Eskom

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Date
26 January 2022

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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 2021.

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

Date: 26/01/2022

Supported by:

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Date: 26/01/2026

KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTHS OF NOVEMBER 2021.

Verified by:

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Date 27/01/2022

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Date 31/01/2022

Eskom NOVEMBER 2021 REV 02

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-2021
	Coal	Tons	*2 260 000*	*629 468*
	Fuel Oil	Tons	*5 000*	*2481.18*
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Production Rate Nov-2021
	Energy	GWh(MW)	*4380*	*1 539 056.00*
	Ash	Tons	*770 000*	*205 143.6*
	RE Ash	kg/MWh	*not specified*	*0.610*

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
Sulphur Content	%	*<1 (%)*	*1.020*
Ash Content	%	*40 (%)*	*32.590*

3 EMISSION LIMITS (mg/Nm³)

Associated Unit/Stack	PM	SOx	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 ABATEMET TECHNOLOGY (%)

Associated Unit/Stack	Technology Type	Efficiency Nov-2021	Technology Type	Utlization Nov-2021
Unit 1	*ESP + SO_3*	*Off-line*	*SO_3*	*Off-line*
Unit 2	*ESP + SO_3*	*99.7%*	*SO_3*	*0.0%*
Unit 3	*ESP + SO_3*	*99.7%*	*SO_3*	*47.3%*
Unit 4	*ESP + SO_3*	*99.8%*	*SO_3*	*0.0%*
Unit 5	*ESP + SO_3*	*99.3%*	*SO_3*	*0.0%*
Unit 6	*ESP + SO_3*	*Off-line*	*SO_3*	*Off-line*

Unit 2,3,4 & 5 sulphur utilization was low because KEPDATA04 and KEPDATA05 failed.

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	*Off-line*	*Off-line*	*Off-line*	*Off-line*
Unit 2	*89.7*	*90.5*	*90.5*	*29.0*
Unit 3	*99.6*	*99.2*	*99.7*	*99.9*
Unit 4	*91.0*	*91.9*	*91.1*	*93.2*
Unit 5	*88.7*	*95.1*	*95.1*	*97.7*
Unit 6	*Off-line*	*Off-line*	*Off-line*	*Off-line*

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

Note: Unit O_2 monitor was defective

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of November 2021

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)	CO_2
Unit 1	Off-line	Off-line	Off-line	Off-line
Unit 2	98.3	2 920	1 118	204 839
Unit 3	142.0	0	0	0
Unit 4	103.3	1 656	583	103 797
Unit 5	237.8	2 092	746	227 674
Unit 6	Off-line	Off-line	Off-line	Off-line
SUM	581.39	6 668	2 447	536 310

Table 6.2: Operating days in compliance to PM AEL Limit - November 2021

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 2	23	4	0	1	5	91.2
Unit 3	23	7	0	0	7	93.1
Unit 4	20	4	0	0	4	83.9
Unit 5	12	1	0	4	0	285.9
Unit 6	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
SUM	78	16	0	5	16	

Table 6.3: Operating days in compliance to SOx AEL Limit - November 2021

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SOx (mg/Nm³)
Unit 1	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 2	29	0	0	0	0	3 131.2
Unit 3	30	0	0	0	0	2 066.3
Unit 4	27	0	0	0	0	2 158.7
Unit 5	19	0	0	0	0	2 071.5
Unit 6	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
SUM	105	0	0	0	0	

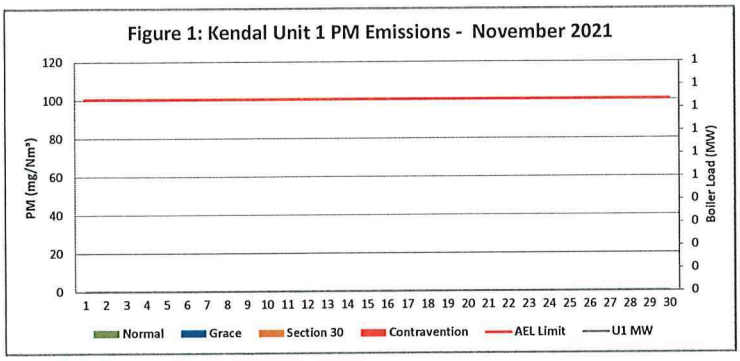
Table 6.4: Operating days in compliance to NOx AEL Limit - November 2021

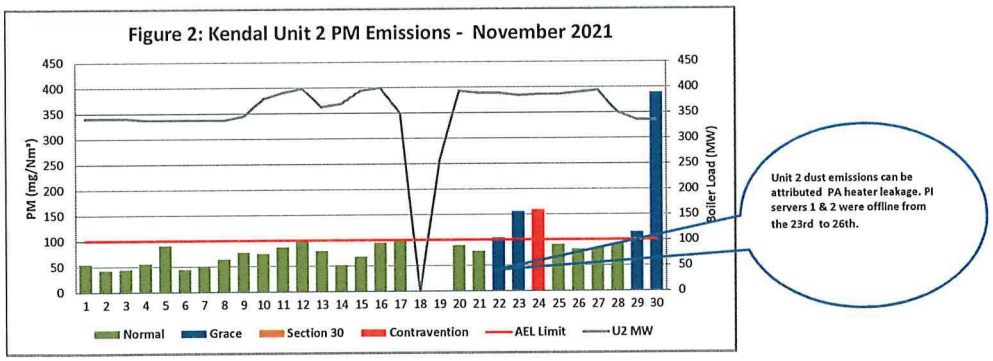
Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 2	29	0	0	0	0	787.7
Unit 3	30	0	0	0	0	537.3
Unit 4	27	0	0	0	0	746.1
Unit 5	19	0	0	0	0	740.3
Unit 6	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
SUM	105	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





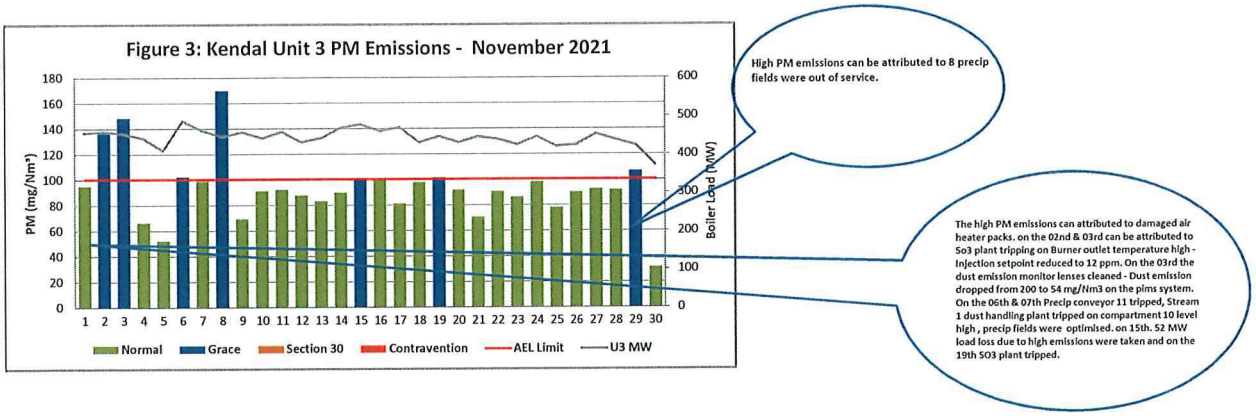


Figure 3: Kendal Unit 3 PM Emissions - November 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW
High PM emissions can be attributed to 8 precip fields were out of service.
The high PM emissions can attributed to damaged air heater packs. on the 02nd & 03rd can be attributed to So3 plant tripping on Burner outlet temperature high - Injection setpoint reduced to 12 ppm. On the 03rd the dust emission monitor lenses cleaned - Dust emission dropped from 200 to 54 mg/Nm3 on the pims system. On the 06th & 07th Precip conveyor 11 tripped, Stream 1 dust handling plant tripped on compartment 10 level high , precip fields were optimised. on 15th. 52 MW load loss due to high emissions were taken and on the 19th SO3 plant tripped.

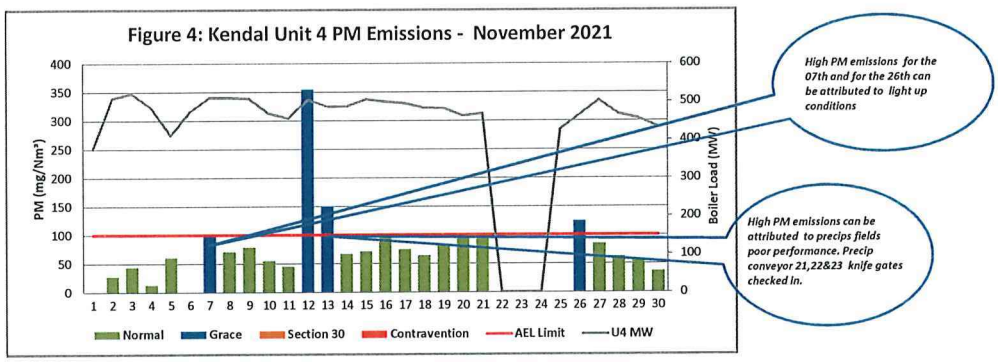


Figure 4: Kendal Unit 4 PM Emissions - November 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW
High PM emissions for the 07th and for the 26th can be attributed to light up conditions
High PM emissions can be attributed to precips fields poor performance. Precip conveyor 21,22&23 knife gates checked in.

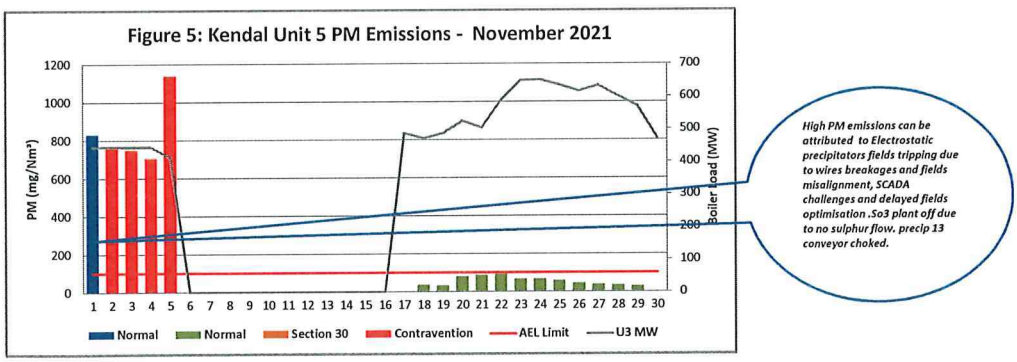


Figure 5: Kendal Unit 5 PM Emissions - November 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Normal
Section 30
Contravention
AEL Limit
U3 MW
High PM emissions can be attributed to Electrostatic precipitators fields tripping due to wires breakages and fields misalignment, SCADA challenges and delayed fields optimisation .So3 plant off due to no sulphur flow. precip 13 conveyor choked.

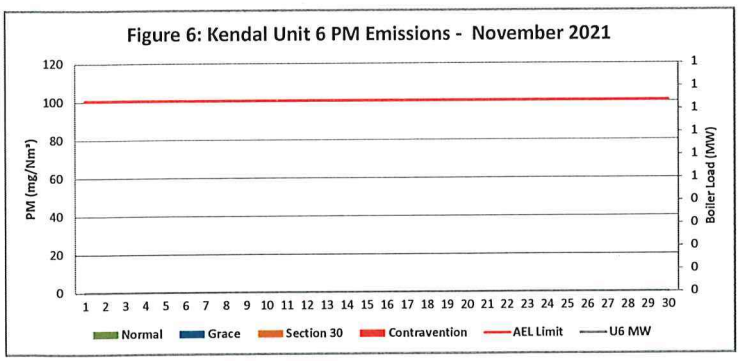


Figure 6: Kendal Unit 6 PM Emissions - November 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U6 MW

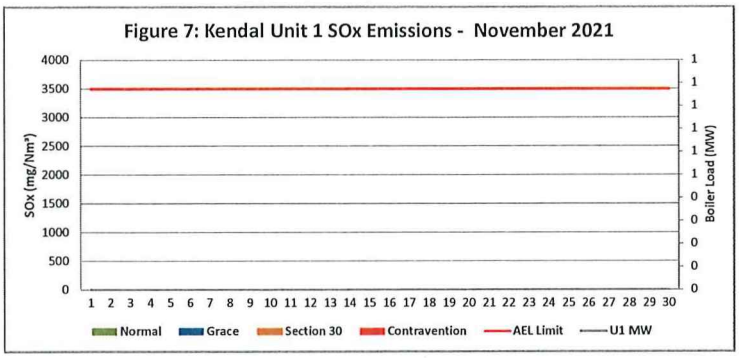


Figure 7: Kendal Unit 1 SOx Emissions - November 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

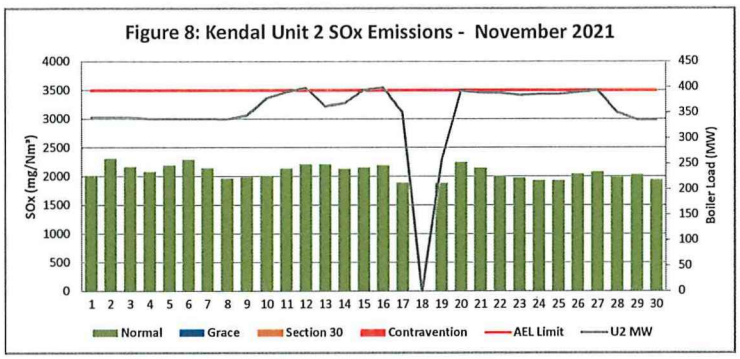


Figure 8: Kendal Unit 2 SOx Emissions - November 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW

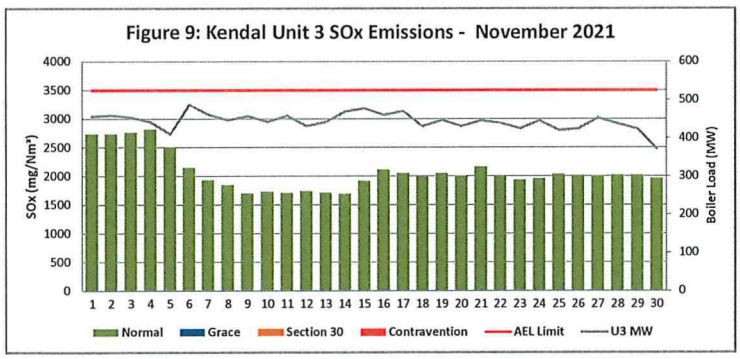


Figure 9: Kendal Unit 3 SOx Emissions - November 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

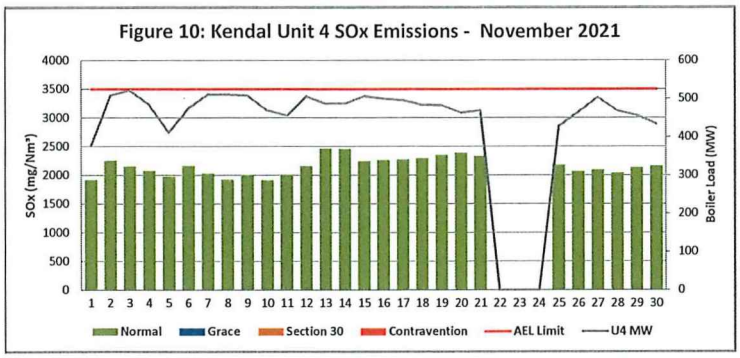


Figure 10: Kendal Unit 4 SOx Emissions - November 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW

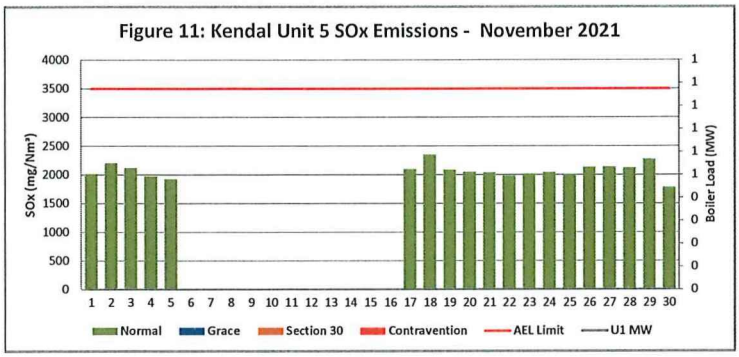


Figure 11: Kendal Unit 5 SOx Emissions - November 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

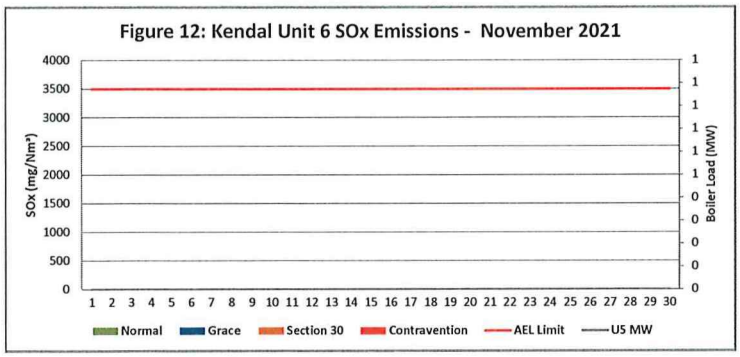


Figure 12: Kendal Unit 6 SOx Emissions - November 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW

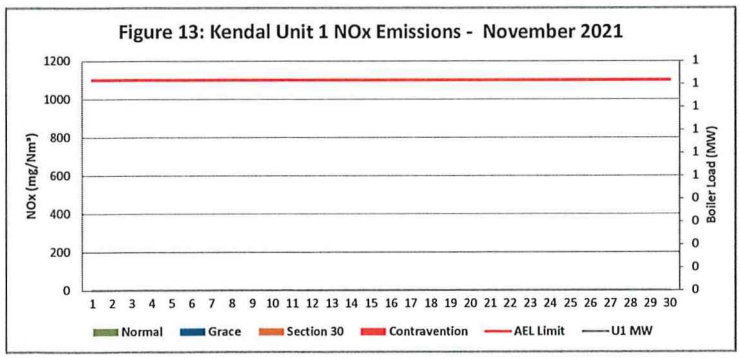


Figure 13: Kendal Unit 1 NOx Emissions - November 2021
NOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

Figure 14: Kendal Unit 2 NOx Emissions - November 2021

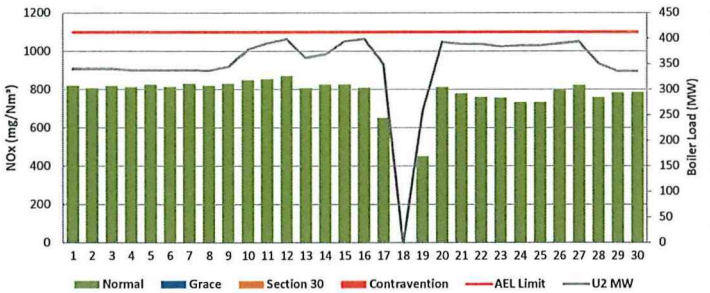


Figure 15: Kendal Unit 3 NOx Emissions - November 2021

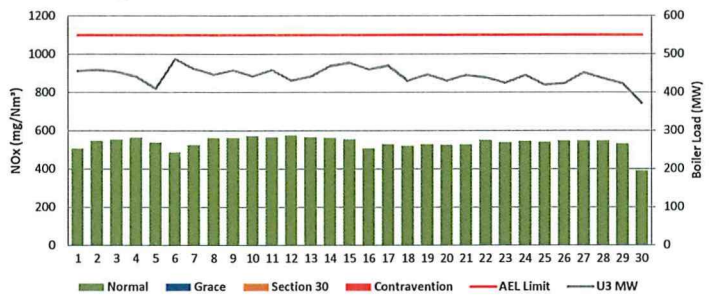


Figure 16: Kendal Unit 4 NOx Emissions - November 2021

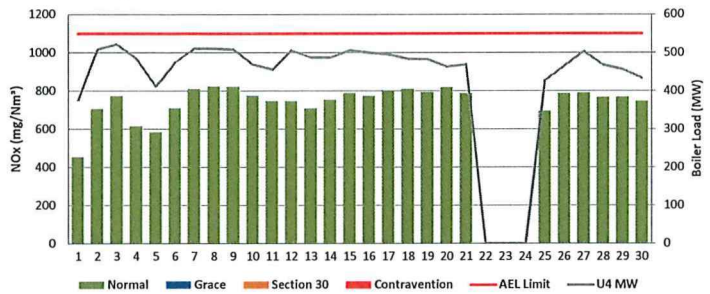
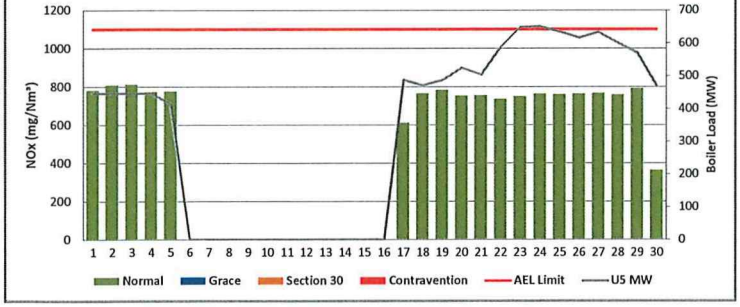
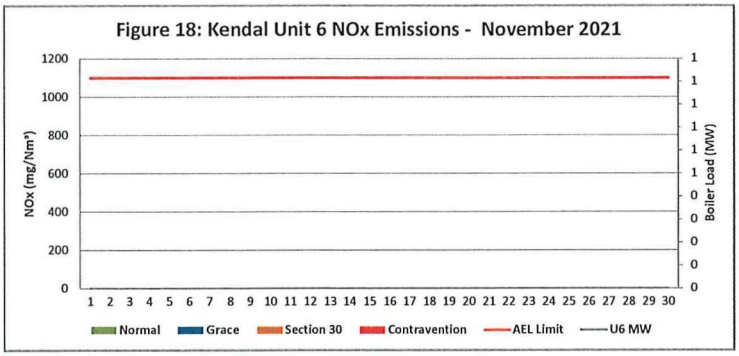


Figure 17: Kendal Unit 5 NOx Emissions - November 2021





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

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

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

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 98% reliability is compared to the dust concentration signal If the dust concentration signal is above 98% 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 98%/24hours))x 100

Emissions Performance

- Average velocity values from the latest correlation report were used on the gaseous emissions on Unit 1, 2, 3, 4 due to defective CEMS monitors and velocity correction factors were set M=1 and C=0
- Avarage emissions for Unit 2 O2 was used from the QAL2 parallel report because the monitor was out of calibration and average emissions available for the month were used for the SOx and Nox emissions from 23rd until 26 due to monitor failure
- Avarage emissions for Unit 3 pressure was used from the QAL2 parallel report due to defective analysers
- Avarage emissions for Unit 5 CO2 average was used from QAL2 parallel report due to defective monitor
- Unit 1 and 6 were offload

Unit 2
Findings Unit 2 dust emissions can be attributed Primary Air heater leakage PI servers 1 & 2 were offline from the 23rd to 26th
Resolution Primary Air heater leakage to be fixed during GO

Unit 3
Findings High PM emissions on the 29th can be attributed to 8 precip fields were out of service The high PM emissions can attributed to damaged air heater packs on the 02nd & 03rd can be attributed to So3 plant tripping on Burner outlet temperature high - Injection setpoint reduced to 12 ppm On the 03rd the dust emission monitor lenses cleaned - Dust emission dropped from 200 to 54 mg/Nm3 on the pims system On the 06th & 07th Precip conveyor 11 tripped, Stream 1 dust handling plant tripped on compartment 10 level high , precip fields were optimised on 15th 52 MW load loss due to high emissions were taken and on the 19th SO3 plant tripped On the 29th to 8 precip fields were out of service

Resolution The DHP and SO3 plant was returned back to service after repairs

Unit 4
Findings High PM emissions can be attributed to precips fields poor performance Precip conveyor 21,22&23 knife gates checked in
Resolution The plant was repaired

Note Unit 4 correlations test were done in November 2021, awaiting report Report to be received in January November report will be resent after implementation of the new correlation curves

Unit 5
Findings High PM emissions can be attributed to Electrostatic precipitators fields tripping due to wires breakages and fields misalignment, SCADA challenges and delayed fields optimisation So3 plant off due to no sulphur flow precip 13 conveyor choked
Resolution The unit was shut down for repairs