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Date:
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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 DECEMBER 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:

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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 Dec-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 Dec-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	1.180

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	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 (%)

Associated Unit/Stack	Technology Type	Efficiency Dec-2022	Technology Type	SO ₂ Utilization Dec-2022
Unit 1	ESP + SO ₂	95.878%	SO ₂	93.8%
Unit 2	ESP + SO ₂	91.453%	SO ₂	76.4%
Unit 3	ESP + SO ₂	98.921%	SO ₂	89.0%
Unit 4	ESP + SO ₂	99.860%	SO ₂	67.0%
Unit 5	ESP + SO ₂	93.423%	SO ₂	72.9%
Unit 6	ESP + SO ₂	99.707%	SO ₂	83.6%

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

U2,3,4,5 and 6 SO₂ Utilization is low due to:
 -SO₂ Plant was off due to no Sulphur flow
 -SO₂ Plant on hold due to low steam temperature
 SO₂ Plant tripped due to low steam temperature
 -SO₂ stopped due to PTW on steam

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO ₂	NO	O ₂
Unit 1	50.0	99.2	99.0	99.2
Unit 2	47.8	56.6	47.2	92.7
Unit 3	69.1	99.2	96.3	82.9
Unit 4	100.0	100.0	37.2	32.5
Unit 5	99.6	45.2	26.5	100.0
Unit 6	83.8	99.8	87.0	100.0

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

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

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of December 2022

Associated Unit/Stack	PM (tons)	SO ₂ (tons)	NO _x (tons)
Unit 1	1 375.6	1 473	617
Unit 2	3 768.5	1 213	593
Unit 3	258.5	777	291
Unit 4	45.4	488	177
Unit 5	1 607.7	2 603	1 093
Unit 6	67.5	1 606	546
SUM	7 143.05	8 161	3 318

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

Associated Unit/Stack	Normal	Grace	Section 30	Contra-vention	Total Exceedance	Average PM (mg/Nm ³)
Unit 1	0	4	0	8	12	1 326.1
Unit 2	0	2	0	21	23	1 551.7
Unit 3	0	4	0	7	11	169.5
Unit 4	6	6	0	4	10	201.1
Unit 5	0	4	0	25	29	889.2
Unit 6	10	7	0	0	7	133.8
SUM	16	27	0	65	92	

Table 6.3: Operating days in compliance to SO₂ AEL Limit - December 2022

Associated Unit/Stack	Normal	Grace	Section 30	Contra-vention	Total Exceedance	Average SO ₂ (mg/Nm ³)
Unit 1	15	0	0	0	0	1 663.2
Unit 2	24	0	0	0	0	1 149.2
Unit 3	14	0	0	0	0	1 556.2
Unit 4	21	0	0	0	0	1 537.4
Unit 5	30	0	0	0	0	1 489.2
Unit 6	18	0	0	0	0	1 496.8
SUM	122	0	0	0	0	

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

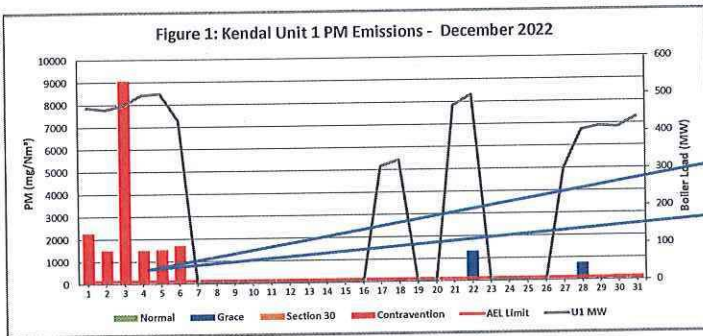
Associated Unit/Stack	Normal	Grace	Section 30	Contra-vention	Total Exceedance	Average NOx (mg/Nm ³)
Unit 1	15	0	0	0	0	676.1
Unit 2	24	0	0	0	0	553.0
Unit 3	14	0	0	0	0	567.6
Unit 4	21	0	0	0	0	578.5
Unit 5	30	0	0	0	0	625.7
Unit 6	18	0	0	0	0	515.2
SUM	122	0	0	0	0	

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

Table 6.5: Legend Description

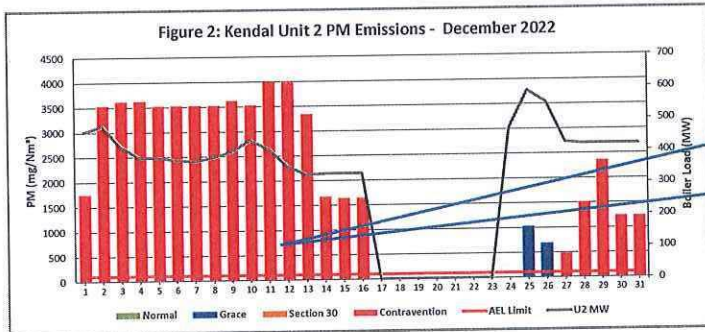
Condition	Colour	Description
Normal	Green	Emissions below Emission Limit Value (ELV)
Grace	Blue	Emissions above the ELV during grace period
Section 30	Orange	Emissions above ELV during a NEMA S30 incident
Contra-vention	Red	Emissions above ELV but outside grace or S30 incident conditions

Figure 1: Kendal Unit 1 PM Emissions - December 2022



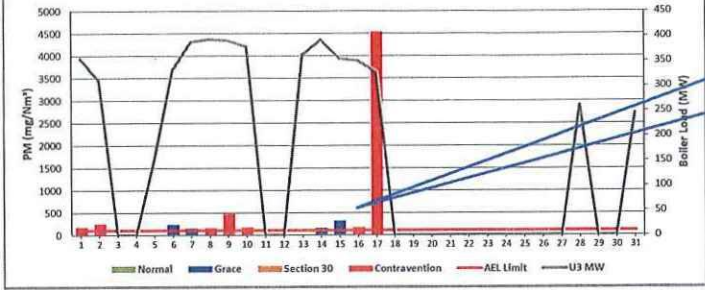
High emissions can be attributed to Unavailability of ash spreader and emergency dumping on the ODEK13 was stopped for the spreader tie-in and commissioning. High level protection failed to sequence trip the running stream. (ODETK24 and 11) Outside ash conveyors tripped multiple times. High compartment levels, knife gates closed. Right ID fans out of service due to vibration, running with one ID fan. SO3 plant was off through out the station. DHP related issues also contribute to ESP fields performance.

Figure 2: Kendal Unit 2 PM Emissions - December 2022



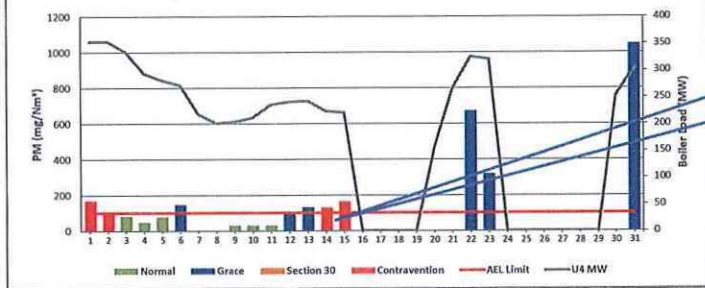
High emissions can be attributed to DHP off due to high compartment levels. All precip hopper knife gates fully closed, Precip conv 21 - 24 choked. DHP stopped, bucket elevator trips on speed switch, SO3 plant off, steam temp low SO3 plant tripped due to steam temp low. PRECEIP CONV 13 TRIPPED. Stream 1 bucket elevator tripped on speed switch. Precip conveyor 13 and 14 keeps on tripping SO3 Plant O/C due to stream supply that was closed. DHP OFF due to bucket elevators flopper gates failed to move. 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, DHP off due to high compartment levels.

Figure 3: Kendal Unit 3 PM Emissions - December 2022



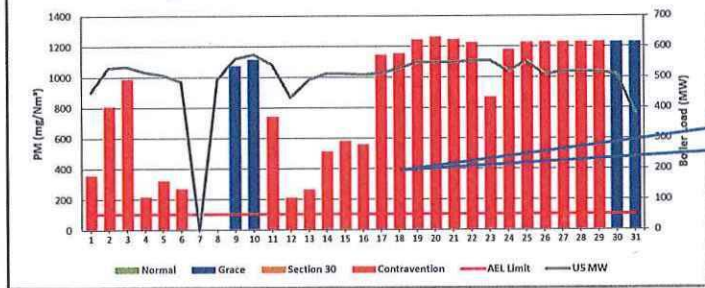
High PM emissions can be attributed to SO3 PLANT NOT STABLE DUE TO RH BACK END TEMP LOW, DHP stopped due to compartments full, SO3 stopped due to PTW on steam leak, DHP off
Bucket elevator stream 1, Ash plant kept tripping, Precip conveyors chokes, Knife gates close.

Figure 4: Kendal Unit 4 PM Emissions - December 2022



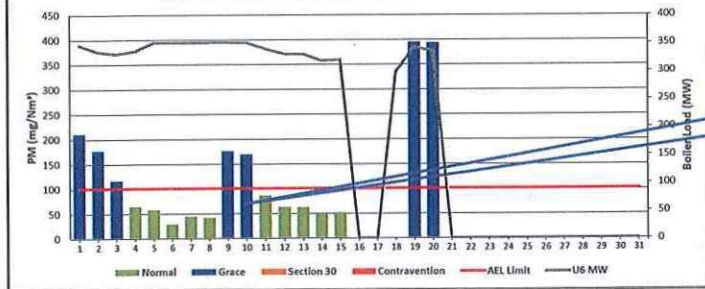
High PM emissions can be attributed to SO3 plant is not running due to no sulphur flow and steam temp. DHP standing bucket elevator stream 1 tripping. Precip 11 and 24 keeps tripping.

Figure 5: Kendal Unit 5 PM Emissions - December 2022



High PM emissions can be attributed to SO3 plant off due to no steam flow, DHP off due to compartments level high, ESP conveyor 11 to 14 tripped.

Figure 6: Kendal Unit 6 PM Emissions - December 2022



High PM emissions can be attributed to light up condition

Figure 7: Kendal Unit 1 SO₂ Emissions - December 2022

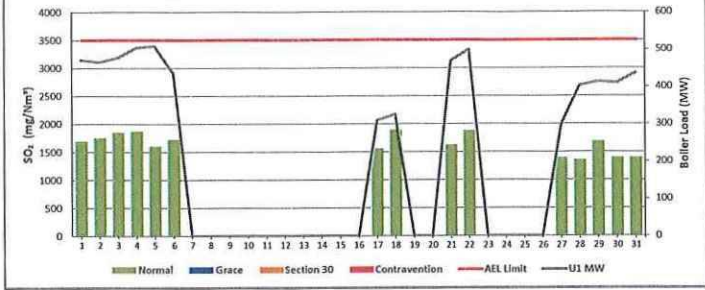


Figure 8: Kendal Unit 2 SO₂ Emissions - December 2022

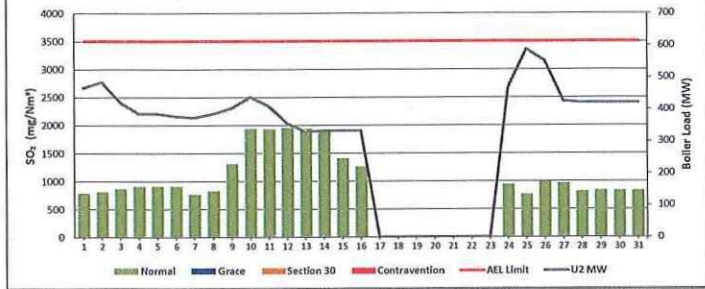


Figure 9: Kendal Unit 3 SO₂ Emissions - December 2022

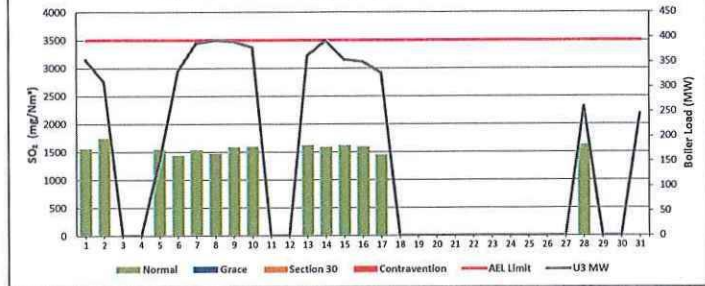


Figure 10: Kendal Unit 4 SO₂ Emissions - December 2022

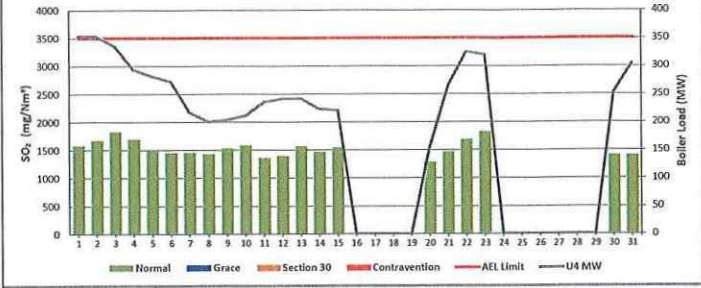


Figure 11: Kendal Unit 5 SO₂ Emissions - December 2022

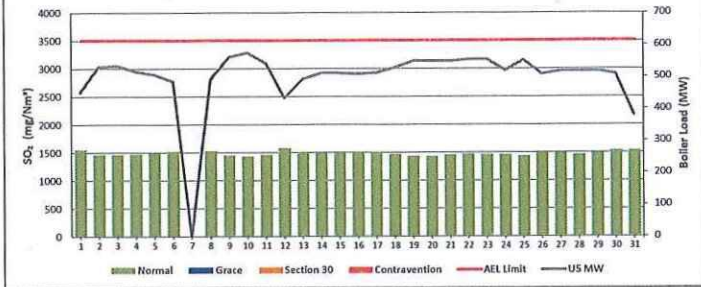


Figure 12: Kendal Unit 6 SO₂ Emissions - December 2022

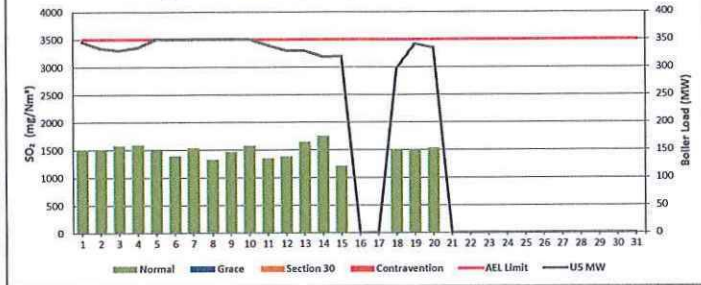
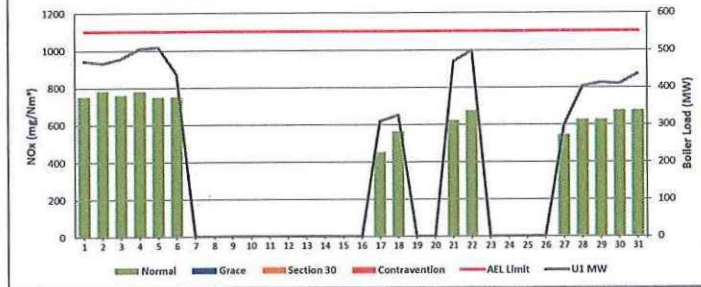
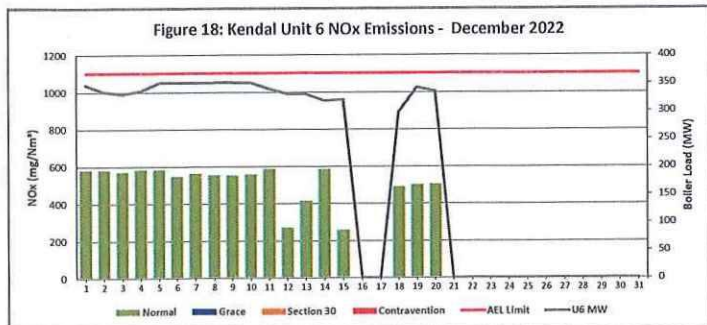
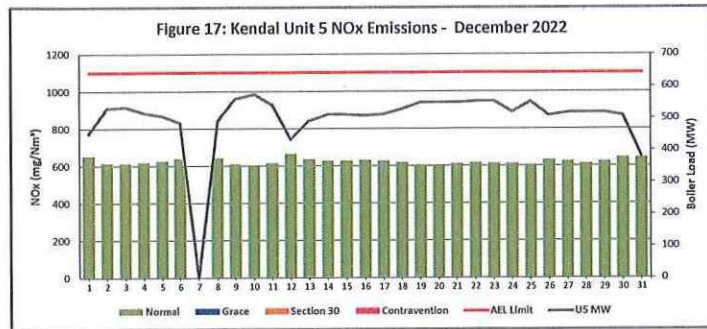
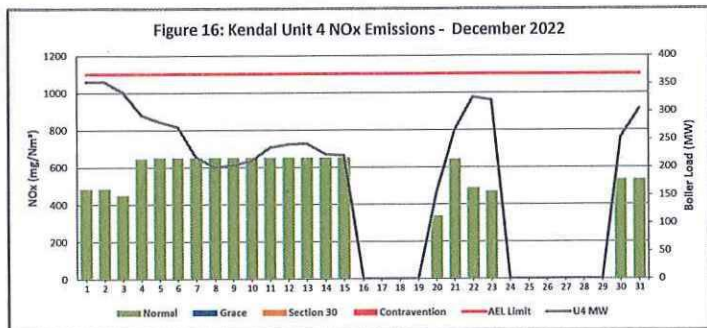
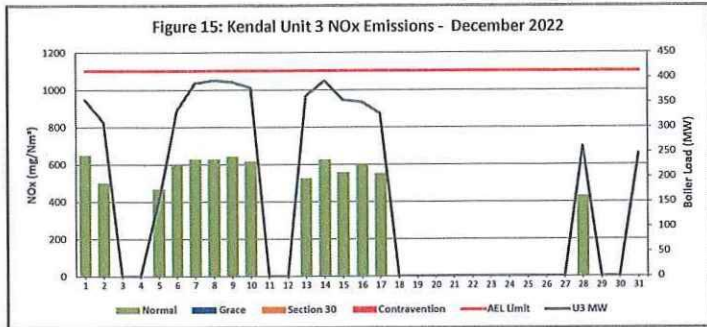
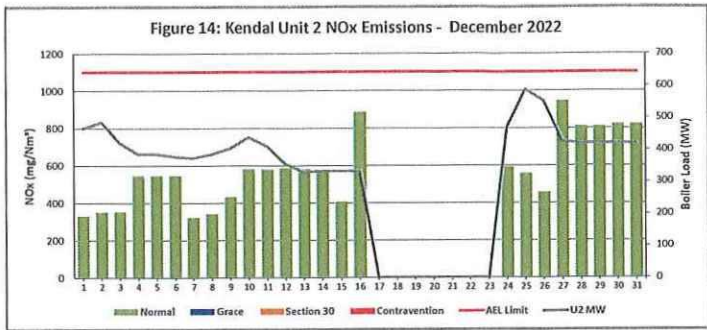


Figure 13: Kendal Unit 1 NO_x Emissions - December 2022





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

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

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

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:

$$= (1 - (\text{count hours above } 99.325\% / 24 \text{ hours})) \times 100$$

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 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.
- > Average emissions for unit 1 SOx and NOx from the 21st to the 24th, Unit 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 4 NOx on the 5th to the 15th were used from the QAL2 report as the monitor was defective.
- > Average emissions for Unit 5 SOx and NOx for the whole month were used from the QAL 2 report as the analyser was faulty and on some days the supply break had tripped.
- > Average emissions for Unit 3 CO2 and O2 were taken from QAL2 report as the CO2 and O2 as the monitors were not operating adequately.

- > Unit 1
- > Findings: Unavailability of ash spreader and emergency dumping on the 00EK13 was stopped for the spreader tie-in and commissioning. High level protection failed to sequence trip the running stream. (00ETK24 and 11) Outside ash conveyors tripped multiple times. High compartment levels, knife gates closed. Right ID fans out of service due to vibration, running with one ID fan. SO3 plant was off through out the station. DHP related issues also contribute to ESP fields performance
- > Resolution: Plant repaired

- > Unit 2
- > Findings: High emissions can be attributed to DHP off due to high compartment levels. All precip hopper knife gates fully closed, Precip conv 21 - 24 chocked. DHP stopped, bucket elevator trips on speed switch, SO3 plant off, steam temp low SO3 plant tripped due to steam temp low. Stream 1 bucket elevator tripped on speed switch with Precip conveyor 13 and 14 kept on tripping. DHP Off due to bucket elevators flopper gates fail to move.
- > SO3 plant out of service due to the stream supply that is closed. DHP Off due to bucket elevators flopper gates fail to move.
- > Resolution: Plant repaired.

- > Unit 3
- > Findings: High PM emissions can be attributed to SO3 Plant not stable due to RH back end temp low, DHP stopped due to compartment levels full, SO3 stopped due to PTW on steam leak, DHP off kept on tripping, Precip conveyors chocked, Knife gates closed.
- > Resolution: Plant repaired.

- > Unit 4
- > Findings: High PM emissions can be attributed to SO3 plant not running due to no sulphur flow and steam temp. DHP standing bucket elevator stream 1 tripping. Precip 11 and 24 kept on tripping.
- > Resolution: Plant repaired.

- > Unit 5
- > Findings: High PM emissions can be attributed to NO Sulphur flow at SO3 plant.
- > Resolution: Plant repaired.

- > Unit 6
- > Findings: High PM emissions can be attributed to light up condition.