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Date:  
20 December 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 NOVEMBER 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: 20/12/2023

**Supported by:**

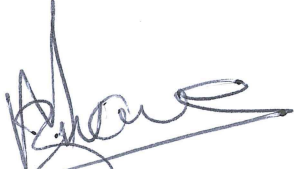


Solly Chokoe  
**ENVIRONMENTAL MANAGER- KENDAL POWER STATION**

Date: 20/12/2023

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

**Verified by:**



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

Date: 21/12/2023

**Validated by:**



Tendani Rasivhetshela  
**BOILER ENGINEERING MANAGER-KENDAL POWER STATION**

Date: 09/01/2024

**Supported by:**



Matibongwe Mabizela  
**ENGINEERING MANAGER-KENDAL POWER STATION**

Date: 10/01/2024

**Approved by:**



Kobus Steyn  
**GENERAL MANAGER-KENDAL POWER STATION**

Date: 12 January 2024

**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 Nov-2023
	Coal	Tons	2 280 000	616 890
	Fuel Oil	Tons	5 000	8947,630

Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Indicative Production Rate Nov-2023
	Energy	GWh	2 963 520	1 020,321
	Ash	Tons	770 000	200 427,561
	RE Ash	kg/MWh	not specified	1,234

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)	18,840
Sulphur Content	%	<1 (%)	0,810
Ash Content	%	40 (%)	32,490

**3 EMISSION LIMITS (mg/Nm³)**

Associated Unit/Stack	PM	SO <sub>2</sub>	NO <sub>x</sub>
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 Nov-2023	Technology Type	SO <sub>2</sub> Utilization Nov-2023
Unit 1	ESP + SO <sub>2</sub>	99.127%	SO <sub>2</sub>	86.8%
Unit 2	ESP + SO <sub>2</sub>	99.399%	SO <sub>2</sub>	92.4%
Unit 3	ESP + SO <sub>2</sub>	Off-line	SO <sub>2</sub>	Off-line
Unit 4	ESP + SO <sub>2</sub>	99.439%	SO <sub>2</sub>	0.0%
Unit 5	ESP + SO <sub>2</sub>	98.695%	SO <sub>2</sub>	65.7%
Unit 6	ESP + SO <sub>2</sub>	99.354%	SO <sub>2</sub>	83.7%

Stations very old and obsolete windows 97 SCADA system which the station has to be replaced during the unit 4 GO outage. Commissioning of the server is still on going.

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

SO3 plant not running due to low Sulphur flow. SO3 pipe line blocked. SO3 Plant not communicating

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO <sub>2</sub>	NO	O <sub>2</sub>
Unit 1	96.8	99.3	99.7	99.7
Unit 2	82.8	98.0	98.2	54.0
Unit 3	Off	Off	Off	Off
Unit 4	95.8	74.6	74.6	63.3
Unit 5	85.3	98.2	91.5	100.0
Unit 6	99.0	85.0	100.0	69.8

Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO<sub>2</sub>

Note: Unit 4 SO2 and Nox monitors reliability is low due to defective monitors. Unit 2,4 and 6 O2 monitors reliability low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of November 2023

Associated Unit/Stack	PM (tons)	SO <sub>2</sub> (tons)	NO <sub>x</sub> (tons)
Unit 1	326.8	3 106	1 252
Unit 2	217.2	1 317	561
Unit 3	Off	Off	Off
Unit 4	211.8	1 565	633
Unit 5	370.0	1 090	437
Unit 6	133.5	0	0
SUM	1 259.30	7 078	2 883

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

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

Associated Unit/Stack	Normal	Grace	Section 30	Contraven- tion	Total Exceedance	Average PM (mg/Nm <sup>3</sup> )
Unit 1	16	7	0	7	14	189.0
Unit 2	0	2	0	22	24	184.2
Unit 3	Off	Off	Off	Off	Off	Off
Unit 4	10	8	0	12	20	207.3
Unit 5	2	3	0	14	17	426.4
Unit 6	3	3	0	10	13	173.3
SUM	31	23	0	65	88	

Table 6.3: Operating days in compliance to SO<sub>2</sub> AEL Limit - November 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contraven- tion	Total Exceedance	Average SO <sub>2</sub> (mg/Nm <sup>3</sup> )
Unit 1	30	0	0	0	0	1 366.7
Unit 2	25	0	0	0	0	2 220.0
Unit 3	Off	Off	Off	Off	Off	Off
Unit 4	30	0	0	0	0	1 912.4
Unit 5	21	0	0	0	0	1 626.0
Unit 6	17	0	0	0	0	815.4
SUM	123	0	0	0	0	

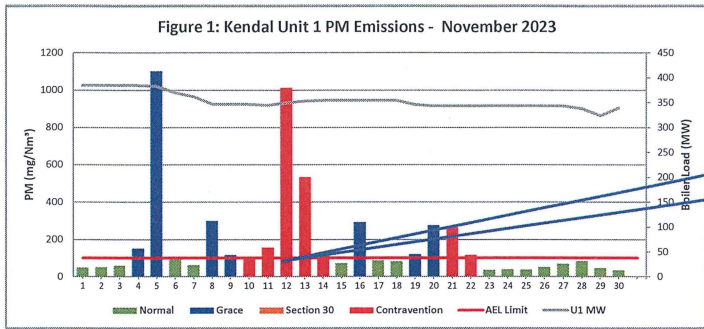
Table 6.4: Operating days in compliance to NOx AEL Limit - November 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contra-vention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	30	0	0	0	0	554.5
Unit 2	25	0	0	0	0	965.2
Unit 3	Off	Off	Off	Off	Off	Off
Unit 4	30	0	0	0	0	773.7
Unit 5	21	0	0	0	0	652.1
Unit 6	17	0	0	0	0	618.9
SUM	123	0	0	0	0	

Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO<sub>2</sub>

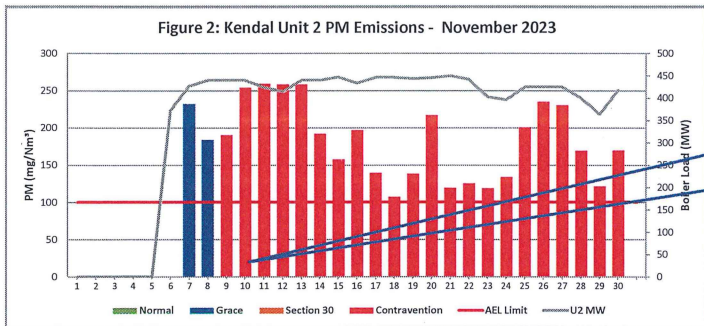
Table 6.5: Legend Description

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
Contra-vention	RED	Emissions above ELV but outside grace or S30 incident conditions



High emissions can be attributed to SO3 plant not running due to low Sulphur flow. SO3 pipe line blocked, PCP 13 tripped all knife gates are closed due to compartments high levels, Filled performance deteriorating, F24 - Fan failure, unit had ashbacklogs.

Unit 1 monitor maxed out on the 4th and 5th, 12th, 13th and 16th



High emissions can be attributed to Precip fields 11, 12, 22 and 44 o/c fan faulty, Field 11 no internals, Field 13,14,15 indicating internal short circuit, F44 has electrical faults - Fan failure. Stream 2, 1st collector O/C, Communication fault on the system from Unit 1-6, High back end temps pcp13 choked and all knife gates shut, 5 precip fields underperforming.

Unit 2 monitor maxed out from the 10th to the 14th and the 26th

Figure 3: Kendal Unit 3 PM Emissions - November 2023

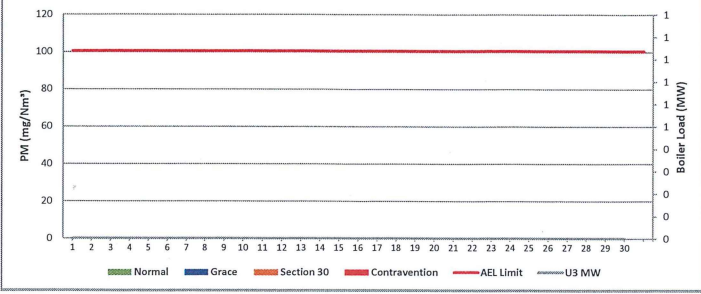
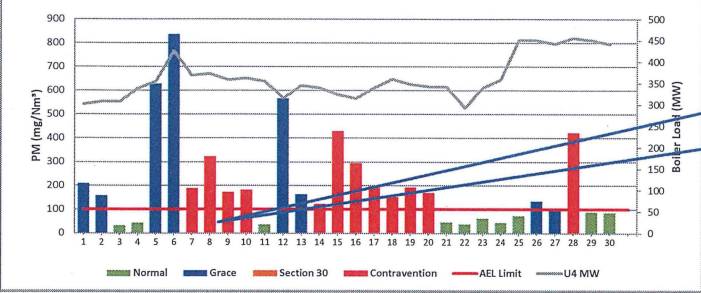
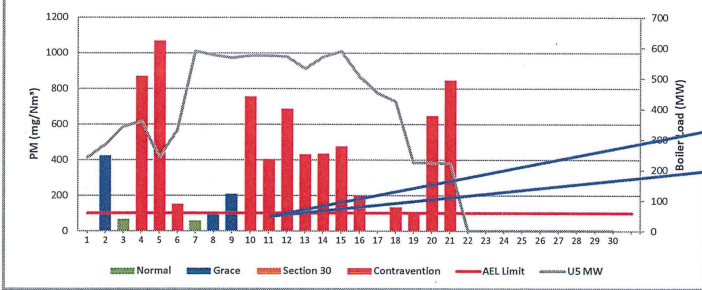


Figure 4: Kendal Unit 4 PM Emissions - November 2023



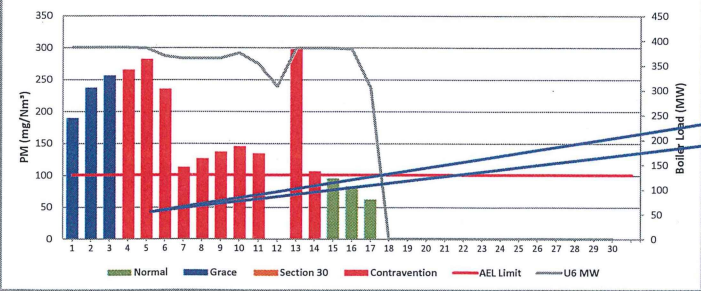
High PM emissions can be attributed to LHS on pcp 11-14 standing with all knife gates shut, faulty on first collection stream 1, pcp 11-14 all knife gates closed (stream 1 tripped) faulty on first collection stream 1, Stream 1 2nd collector not available, LH draught group was shud down, Stream 2 1st collector gearbox mechanically defective, First collector stream 1 kept tripping, Stream 1 First Collector choked (PCP 11-14 OFF and all Knife gates closed) bucket elevator blockage -

Figure 5: Kendal Unit 5 PM Emissions - November 2023



High PM emissions can be attributed to DHP Stream 2, 1st collecting conveyor tripped, DHP tripped due to High compartment 10, compartment 10 full chute onto top bunker conveyor blocked - knife gates closed. Ash constraints due to ash plant standing DHP standing on unit 05 bucket elevator, DHP standing due Stream 2 Second Collector tripped and fails to reset and stream 1 not available. Stream 2 bucket elevator tightening on the knots Precip fields 12, 23, 31, 32, 42, 43 not performing DHP standing ,

Figure 6: Kendal Unit 6 PM Emissions - November 2023



High PM emissions can be attributed to S03 Plant not communicating Precip conveyor 11 faulty

Figure 7: Kendal Unit 1 SO<sub>2</sub> Emissions - November 2023

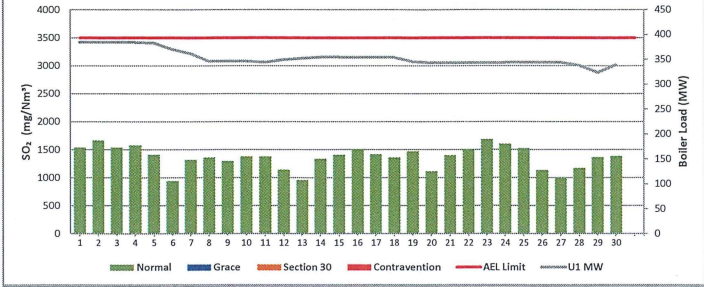


Figure 8: Kendal Unit 2 SO<sub>2</sub> Emissions - November 2023

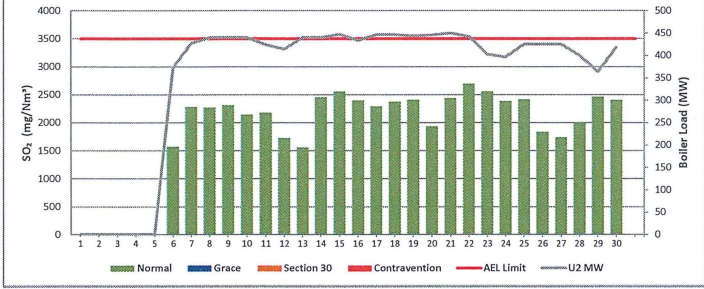


Figure 9: Kendal Unit 3 SO<sub>2</sub> Emissions - November 2023

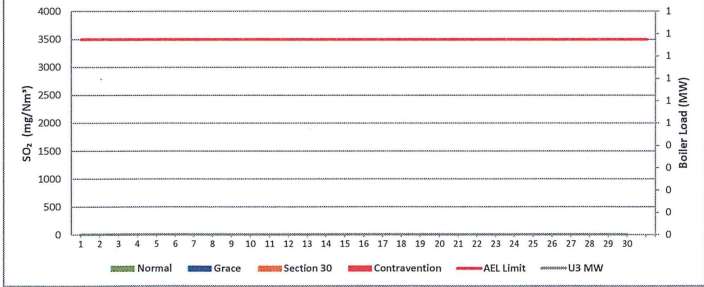


Figure 10: Kendal Unit 4 SO<sub>2</sub> Emissions - November 2023

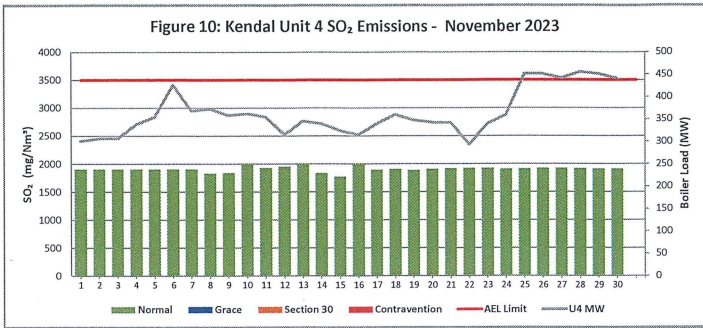


Figure 11: Kendal Unit 5 SO<sub>2</sub> Emissions - November 2023

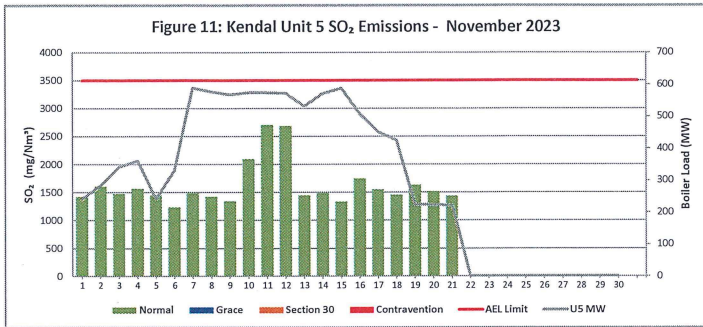


Figure 12: Kendal Unit 6 SO<sub>2</sub> Emissions - November 2023

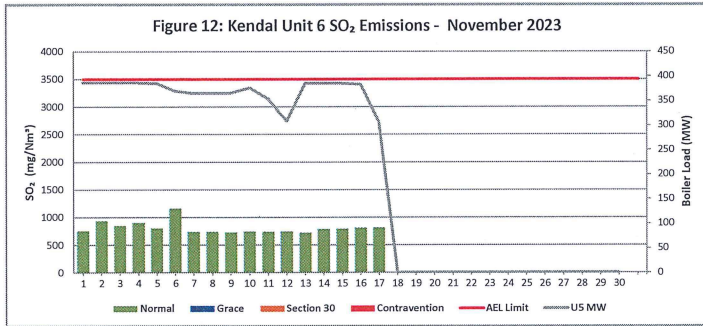


Figure 13: Kendal Unit 1 NO<sub>x</sub> Emissions - November 2023

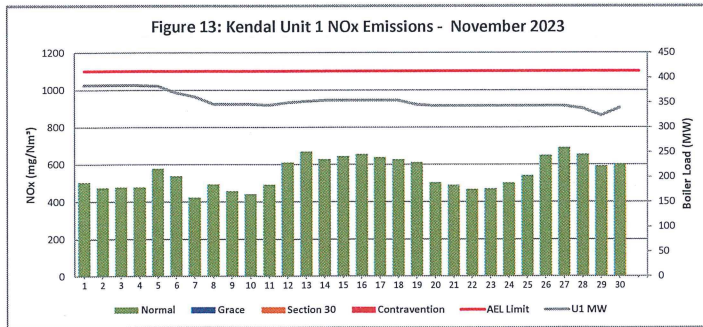




Figure 14: Kendal Unit 2 NOx Emissions - November 2023

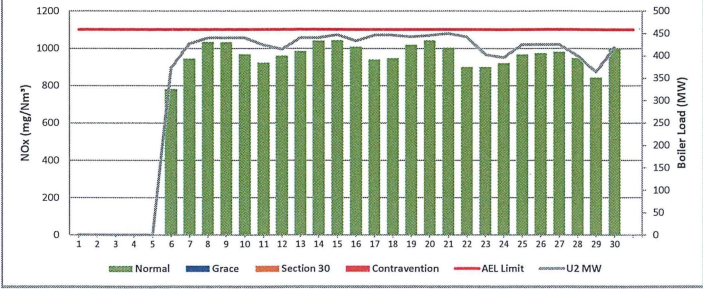


Figure 15: Kendal Unit 3 NOx Emissions - November 2023

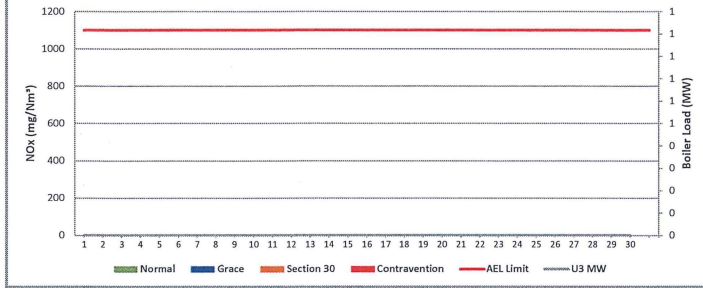


Figure 16: Kendal Unit 4 NOx Emissions - November 2023

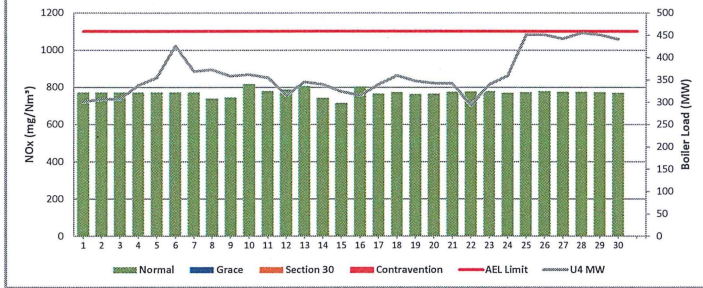


Figure 17: Kendal Unit 5 NOx Emissions - November 2023

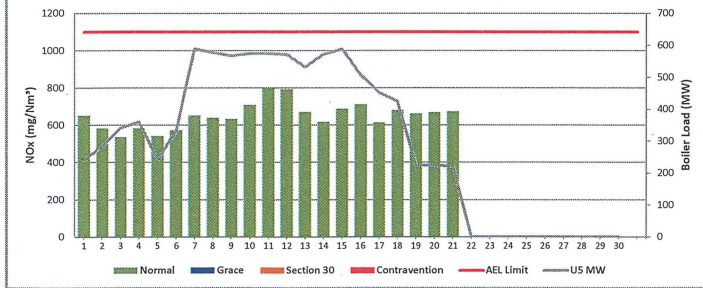
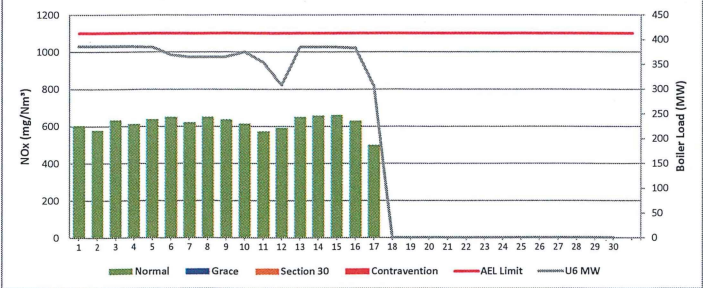


Figure 18: Kendal Unit 6 NOx Emissions - November 2023



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

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

$$\eta = 1 - \frac{\text{DustEmissionFromAQR ReportDustMonitor(tons)}}{(\text{CoalBurnt(tons)} \times \% \text{AshContent} \times 80\%)} \times 100$$

**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 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
- > Unit 5 Monitor still using the old monitor correlation. After new correlations are done, new correlation factors will be implemented and backfitted to the date of monitor installation.
- > U1 and 2 monitor maxed out, meaning the the emissions were higher than what the monitor was correlated for. In which case we use surrogate values. This is attributed to abnormal plat conditions.
- > Average emissions for unit 2 ,4 and 5 were taken from QAL2 report as the CO2 and O2 Faulty instrument (CEMS/monitors) get wrong readings impacting the AQR's calculations.
- > Unit 2 burner tilt positions.
  
- > Unit 1
- > Findings: The high emissions can be attributed to SO3 plant not running due to low Sulphur flow, SO3 pipe line blocked. PCP 13 tripped all knife gates are closed due to compartments high levels, Field performance deteriorating, F24 – Fan failure, unit had ashbacklogs.
- > Resolution: Plant repaired
  
- > Unit 2
- > Findings: The high emissions can be attributed to pcp13 choked and all knife gates shut, 5 precip fields underperforming, Precip fields 11, 12, 22 and 44 o/c fan faulty, Field 11 no internals, Field 13,14,15 indicating internal short circuit, F44 has electrical faults - Fan failure. Stream 2, 1st collector O/C, Communication fault on the system from Unit 1-6, High back end temps.
- > Resolution: Plant repaired.
  
- > Unit 3 - Unit on Outage
  
- > Unit 4
- > Findings: High PM emissions can be attributed to LHS on pcp 11\_14 standing with all knife gates shut, faulty on first collection stream 1, pcp 11-14 all knife gates closed (stream 1 tripped) faulty on first collection stream 1, Stream 1 2nd collector not available, LH draught group was shud down, Stream 2 1st collector gearbox mechanically defective, First collector stream 1 kept tripping, Stream 1 First Collector chocked (PCP 11-14 OFF and all Knife gates closed) bucket elevator blockage.
- > Resolution: Plant repaired.
  
- > Unit 5
- > Findings: High PM emissions can be attributed to DHP Stream 2, 1st collecting conveyor tripped, DHP tripped due to High compartment 10, compartment 10 full chute onto top bunker conveyer blocked - knife gates closed. Ash constraints due to ash plant standing, DHP standing on unit 05 bucket elevator, DHP standing due Stream 2 Second Collector tripped and fails to reset and stream 1 not available. Stream 2 bucket elevator tightening on the knots, Precip fields 12, 23, 31, 32, 42, 43 not performing DHP standing,
- > Resolution: Plant repaired.
  
- > Unit 6
- > Findings: High PM emissions can be attributed to SO3 Plant not communicating Precip conveyor 11 faulty
- > Resolution: Plant repaired.