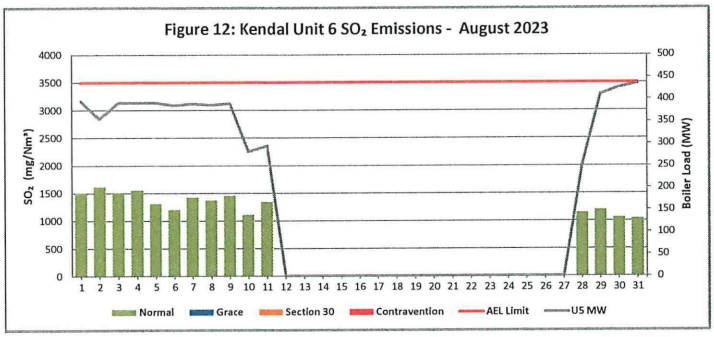


Figure 13: Kendal Unit 1 NOx Emissions - August 2023

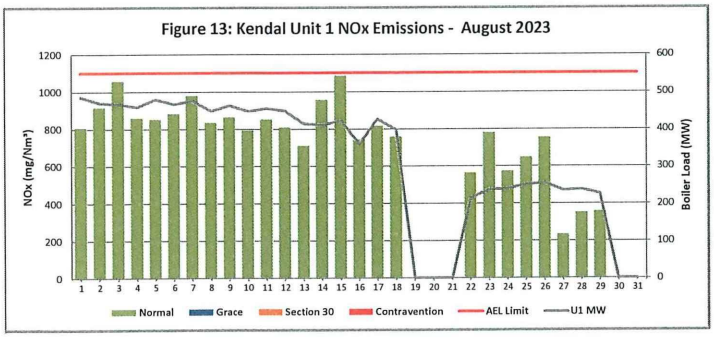


Figure 14: Kendal Unit 2 NOx Emissions - August 2023

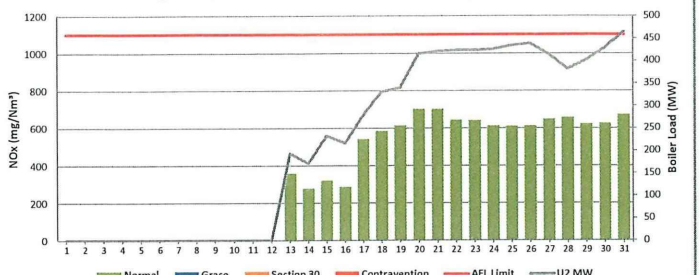


Figure 15: Kendal Unit 3 NOx Emissions - August 2023

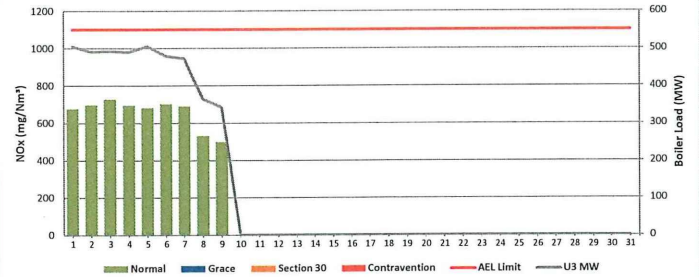


Figure 16: Kendal Unit 4 NOx Emissions - August 2023

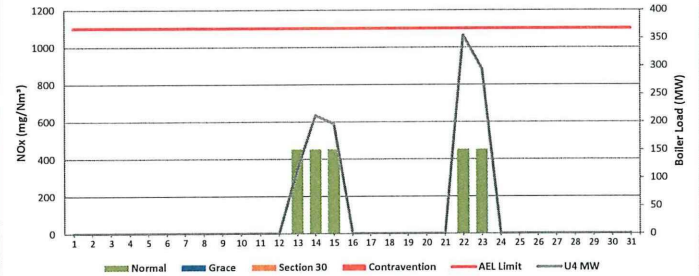


Figure 17: Kendal Unit 5 NOx Emissions - August 2023

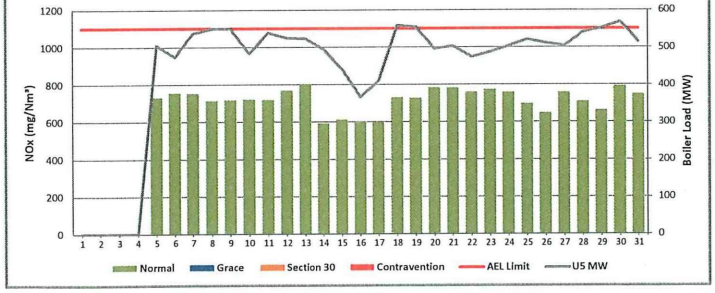
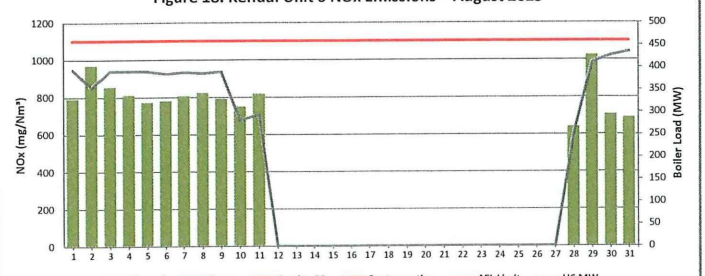


Figure 18: Kendal Unit 6 NOx Emissions - August 2023



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

ADDENDUM TO MONTHLY EMISSIONS REPORT

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

$\eta = (1 - (Output/Input))$ x 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 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 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 1st - 2nd, 4th - 7th, 10th - 11th,18th,24th,28 and 29th - 31st, Unit 3 on the 1st -8th. Figures will be restated based on updated upset testing and surrogate value determination that Kendal will conduct in September- October.
- Unit 1 NOx on the 7th, 14th -22nd,23rd and 24th,monitor was defective, data was deleted the tool will avarage itself.

-
- Unit 1
- Findings: The high emissions can be attributed to Primary conveyor 14 knife gates closed for chain replacement, SO3 trip due to burner out let temp high, SO3 plant on hold mode due to low steam temperature, SO3 plant tripped due to steam inlet, Fuel oil support, Precip convyor 12 tripped.
- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to DHP off, Fuel oil support, DHP off due to PLC off, Unit Light up - hot start,
- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to DHP off, Fuel oil support,Top bunker conveyor off awaiting for spares, First 5 hopper knife gates on precip conveyors 11 - 24 shut - No conditioners available for compartment 10. Stream 1 dust handling plant tripped - Compartment 10 level high - All precip hopper knife gates shut. DHP plant stopped due to compartment full.
- Resolution: Palnt repaired.

- Unit 4
- Findings: High PM emissions can be attributed to Light up condition - cold start, Fuel oil support
- Resolution: Plant repaired.

- Unit 5
- Findings: High PM emissions can be attributed to Fuel oil support Light up condition - Hot start, Precip field 11,12,21,22,24,26,36,43 and 45 falling out and fails to reset, SO3 plant had no flow due to lower steam temperature, DHP stopped due high compartment levels.Precip conv 14 still keeps tripping, DHP off stream 2, second collector conveyor faulty, DHP stopped due high compartment levels, DHP tripped due to high FAB 3 compartments - all hoppers knife gates fully shut,DHP stream 1 trips due to compartments full.
- Resolution: Plant repaired.

- Unit 6
- Findings: High PM emissions can be attributed to fuel oil support, SO3 plant had no flow due to lower steam temperature, DHP stopped due high compartment levels precip field faulty.
- Resolution: Plant repaired.