Eskom

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Date:
23 January 2023

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Dear Mrs. Mpho Nembilwi

Ref: Kendal Power Station AEL (17/4/AEL/MP312/11/15)

KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF NOVEMBER 2022.

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: 23/01/2023

Supported by:

Solly Chokoe
ENVIRONMENTAL MANAGER- KENDAL POWER STATION

Date: 23/01/2023

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KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF NOVEMBER 2022

Verified by:

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BOILER ENGINEERING: SYSTEM ENGINEER- KENDAL POWER STATION

Validated by:

Date: 25/01/2023

Tendani Rasivhetshele
BOILER ENGINEERING MANAGER-KENDAL POWER STATION

Supported by:

Date: 26/01/2023

Mallbongwe Mabizela
ENGINEERING MANAGER-KENDAL POWER STATION

Approved by:

Date: 26 January 2023

Kobus Steyn
GENERAL MANAGER-KENDAL POWER STATION

Eskom

NOVEMBER 2022

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-2022
	Coal	Tons	2 260 000	761 543
	Fuel Oil	Tons	5 000	8456.59
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Production Rate Nov-2022
	Energy	GWh(MW)	(3.153,600)4380	1 356 465.00
	Ash	Tons	770 000	234 707.6
	RE Ash	kg/MWh	not specified	5.470

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
Sulphur Content	%	<1 (%)	0.700
Ash Content	%	40 (%)	30.820

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 Nov-2022	Technology Type	SO_3 Utilization Nov-2022
Unit 1	ESP + SO_3	92.083%	SO_3	91.7%
Unit 2	ESP + SO_3	95.789%	SO_3	69.4%
Unit 3	ESP + SO_3	93.427%	SO_3	63.8%
Unit 4	ESP + SO_3	99.678%	SO_3	95.1%
Unit 5	ESP + SO_3	96.037%	SO_3	82.2%
Unit 6	ESP + SO_3	98.984%	SO_3	90.8%

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

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	56.8	86.6	83.8	99.4
Unit 2	85.0	21.3	52.5	99.6
Unit 3	78.7	98.7	99.0	81.6
Unit 4	99.7	100.0	99.4	96.4
Unit 5	97.2	1.9	4.0	100.0
Unit 6	97.5	100.0	97.8	73.1

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

Note: Unit 1 and 3 dust monitors realiability is low due to monitors maxing out. Unit 2 SO2 and Nox,Unit 4 O2, Unit 5 SO2 and Nox and Unit 6 O2 monitors reliability low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of November 2022

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	2 616.5	3 328	1 298
Unit 2	1 856.5	1 269	418
Unit 3	1 574.6	1 801	721
Unit 4	104.1	1 265	375
Unit 5	968.6	2 207	927
Unit 6	303.4	1 678	651
SUM	7 423.73	11 549	4 390

Table 6.2: Operating days in compliance to PM AEL Limit - November 2022

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	2	10	0	14	24	888.5
Unit 2	6	4	0	20	24	757.7
Unit 3	2	8	0	13	21	150.5
Unit 4	20	5	0	5	10	119.0
Unit 5	0	2	1	18	21	1 106.8
Unit 6	6	5	0	16	21	237.9
SUM	36	34	1	86	121	

Table 6.3: Operating days in compliance to SO_2 AEL Limit - November 2022

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	27	0	0	0	0	1 686.3
Unit 2	30	0	0	0	0	982.2
Unit 3	25	0	0	0	0	1 001.7
Unit 4	30	0	0	0	0	1 650.0
Unit 5	23	0	0	0	0	1 644.6
Unit 6	28	0	0	0	0	1 445.7
SUM	163	0	0	0	0	

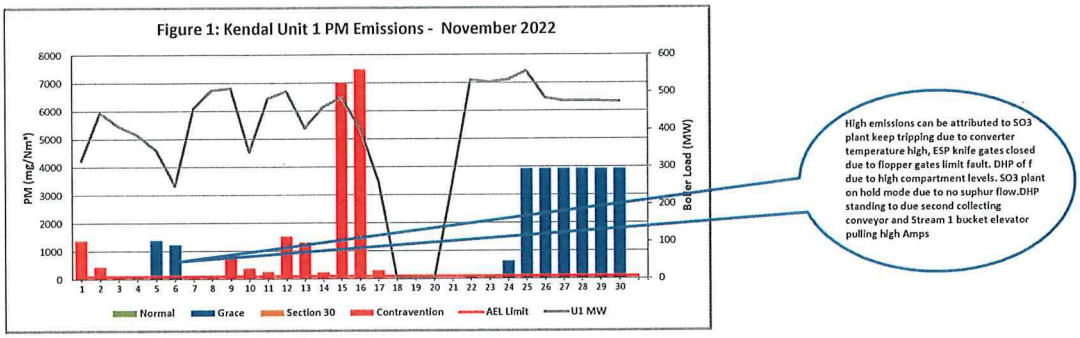
Table 6.4: Operating days in compliance to NOx AEL Limit - November 2022

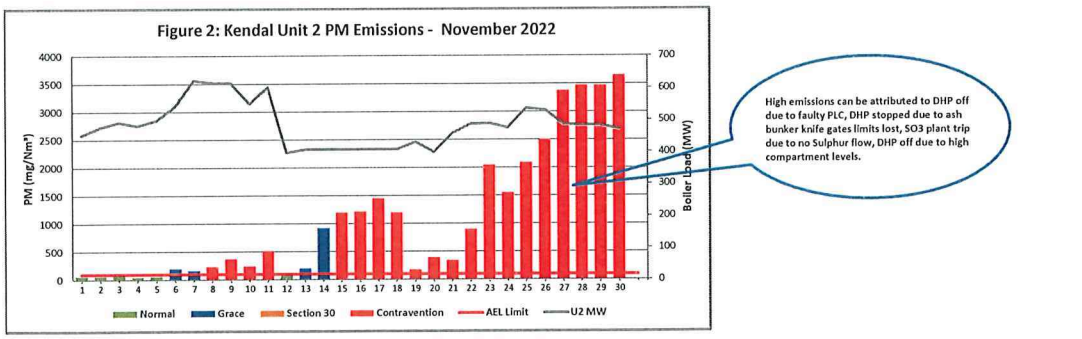
Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	27	0	0	0	0	658.9
Unit 2	30	0	0	0	0	322.8
Unit 3	25	0	0	0	0	387.4
Unit 4	30	0	0	0	0	491.5
Unit 5	23	0	0	0	0	691.0
Unit 6	28	0	0	0	0	564.3
SUM	163	0	0	0	0	

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





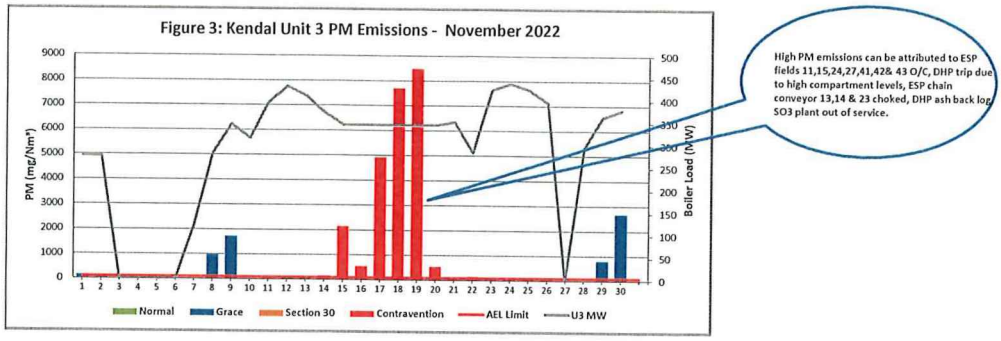


Figure 3: Kendal Unit 3 PM Emissions - November 2022
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW
High PM emissions can be attributed to ESP fields 11,15,24,27,41,42& 43 O/C, DHP trip due to high compartment levels, ESP chain conveyor 13,14 & 23 choked, DHP ash back log, SO3 plant out of service.

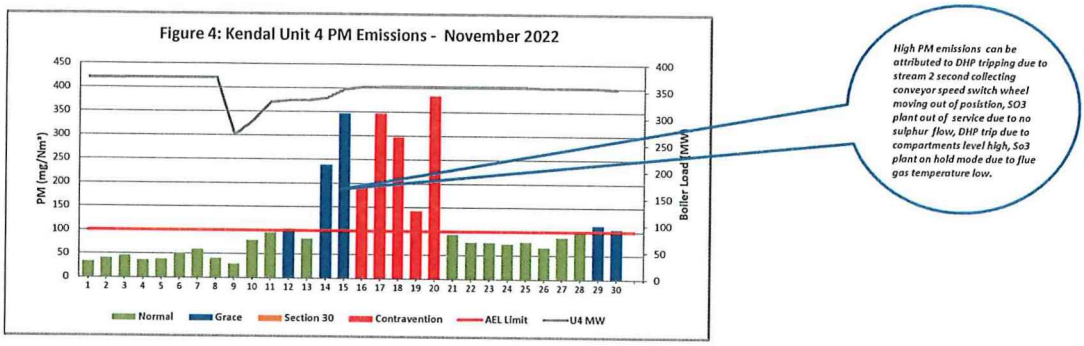


Figure 4: Kendal Unit 4 PM Emissions - November 2022
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW
High PM emissions can be attributed to DHP tripping due to stream 2 second collecting conveyor speed switch wheel moving out of position, SO3 plant out of service due to no sulphur flow, DHP trip due to compartments level high, So3 plant on hold mode due to flue gas temperature low.

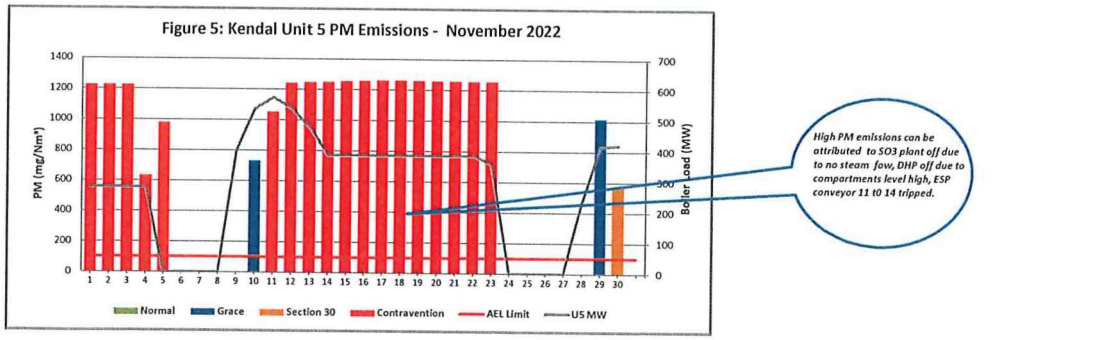


Figure 5: Kendal Unit 5 PM Emissions - November 2022
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW
High PM emissions can be attributed to SO3 plant off due to no steam fow, DHP off due to compartments level high, ESP conveyor 11 t0 14 tripped.

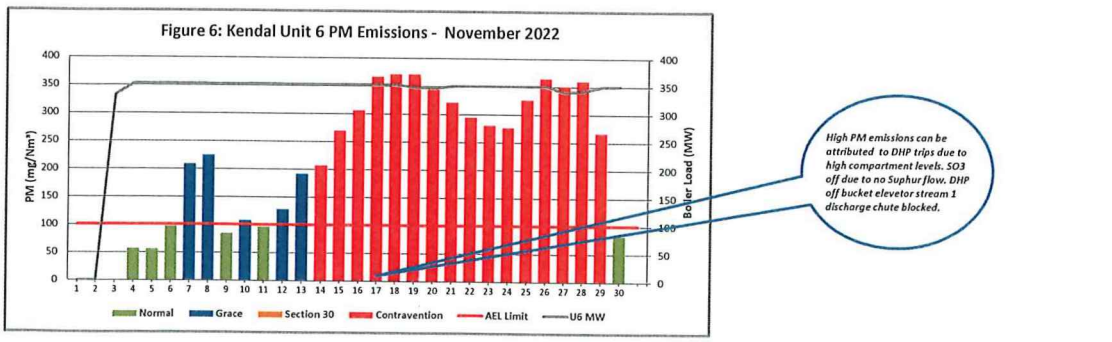


Figure 6: Kendal Unit 6 PM Emissions - November 2022
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U6 MW
High PM emissions can be attributed to DHP trips due to high compartment levels. SO3 off due to no Suphur flow. DHP off bucket elevetor stream 1 discharge chute blocked.

Figure 7: Kendal Unit 1 SO_2 Emissions - November 2022

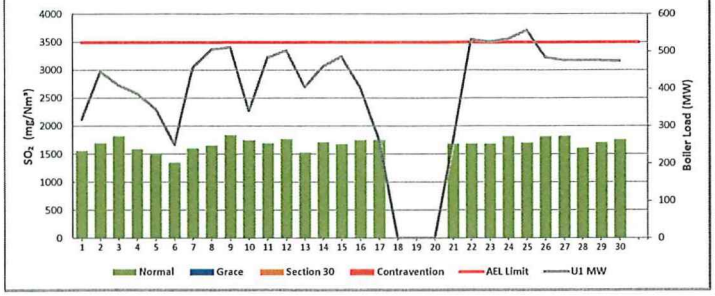


Figure 8: Kendal Unit 2 SO_2 Emissions - November 2022

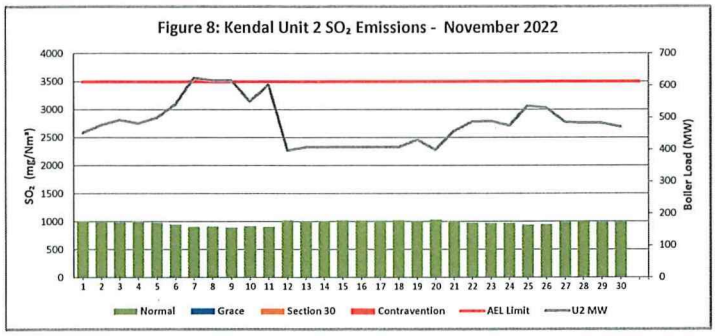


Figure 9: Kendal Unit 3 SO_2 Emissions - November 2022

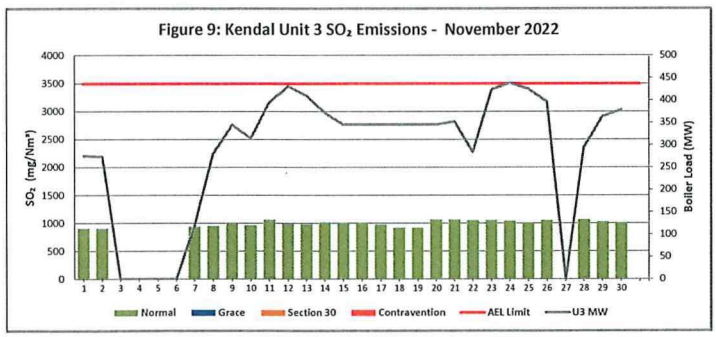


Figure 10: Kendal Unit 4 SO_2 Emissions - November 2022

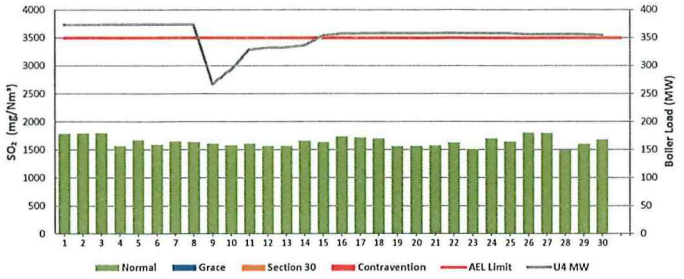


Figure 11: Kendal Unit 5 SO_2 Emissions - November 2022

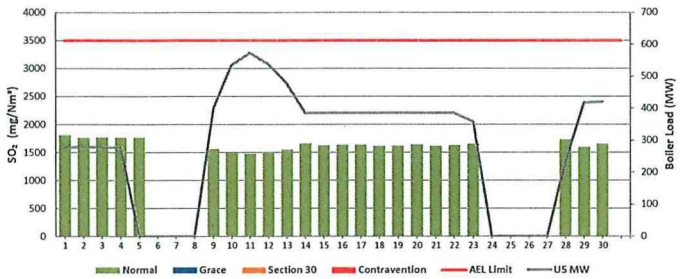


Figure 12: Kendal Unit 6 SO_2 Emissions - November 2022

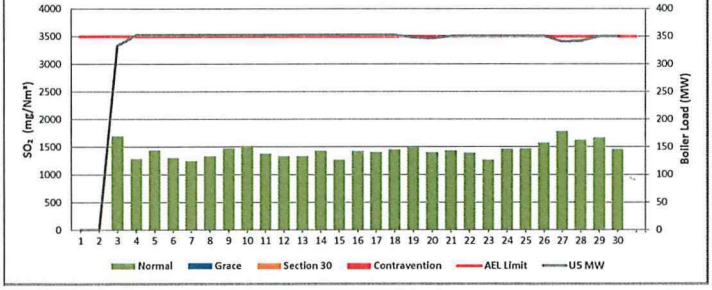
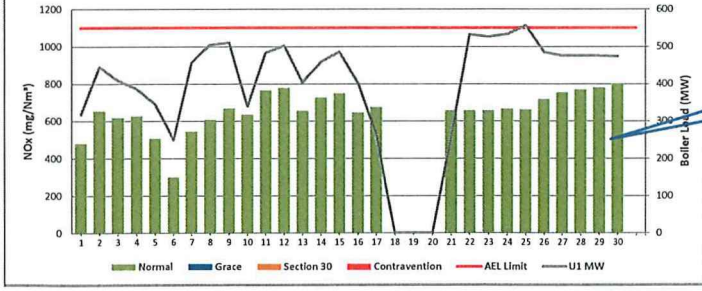


Figure 13: Kendal Unit 1 NOx Emissions - November 2022



High NOx emissions can be attributed to unbalanced conditions of combustion resulting in high flame temperature and consenquentially high NOX.

Figure 14: Kendal Unit 2 NOx Emissions - November 2022

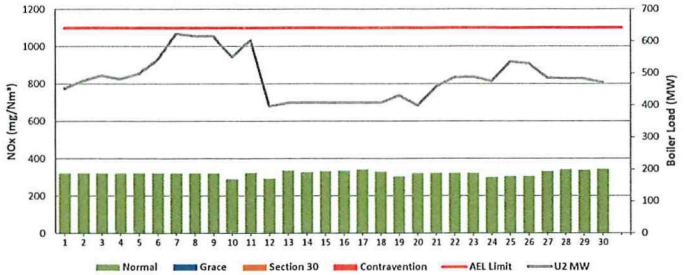


Figure 15: Kendal Unit 3 NOx Emissions - November 2022

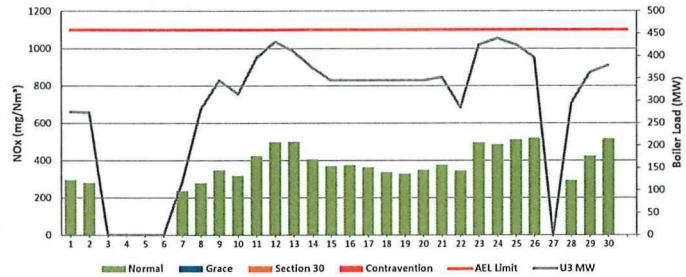


Figure 16: Kendal Unit 4 NOx Emissions - November 2022

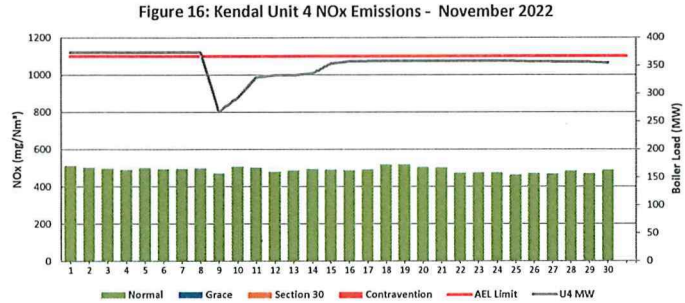


Figure 17: Kendal Unit 5 NOx Emissions - November 2022

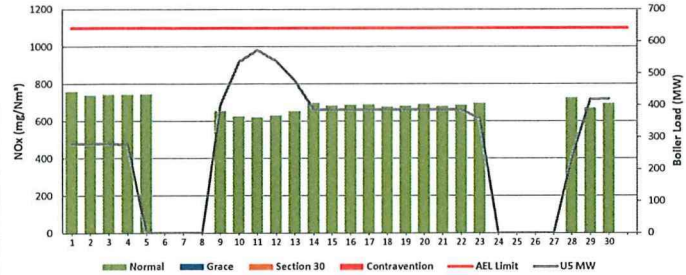
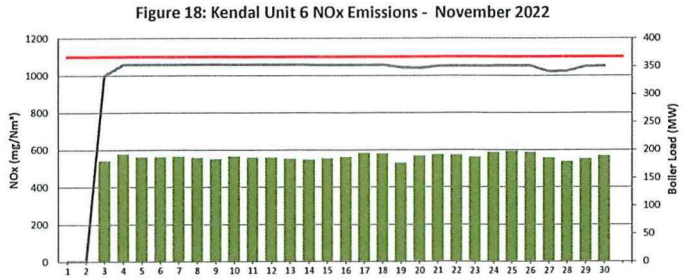


Figure 18: Kendal Unit 6 NOx Emissions - November 2022



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.
- Unit 4 dust monitor output 2 is faulty. where output 1 is greater or equal to 87.5, output 1 readings were copied to output 2.
- Unit 1 dust monitor output 1 was defective from the 22nd to the 24th, Output 2 readings were copied to Output 1.
- Avarage emeissions for unit 1 SOx and NOx from the the 21st to the 24th, Unt 2 SOx and NOx from the 1st to the 10th were used from the available data as the monitors were defective.
- Average emissions for Unit 2 SOx were used from the QAL2 report as the monitor was defective.
- Avarage emissions for Unit 5 SOx and NOx for for the whole month were used from the QAL 2 report as the monitors were defective.
- Avarage emissions for Unit 3 CO2 and O2 were taken from QAL2 report as the CO2 and O2 monitors were not operating adequately.

-
- Unit 1
- Findings: The high emissions can be attributed to SO3 plant off due to SO3 plant keep tripping due to converter temperature high, ESP knife gates closed due to flopper gates limit fault. DHP of f due to high compartment levels, SO3 plant on hold mode due to no suphur flow, DHP standing due to second collecting conveyor and Stream 1 bucket elevator pulling high Amps.
- High NOx emissions can be attributed to unbalanced conditions of combustion resulting in high flame temperature and consenquentially high NOX. The unbalanced conditions of combustion were caused by various issues on mills.

- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to DHP off due to faulty PLC, DHP stopped due to ash bunker knife gates limits lost, SO3 plant trip due to no Sulphur flow and DHP off due to high compartment levels.
- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to ESP fields 11,15,24,27,41,42& 43 O/C, DHP trip due to high compartment levels, ESP chain conveyor 13,14 & 23 choked, DHP ash back log and SO3 plant out of service.
- Resolution: Palnt repaired.

- Unit 4
- Findings: High PM emissions can be attributed to DHP tripping due to stream 2 second collecting conveyor speed switch wheel moving out of posistion, SO3 plant out of service due to no sulphur flow, DHP trip due to compartments level high and So3 plant on hold mode due to flue gas temperature low.
- Resolution: Plant repaired.

- Unit 5
- Findings: High PM emissions can be attributed to SO3 plant off due to no steam fow, DHP off due to compartments level high and ESP conveyor 11 to 14 tripped.
- Resolution: Plant repaired.

- Unit 6
- Findings: High PM emissions can be attributed to DHP trips due to high compartment levels. SO3 off due to no Suphur flow. DHP off bucket elevetor stream 1 discharge chute blocked.
- Resolution: Plant repaired.