Eskom

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Date
14 December 2021

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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 OCTOBER 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:

Tshilidzi Vilane
ENVIRONMENTAL OFFICER- KENDAL

Date: 14/12/2021

Supported by:

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Solly Chokoe
ENVIRONMENTAL MANAGER- KENDAL

Date: 14/12/2021

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

Verified by:

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Date: 14/12/2021

Validated by:

Tendani Rasivhetshele
ACTING BOILER ENGINEERING MANAGER-KENDAL

Date 22/12/2021

Supported by:

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ENGINEERING MANAGER-KENDAL

Date 23/12/2021

Approved by:

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GENERAL MANAGER-KENDAL

Date 23/12/2021

Eskom

OCTOBER 2021 REV 01

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 Oct-2021
	Coal	Tons	2 260 000	653 718
	Fuel Oil	Tons	5 000	4385.26
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Production Rate Oct-2021
	Energy	GWh(MW)	4380	1 059 546.73
	Ash	Tons	770 000	214 484.9
	RE Ash	kg/MWh	not specified	1.150

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
Sulphur Content	%	<1 (%)	1.000
Ash Content	%	40 (%)	32.810

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 Oct-2021	Technology Type	Utlization Oct-2021
Unit 1	*ESP + SO_3*	*Off-line*	*SO_3*	*Off-line*
Unit 2	*ESP + SO_3*	*99.8%*	*SO_3*	*90.3%*
Unit 3	*ESP + SO_3*	*99.8%*	*SO_3*	*98.8%*
Unit 4	*ESP + SO_3*	*99.2%*	*SO_3*	*93.7%*
Unit 5	*ESP + SO_3*	*98.6%*	*SO_3*	*0.0%*
Unit 6	*ESP + SO_3*	*99.3%*	*SO_3*	*0.0%*

Unit 5 & 6 readings not available because of PI historian still under commission

***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	*100.0*	*100.0*	*99.5*	*34.6*
Unit 3	*100.0*	*99.4*	*97.5*	*99.5*
Unit 4	*95.2*	*100.0*	*100.0*	*99.8*
Unit 5	*90.4*	*100.0*	*100.0*	*100.0*
Unit 6	*64.3*	*0.0*	*0.0*	*0.0*

Note: Monitor reliability for unit 2 and 6 were low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of October 2021

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)	CO2
Unit 1	Off-line	Off-line	Off-line	Off-line
Unit 2	40.3	2 388	904	186686.85
Unit 3	110.7	3 841	944	339594.25
Unit 4	310.6	1 227	411	83204.951
Unit 5	720.3	2 327	800	235814.98
Unit 6	37.3	0	0	0
SUM	1 219.22	9 783	3 059	845 301

Table 6.2: Operating days in compliance to PM AEL Limit - October 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	17	2	0	0	2	146.9
Unit 3	25	3	0	0	3	74.1
Unit 4	5	12	0	8	20	267.4
Unit 5	4	1	0	24	5	433.5
Unit 6	0	2	3	0	5	322.2
SUM	**51**	**20**	**3**	**32**	**35**	

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

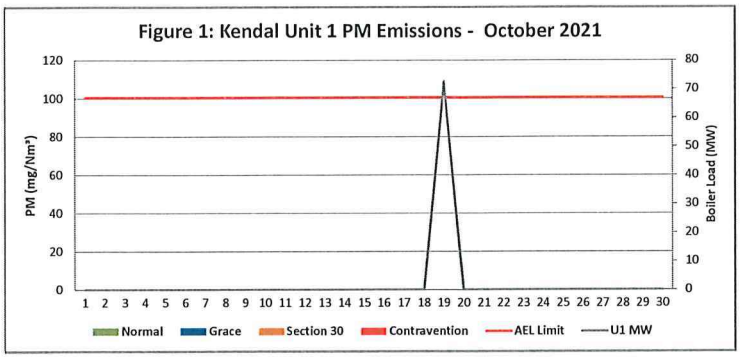
Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SOx (mg/Nm³)
Unit 1	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 2	22	0	0	0	0	2 263.0
Unit 3	29	0	0	0	0	2 038.8
Unit 4	25	0	0	0	0	2 003.9
Unit 5	30	0	0	0	0	2 101.4
Unit 6	0	0	0	0	0	
SUM	**106**	**0**	**0**	**0**	**0**	

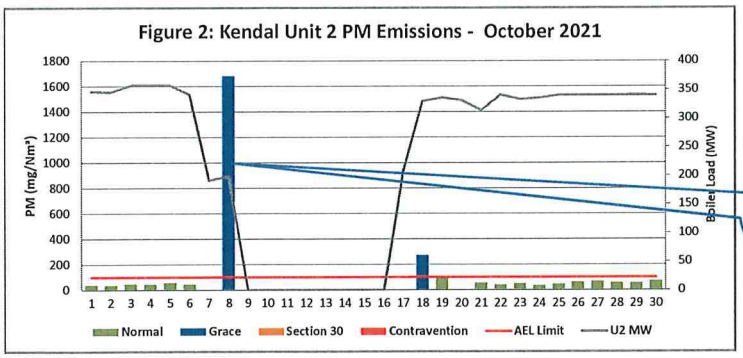
Table 6.4: Operating days in compliance to NOx AEL Limit - October 2021

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	22	0	0	0	0	835.2
Unit 3	29	0	0	0	0	499.9
Unit 4	25	0	0	0	0	684.7
Unit 5	30	0	0	0	0	726.5
Unit 6	0	0	0	0	0	
SUM	106	0	0	0	0	

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





The high emissions can be attributed to boiler trip, tripping on no steam flow path due to cold reheat non-return valves failing to close.

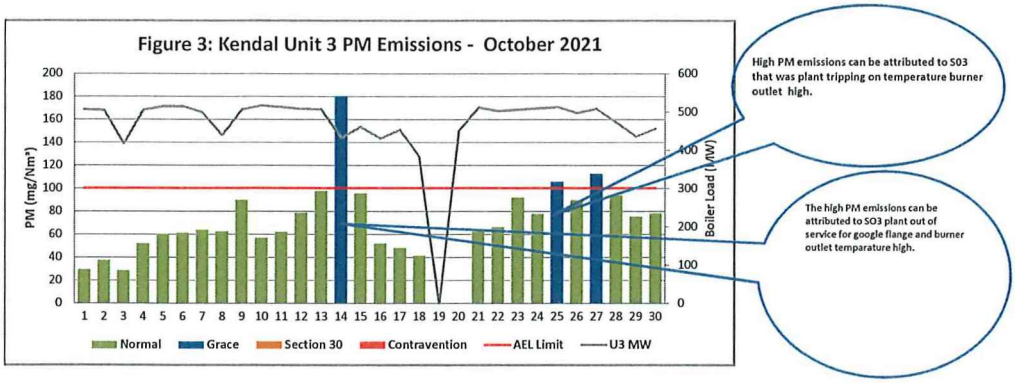


Figure 3: Kendal Unit 3 PM Emissions - October 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW
High PM emissions can be attributed to S03 that was plant tripping on temperature burner outlet high.
The high PM emissions can be attributed to SO3 plant out of service for google flange and burner outlet temparature high.

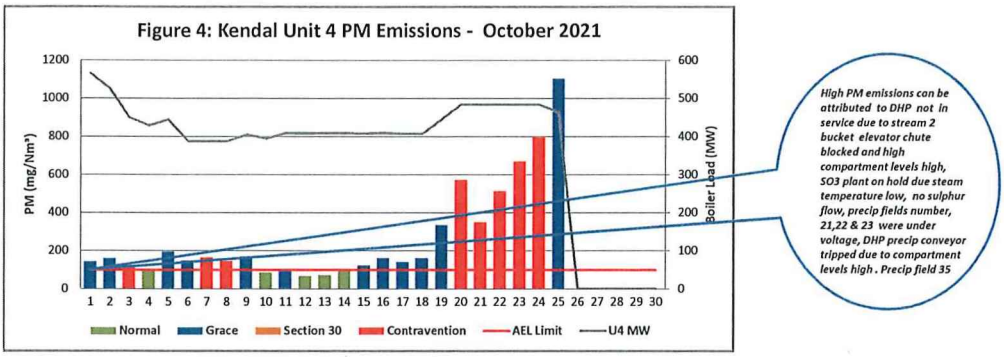


Figure 4: Kendal Unit 4 PM Emissions - October 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U4 MW
High PM emissions can be attributed to DHP not in servlce due to stream 2 bucket elevator chute blocked and high compartment levels high, SO3 plant on hold due steam temperature low, no sulphur flow, precip fields number, 21,22 & 23 were under voltage, DHP precip conveyor tripped due to compartment levels high . Precip field 35

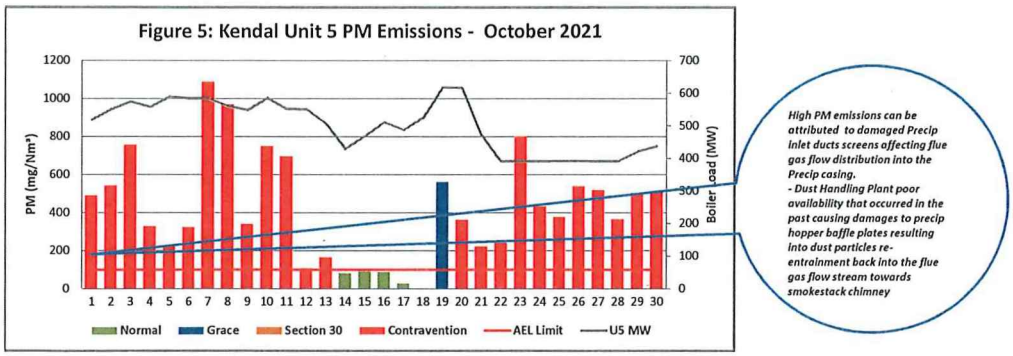


Figure 5: Kendal Unit 5 PM Emissions - October 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U5 MW
High PM emissions can be attributed to damaged Precip inlet ducts screens affecting flue gas flow distribution into the Precip casing.
- Dust Handling Plant poor availability that occurred in the past causing damages to precip hopper baffle plates resulting into dust particles re-entrainment back into the flue gas flow stream towards smokestack chimney

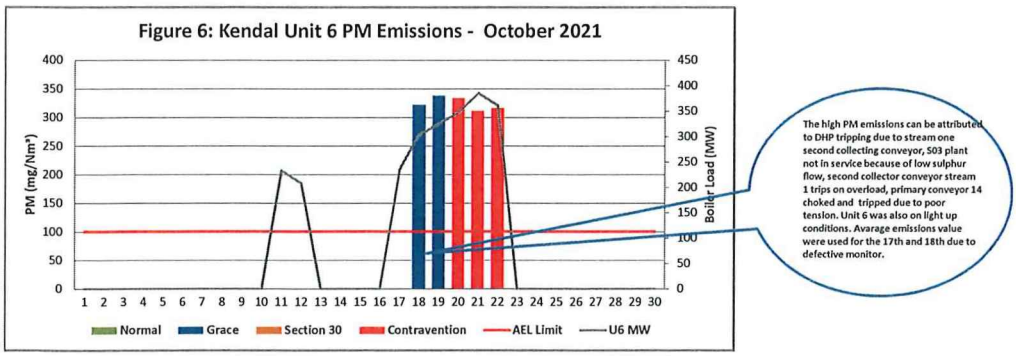


Figure 6: Kendal Unit 6 PM Emissions - October 2021
PM (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U6 MW
The high PM emissions can be attributed to DHP tripping due to stream one second collecting conveyor, S03 plant not in service because of low sulphur flow, second collector conveyor stream 1 trips on overload, primary conveyor 14 choked and tripped due to poor tension. Unit 6 was also on light up conditions. Avarage emissions value were used for the 17th and 18th due to defective monitor.

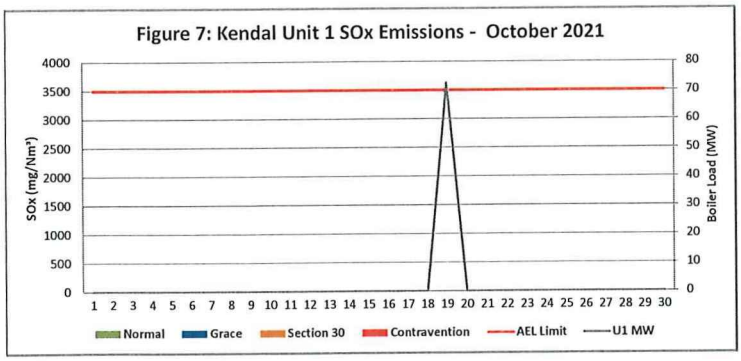


Figure 7: Kendal Unit 1 SOx Emissions - October 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U1 MW

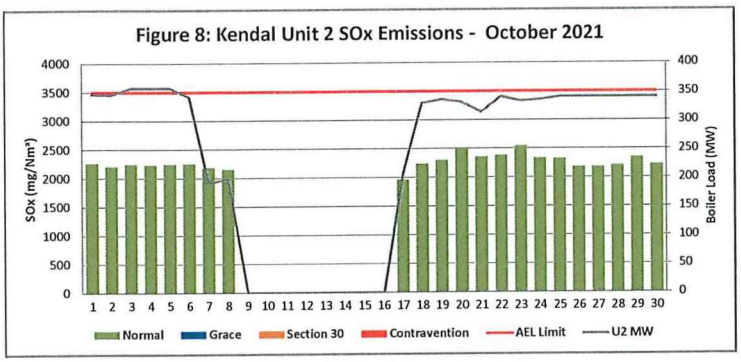


Figure 8: Kendal Unit 2 SOx Emissions - October 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U2 MW

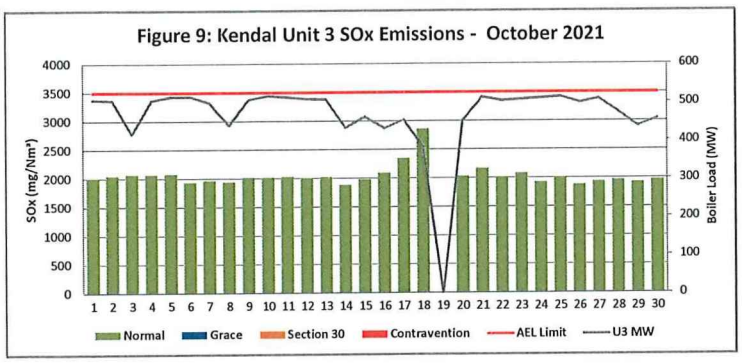


Figure 9: Kendal Unit 3 SOx Emissions - October 2021
SOx (mg/Nm³)
Boiler Load (MW)
Normal
Grace
Section 30
Contravention
AEL Limit
U3 MW

Figure 10: Kendal Unit 4 SOx Emissions - October 2021

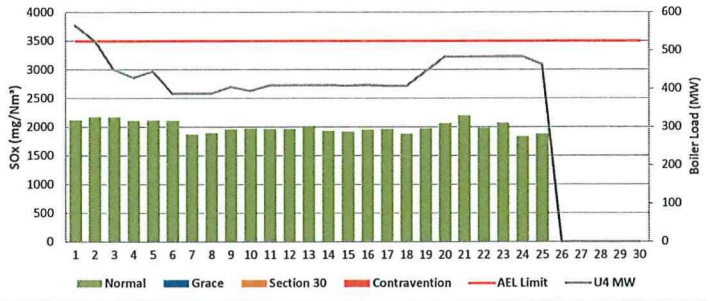


Figure 11: Kendal Unit 5 SOx Emissions - October 2021

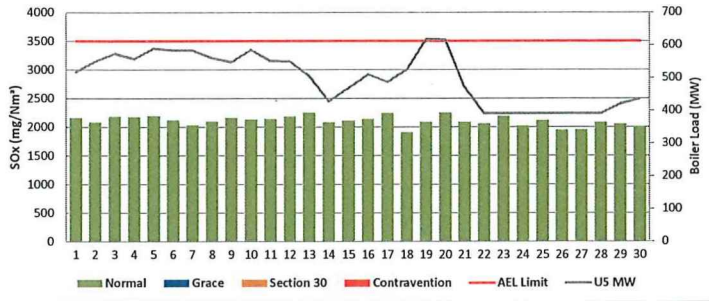


Figure 12: Kendal Unit 6 SOx Emissions - October 2021

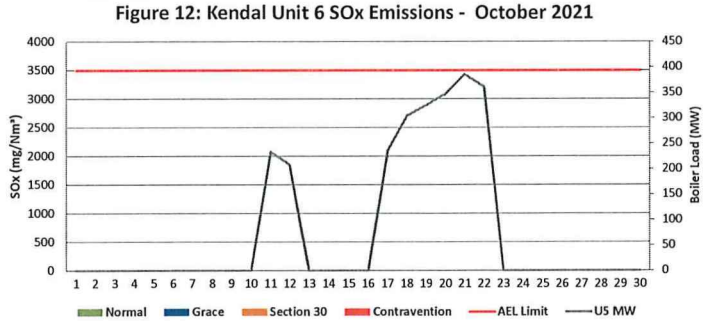


Figure 13: Kendal Unit 1 NOx Emissions - October 2021

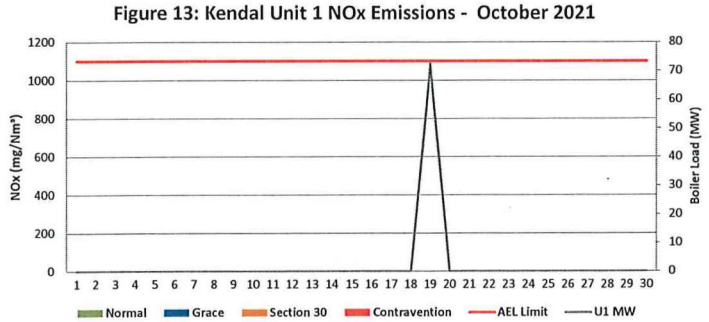


Figure 14: Kendal Unit 2 NOx Emissions - October 2021

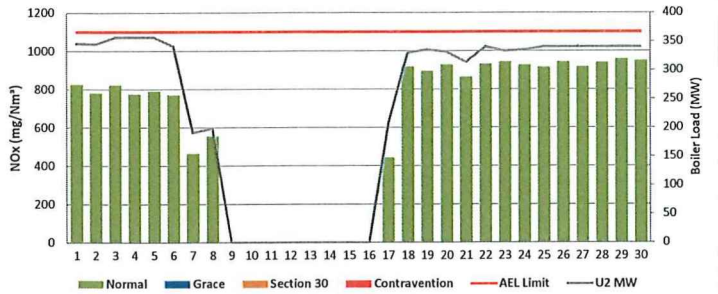


Figure 15: Kendal Unit 3 NOx Emissions - October 2021

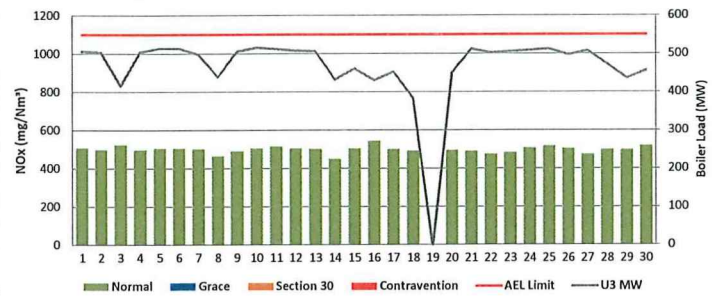


Figure 16: Kendal Unit 4 NOx Emissions - October 2021

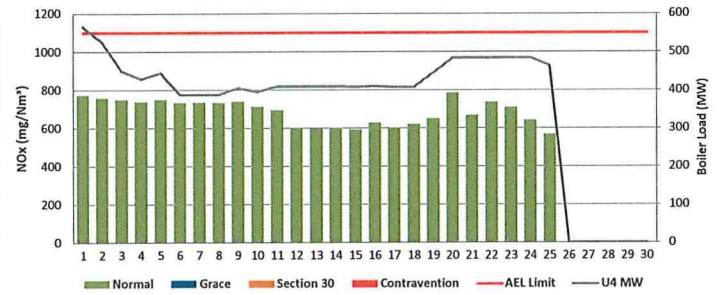
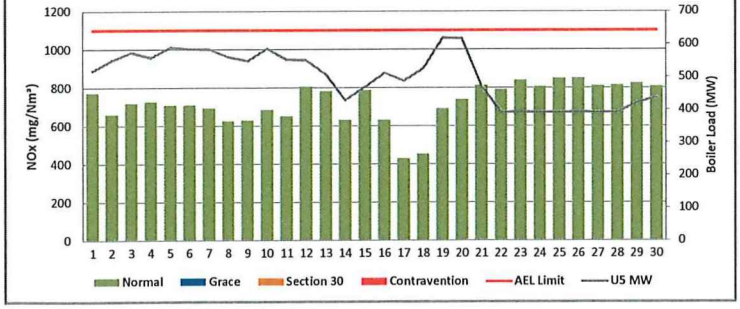
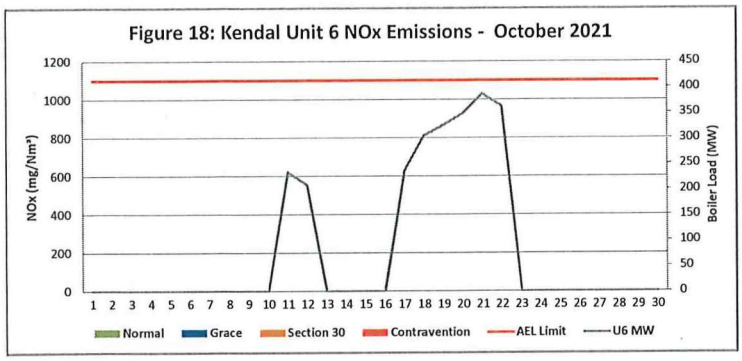


Figure 17: Kendal Unit 5 NOx Emissions - October 2021





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, 5 & 6 due to defective CEMS monitors and velocity correction factors were set M=1 and C=0
- Avarage emissions for Unit 2 flow and Unit 3 pressure were used from the correlation report due to defective analysers

Unit 2
Findings The high emissions can be attributed to boiler trip, tripping on the no steam flow path due to cold reheat non return valves failing to close
Resolution Cold reheat non-return valves were fixed

Unit 3
Findings High PM emissions can be attributed to S03 was that plant tripping on temperature burner outlet high,SO3 plant out of service for google flange and burner outlet temparature high
Resolution The SO3 plant was returned back to service after repairs

Unit 4
Findings High PM emissions can be attributed to DHP not in service due to stream 2 bucket elevator chute blocked and compartment levels high, SO3 plant on hold due steam temperature low, no sulphur flow, precip fields number, 21,22 & 23 were under voltage, DHP precip conveyor tripped due to compartment levels high Precip field 35 tripping on relay fault
Resolution The unit was shut-down for repairs

Unit 5
Findings High PM emissions can be attributed to damaged Precip inlet ducts screens affecting flue gas flow distribution into the Precip casing Dust Handling Plant poor availability that occurred in the past causing damages to precip hopper baffle plates resulting into dust particles re-entrainment back into the flue gas flow stream towards smokestack chimney
Resolution Opportunity maintenance was done to execute some of the scope

Unit 6
Findings The high PM emissions can be attributed to DHP tripping due to stream one second collecting conveyor, S03 plant not in service because of low sulphur flow, second collector conveyor stream 1 *trips on overload*, primary conveyor 14 choked and tripped due to poor tension Unit 6 was also on light up conditions Avarage emissions value were used for the 17th and 18th due to defective monitor
Resolution DHP plant, SO3 plant and dust monitor were repaired