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Date:
06 September 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 MARCH 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

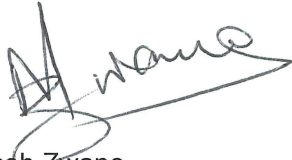
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GENERAL MANAGER-KENDAL POWER STATION

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 Mar-2023
	Coal	Tons	2 260 000	991 148
	Fuel Oil	Tons	5 000	9170.21

Production Rates	Product / By-Product Name	Units	Maximum Production	Production Rate Mar-2023
	Energy	MWh	(3 153 600)4380	1 188 457.00
	Ash	Tons	770 000	302 498.4
	RE Ash	kg/MWh	not specified	5.230

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
Sulphur Content	%	<1 (%)	0.720
Ash Content	%	40 (%)	30.520

3 EMISSION LIMITS (mg/Nm³)

Associated	PM	SO ₂	NO _x
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 (%)

Associate d	Technology Type	Efficiency Mar-2023	Technology Type	SO ₂ Utilization Mar-2023
Unit 1	ESP + SO ₂	98.766%	SO ₂	89.9%
Unit 2	ESP + SO ₂	94.748%	SO ₂	82.3%
Unit 3	ESP + SO ₂	99.736%	SO ₂	0.0%
Unit 4	ESP + SO ₂	Off-line	SO ₂	Off-line
Unit 5	ESP + SO ₂	97.686%	SO ₂	66.9%
Unit 6	ESP + SO ₂	98.817%	SO ₂	78.1%

SO₂ 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.

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

Utilization is low on the units due to

- So₂ is out of service due to cable damage,
- So₂ plant on hold mode heaters are tripping. -SO₂ plant leak,
- SO₂ plant isolated during gasket replacement.
- So₂ plant on hold mode - Steam pressure and temperature low.

5 MONITOR RELIABILITY (%)

Associate d	PM	SO ₂	NO	O ₂
Unit 1	73.6	100.0	97.0	94.5
Unit 2	22.5	100.0	100.0	92.1
Unit 3	99.8	28.6	5.3	0.0
Unit 4	Off-line	Off-line	Off-line	Off-line
Unit 5	94.5	97.6	96.4	97.7
Unit 6	93.6	96.0	89.0	97.1

Note: NO_x emissions is measured as NO in PPM. Final NO_x value is expressed as total NO₂

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

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of March 2023

Associate d	PM (tons)	SO ₂ (tons)	NO _x (tons)
Unit 1	610.0	2 668	1 080
Unit 2	1 625.1	1 397	539
Unit 3	120.0	2 174	966
Unit 4	Off-line	Off-line	Off-line
Unit 5	1 680.5	1 856	766
Unit 6	515.5	1 761	586
SUM	4 550.93	9 856	3 916

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

Associate d	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm ³)
Unit 1	2	5	0	16	21	537.5
Unit 2	0	2	0	18	20	2 162.0
Unit 3	16	6	0	6	12	96.7
Unit 4	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 5	Off-line	1	0	30	31	892.6
Unit 6	1	2	0	26	28	370.9
SUM	19	16	0	96	112	

Table 6.3: Operating days in compliance to SO₂ AEL Limit - March 2023

Associate d	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO ₂ (mg/Nm ³)
Unit 1	25	0	0	0	0	1 933.9
Unit 2	21	0	0	0	0	1 966.4
Unit 3	29	0	0	0	0	1 413.3
Unit 4	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
	31	0	0	0	0	1 655.4
	30	0	0	0	0	1 449.4
SUM	136	0	0	0	0	

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

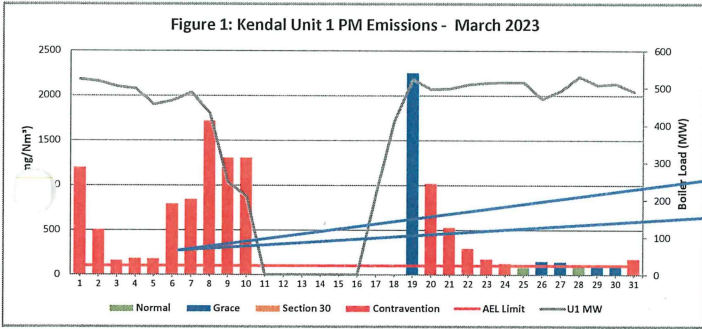
Associate	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm ³)
Unit 1	25	0	0	0	0	733.4
Unit 2	21	0	0	0	0	774.1
Unit 3	29	0	0	0	0	627.8
Unit 4	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 5	31	0	0	0	0	680.0
Unit 6	30	0	0	0	0	473.0
SUM	136	0	0	0	0	

Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO₂

Table 6.5: Legend Description

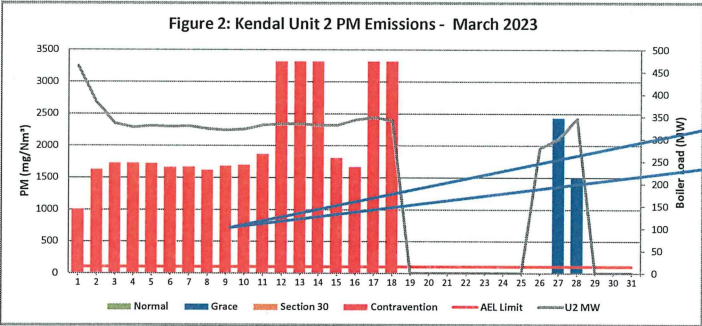
Condition	Colour	Description
Normal	Green	Emissions below Emission Limit Value (ELV)
Grace	Blue	Emissions above the ELV during grace period
Section 30	Orange	Emissions above ELV during a NEMA S30 incident
Contravention	Red	Emissions above ELV but outside grace or S30 incident conditions

Figure 1: Kendal Unit 1 PM Emissions - March 2023



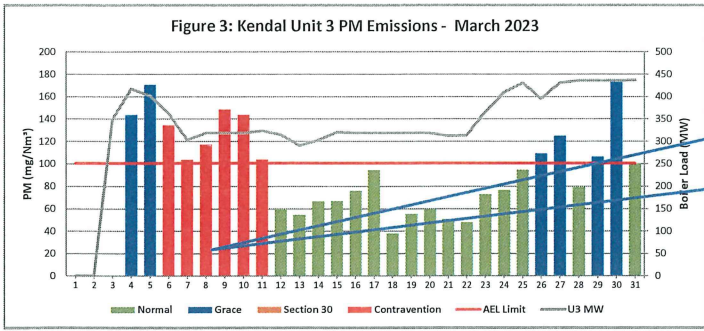
High emissions can be attributed to Stop DHP tripping due to compartment levels high, knife gates closed. DHP tripped due to top bunker conveyor failing to start. Precip conveyor 11, 13, 14 and 23 tripping and failing to start. Primary conveyor 13 and 14 chocked. Apron stopped 3 buckets were damaged. Light up conditoin. SO3 placed on hold mode due to the leak on so3 plant, SO3 plant off due to low

Figure 2: Kendal Unit 2 PM Emissions - March 2023



High emissions can be attributed to DHP off due to SO3 plant tripping, steam temp low, and low sulphur flow. DHP tripping on high compartment levels, precip chain conveyor 11, 21 and 22 chocked, hopper knife gates closed. DHP not running due to stream 1 bucket elevator leaking ash, DHP off due to bucket elevator fails to start. Knife gates closed due to DHP PLC fault.

Figure 3: Kendal Unit 3 PM Emissions - March 2023



High PM emissions can be attributed to Unit light up condition with fuel oil support. DHP trip due to high level on compartments, Stream 2 - 1st collecting conveyor tripped - Fault fails to reset, Stream 1 1st collecting conveyor tripped, Precip conveyor trips, hopper knife gates fully closed. DHP plant trips and top bunker trips. So3 is out of service due to cable damage, SO3 plant on hold mode heaters are tripping, SO3 plant leak, SO3 plant isolated during gasket replacement. SO3 plant on hold mode - Steam pressure and temperature low.

Figure 4: Kendal Unit 4 PM Emissions - March 2023

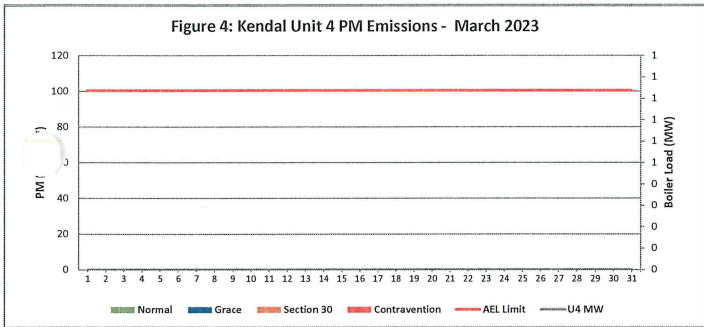
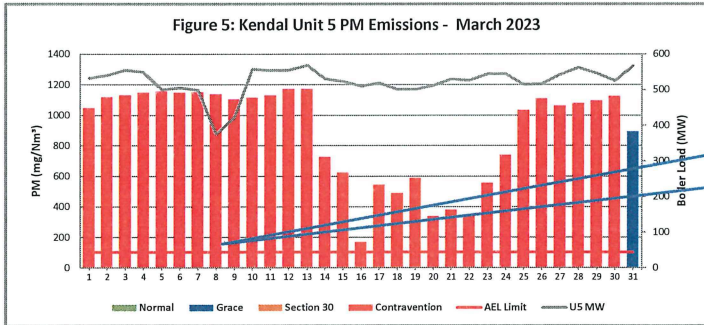
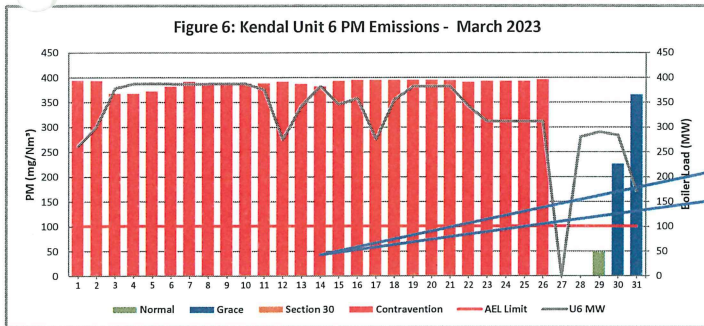


Figure 5: Kendal Unit 5 PM Emissions - March 2023



High PM emissions can be attributed to DHP tripped due to compartments full, all hopper knife gates closed, Precip conveyor 24 kept on tripping. Precip conveyors choked. SO3 plant on hold mode due to Aux steam temp low, SO3 plant on hold mode due to no sulphur flow.

Figure 6: Kendal Unit 6 PM Emissions - March 2023



High PM emissions can be attributed to Precip conv 21 kept on tripping, precip conv 21 hopper knife gates closed. Lighup on fuel oil support. So3 plant on hold mode due to sulphur flow low, SO3 plant on hold due to low steam temp

Figure 7: Kendal Unit 1 SO₂ Emissions - March 2023

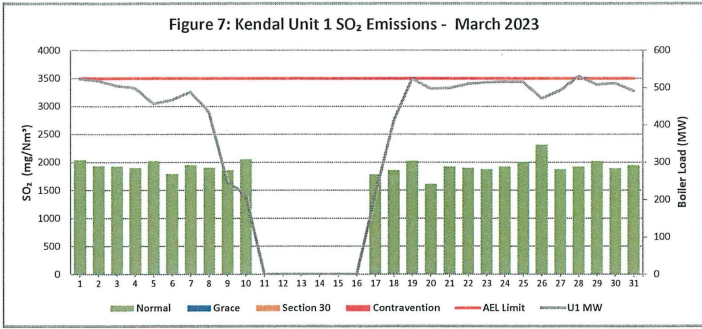


Figure 8: Kendal Unit 2 SO₂ Emissions - March 2023

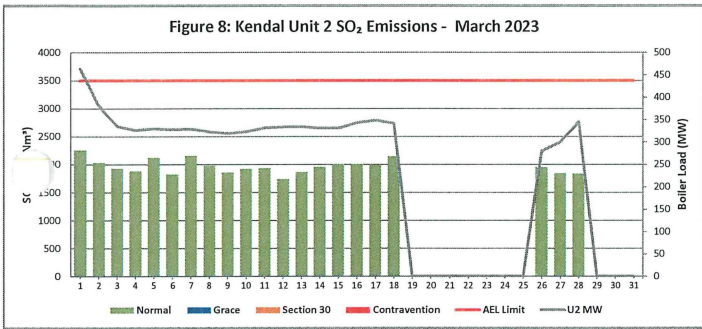


Figure 9: Kendal Unit 3 SO₂ Emissions - March 2023

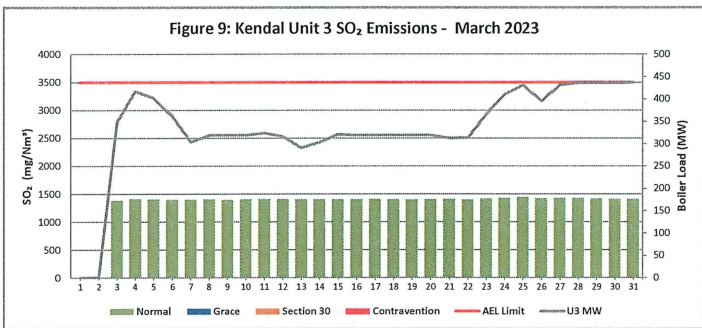


Figure 10: Kendal Unit 4 SO₂ Emissions - March 2023

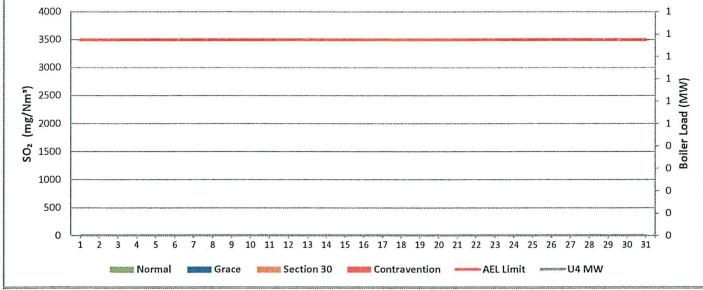


Figure 11: Kendal Unit 5 SO₂ Emissions - March 2023

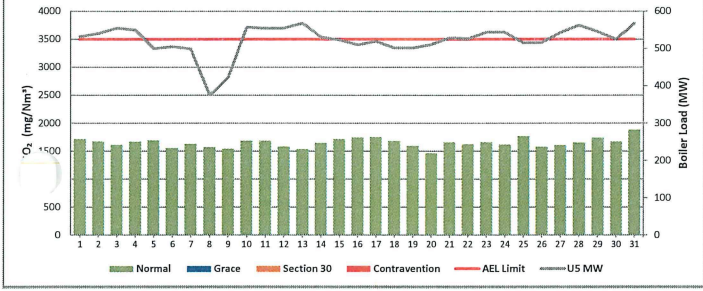


Figure 12: Kendal Unit 6 SO₂ Emissions - March 2023

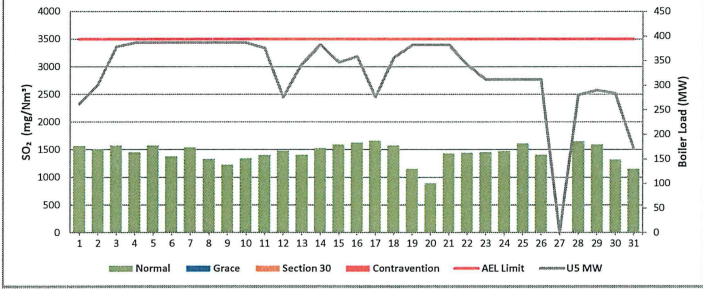


Figure 13: Kendal Unit 1 NO_x Emissions - March 2023

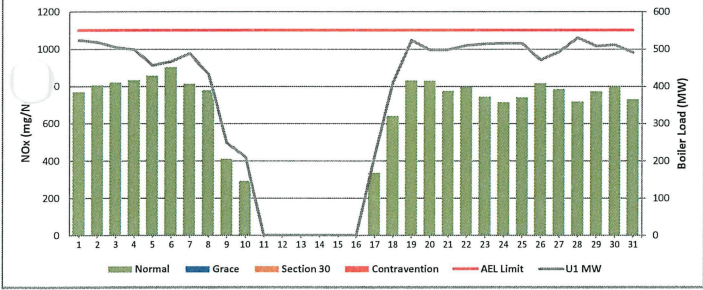


Figure 14: Kendal Unit 2 NOx Emissions - March 2023

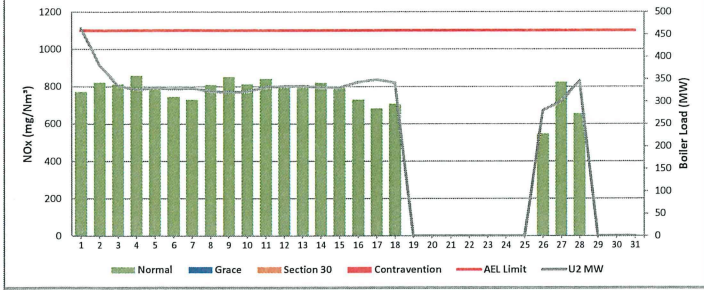


Figure 15: Kendal Unit 3 NOx Emissions - March 2023

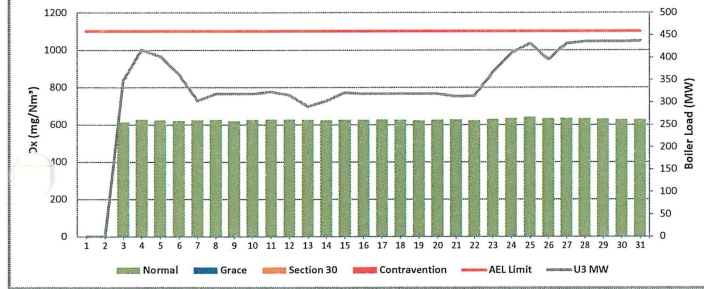


Figure 16: Kendal Unit 4 NOx Emissions - March 2023

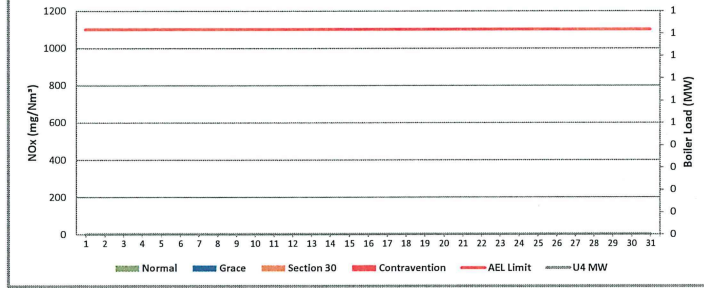


Figure 17: Kendal Unit 5 NOx Emissions - March 2023

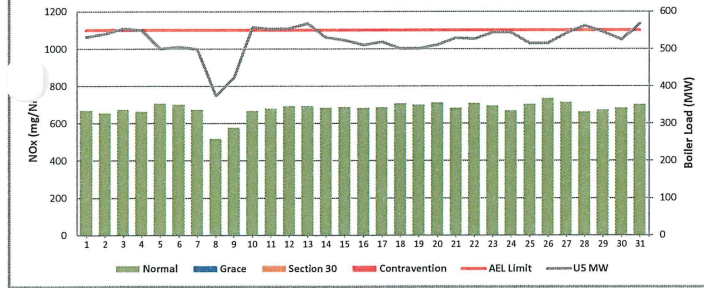
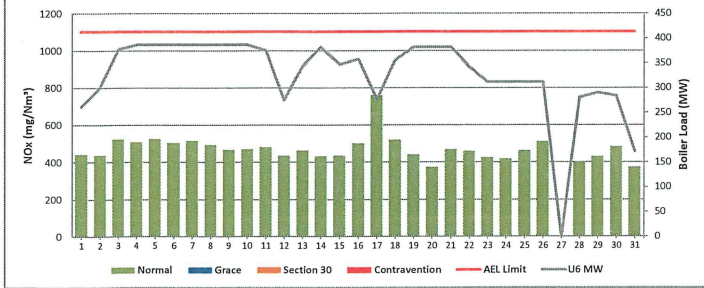


Figure 18: Kendal Unit 6 NOx Emissions - March 2023



7 COMPLAINTS

There were no complaints for this months

Source Code /	Root Cause Analysis	Calculation of impacts /	Dispersion modeling of pollutants where applicable	Measures implemented to

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

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

$$\eta = 1 - \frac{(\text{Dust Emission From AQR Report Dust Monitor (tons)} \times 100)}{(\text{Coal Burnt (tons)} \times \% \text{ Ash Content} \times 80\%)}$$

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 - (count hours above 99.325%/24 hours)) 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 implemented and backfitted to the date of monitor installation.
- Unit 3 gas monitor was defective, we substituted with QAL 2 SRM value for SOx, NOx an O2 for the entire month, and unity value of 1 for NOx, SOx and O2 was used.
- Unit 1
 ➤ Findings: The high emissions can be attributed to Stop DHP tripping due to compartment levels high, knife gates closed. DHP tripped due to top bunker conveyor failing to start. Precip conveyor 11, 13, 14 and 23 tripping and failing to start, Primary conveyor 13 and 14 choked. Apron stopped 3 buckets were damaged. Light up condition.
 ➤ SO3 placed on hold mode due to the leak on so3 plant, SO3 plant off due to low temperature. SO3 plant kept on tripping on burner outlet high.
 ➤ Resolution: Plant repaired
- Unit 2
 ➤ Findings: The high emissions can be attributed to SO3 plant tripping, steam temp low. and low sulphur flow. DHP tripping on high compartment levels, precip chain conveyor 11, 21 and 22 choked, hopper knife gates closed. DHP not running due to stream 1 bucket elevator leaking ash, DHP off due to bucket elevator fails to start. Knife gates closed due to DHP PLC fault.
 ➤ Resolution: Plant repaired.
- Unit 3
 ➤ Findings: The high PM emissions can be attributed to Unit light up condition with fuel oil support. DHP trip due to high level on compartments, Stream 2 - 1st collecting conveyor tripped - Fault fails to reset, Stream 1 1st collecting conveyor tripped, Precip conveyor trips, hopper knife gates fully closed. DHP plant trips and top bunker trips.
 ➤ So3 is out of service due to cable damage, So3 plant on hold mode heaters are tripping, SO3 plant leak, SO3 plant isolated during gasket replacement. So3 plant on hold mode - Steam pressure and temperature low.
 ➤ Resolution: Plant repaired.
- Unit 5
 Findings: High PM emissions can be attributed to DHP tripped due to compartments full, all hopper knife gates closed, Precip conveyor 24 kept on tripping. Precip conveyors choked.
 ➤ SO3 plant on hold mode due to Aux steam temp low, SO3 plant on hold mode due to no sulphur flow.
 ➤ Resolution: Plant repaired.
- Unit 6
 ➤ Findings: High PM emissions can be attributed to Precip conv 21 kept on tripping, precip conv 21 hopper knife gates closed. Light up on fuel oil support.
 ➤ SO3 plant on hold mode due to sulphur flow low, SO3 plant on hold due to low steam temp
 ➤ Resolution: Plant repaired.