Eskom

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Date:
24 January 2024

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Ref*:* 17/4/AEL/MP312/11/09

Dear Ms. Simelane

**KRIEL POWER STATION'S MONTHLY STACK EMISSIONS REPORT FOR THE MONTH OF DECEMBER 2023**

This serves as the monthly report required in terms of Section 7.4 in Kriel Power Station's Atmospheric Emission License 17/4/AEL/MP312/11/09. The emissions are for the month of December 2023. Verified emissions of particulates matter, $SO_2$ and $NO_x$ (as $NO_2$) are also included.

**Raw Materials and Products**

**Table 1:** Quantity of Raw Materials and Products used/produced for the month of December 2023

| Raw Materials and Products used | Raw Material Type | Units | Maximum Permitted Consumption / Rate (Quantity) | Consumption / Rate in Month of December 2023 |
|---|---|---|---|---|
| | Coal | Tons/month | 1 227 600 | 673 566.200 |
| | Fuel Oil | Tons/month | 5 000 | 3 126.785 |
| | | | | |
| **Production Rates** | **Product/ By-Product Name** | **Unit** | **Maximum Production Capacity Permitted (Quantity)** | **Production Rate in Month of December 2023** |
| | Ash | Tons/month | not specified | 177 821.477 |
| | RE PM | kg/MWh | not specified | 0.790 |

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**Abatement Technology**

**Table 2:** Abatement Equipment Control Technology for December 2023.

| Associated Unit/Stack | Technology Type | Actual Efficiency (%) December 2023 | Utilisation December 2023 |
|---|---|---|---|
| Unit 1 | ESP | 99.94% | 0.00% |
| Unit 2 | ESP | 99.13% | 98.91 |
| Unit 3 | ESP | 98.61% | 95.28% |
| Unit 4 | ESP | Outage | Outage |
| Unit 5 | ESP | 98.59% | 100.00% |
| Unit 6 | ESP | Outage | Outage |

**Energy Source Characteristics**

**Table 3:** Energy Source Material Characteristics for the month of December 2023

| Characteristic | Stipulated Range (Unit) | Monthly Average Content |
|---|---|---|
| **Sulphur Content** | 0.6-1.2 (%) | 0.760 |
| **Ash Content** | 27-32 (%) | 26.400 |

**Monthly Monitor Reliability**

| Associated Unit/Stack | PM (%) | SOx (%) | NOx (%) |
|---|---|---|---|
| North | 65.62 | 90.71 | 94.37 |
| South | 36.71 | 100.00 | 100.00 |

**Emissions Reporting**

**Table 6.5: Graph 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 |

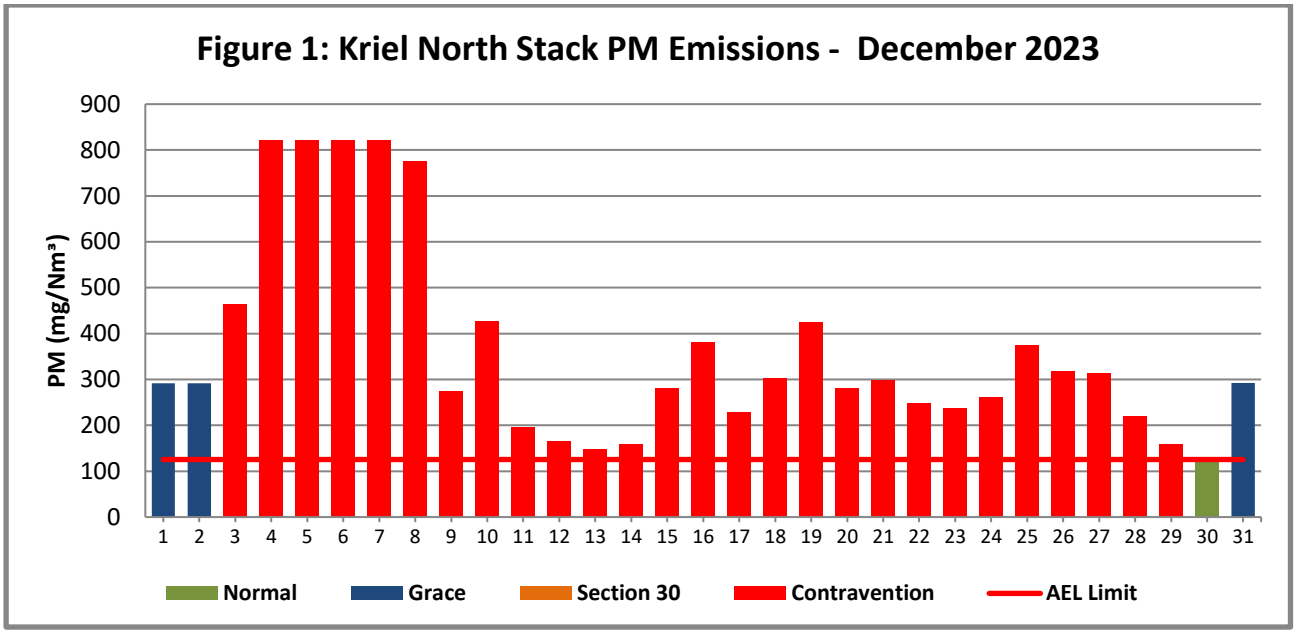


***Figure 1: PM emissions for the month of December 2023 against emission limit for the North Stack. Monthly average was 361.5 mg/Nm3.***

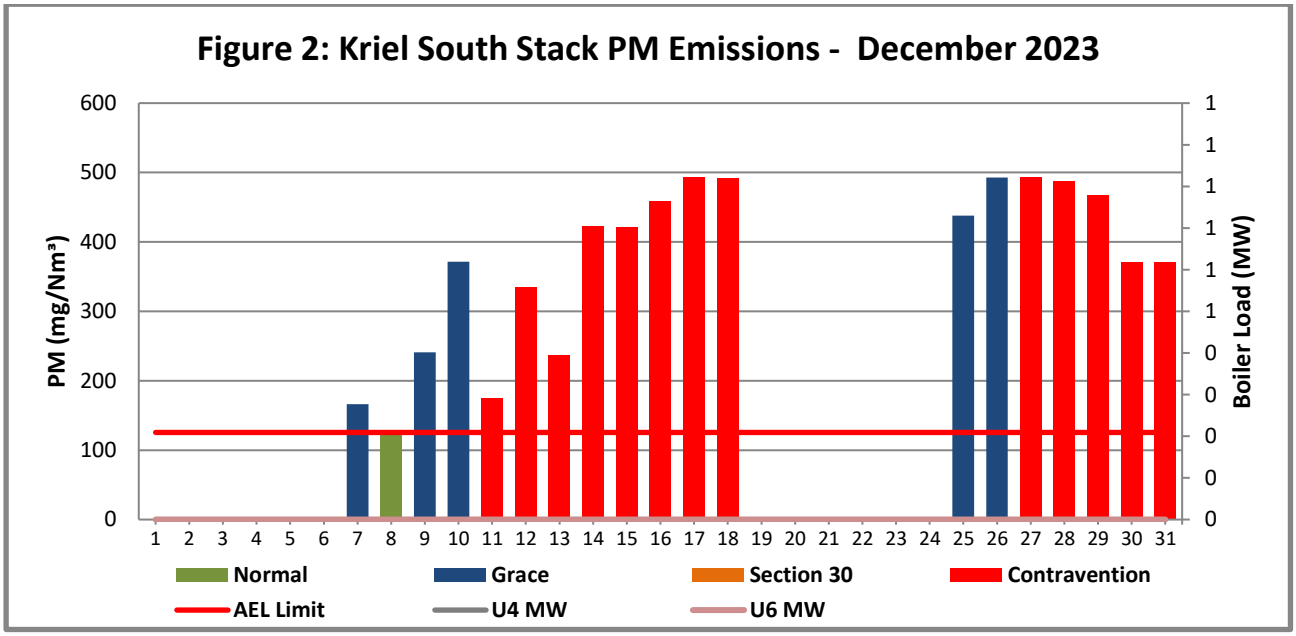


***Figure 2: PM emissions for the month of December 2023 against emission limit for the South Stack. Monthly average was 371.5 mg/Nm3.***

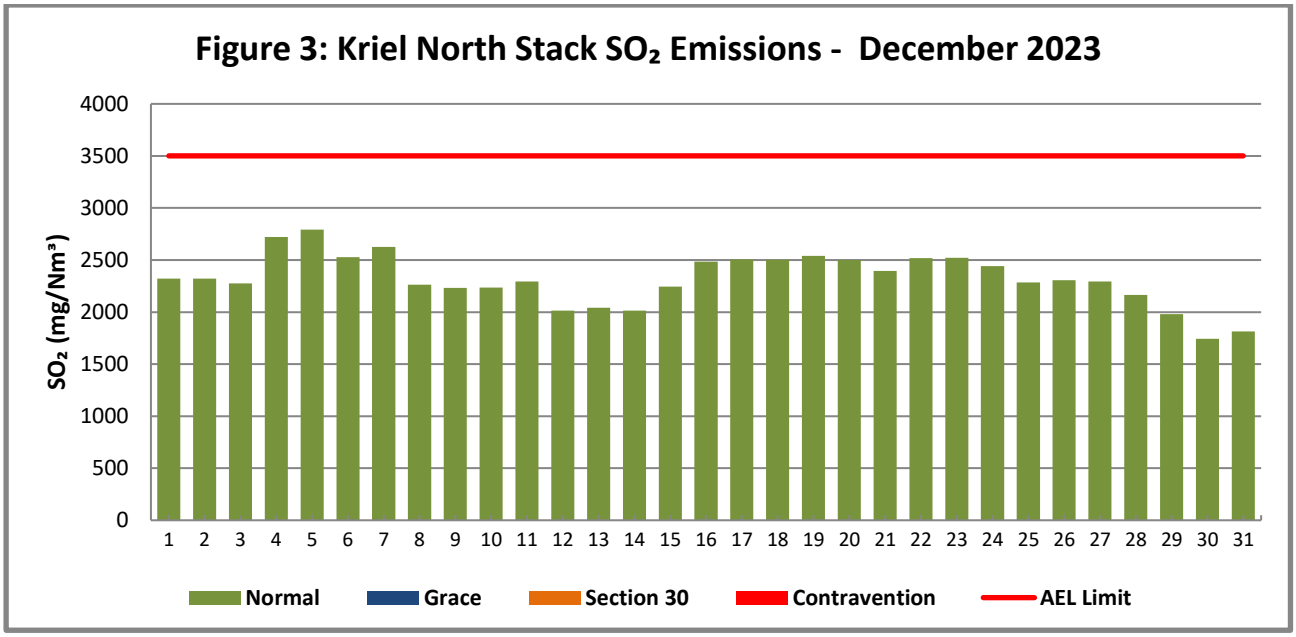


***Figure 3. $SO_2$ emissions for the month of December 2023 against emission limit for the North Stack. The SOx Limit is 3500mg/Nm3.***

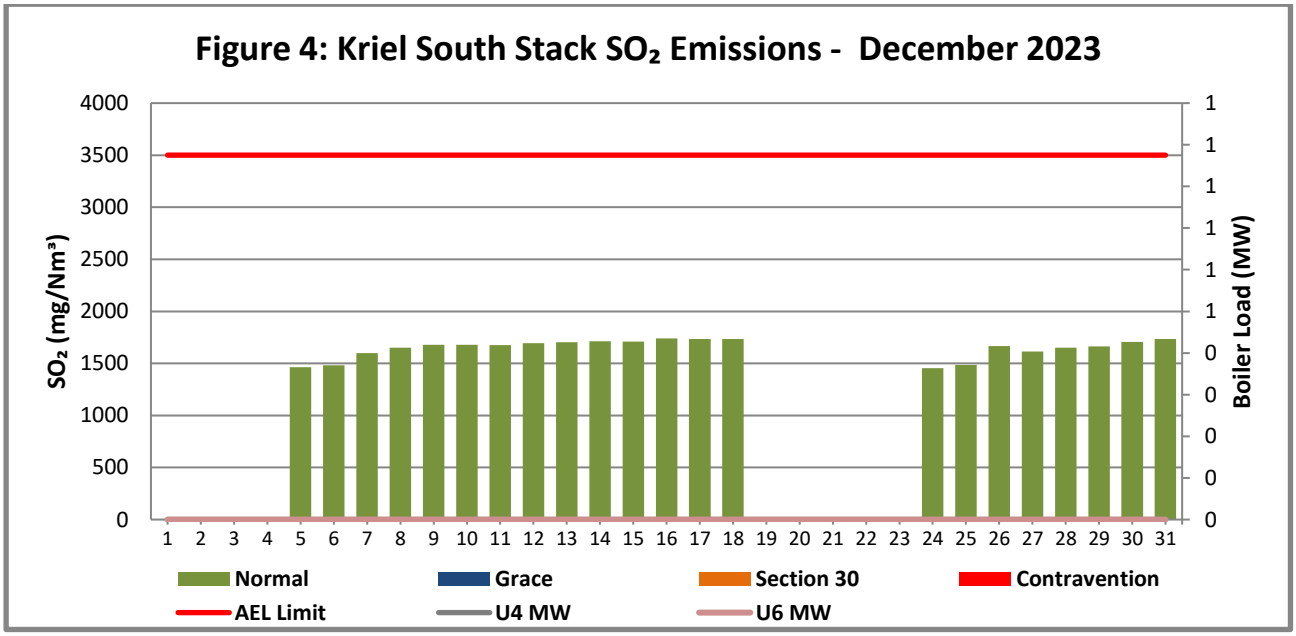


***Figure 4. $SO_2$ emissions for the month of December 2023 against emission limit for the South Stack. The SOx Limit is 3500mg/Nm3.***

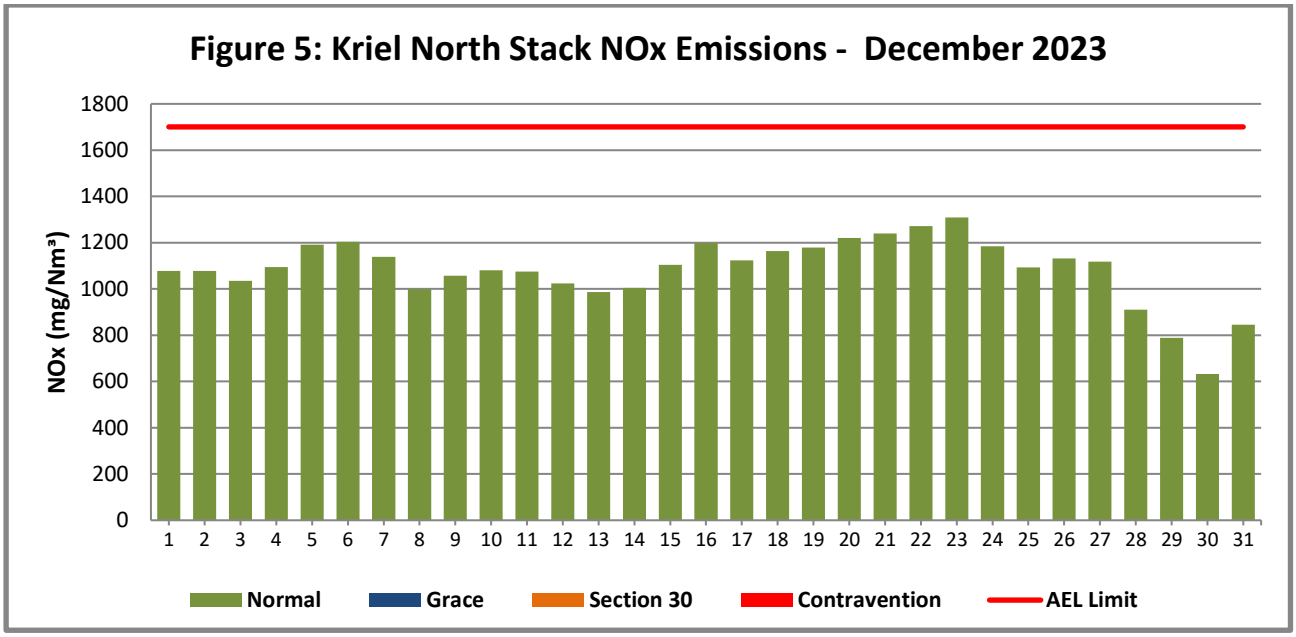


***Figure 5. $NO_2$ emissions for the month of December 2023 against emission limit for the North Stack. The NOx Limit is 1600mg/Nm3.***

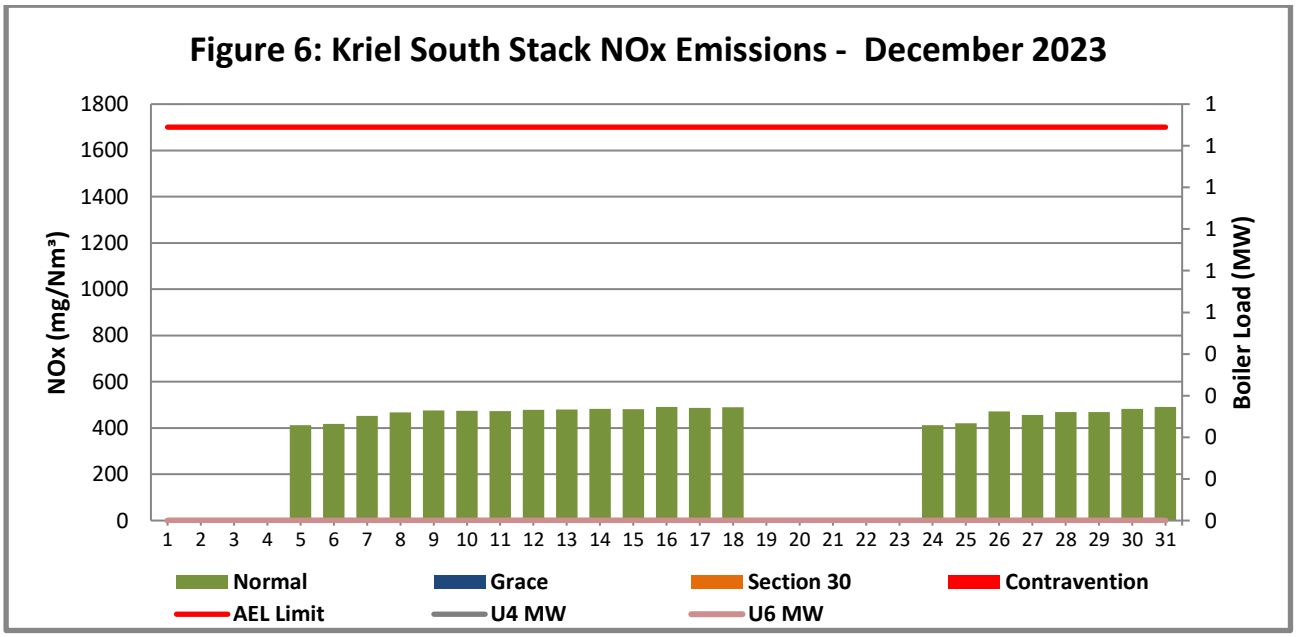


***Figure 6. $NO_2$ emissions for the month of December 2023 against emission limit for the South Stack. The NOx Limit is 1600mg/Nm3.***

**Table 4:** Monthly tonnages for the month December 2023

| Unit | PM (tons) | $SO_2$ (tons) | $NO_2$ (tons) |
|---|---|---|---|
| SUM | 961.0 | 5 973.3 | 2 506.2 |

**Table 5:** Each unit and respective days operating under normal operation and section 30 days respectively.

Table 5.1: Operating days in non-compliance to PM AEL Limit – December 2023

| Associated Unit/Stack | Normal | Grace | Section 30 | Contravention | Monthly Limit Exceedance | Average PM (mg/Nm³) |
|---|---|---|---|---|---|---|
| North | 01 | 03 | 0 | 27 | 30 | 361.5 |
| South | 01 | 05 | 0 | 12 | 18 | 371.5 |

Table 5.2: Operating days in compliance to SOx AEL Limit - December 2023

| Associated Unit/Stack | Normal | Grace | Section 30 | Contravention | Total Exceedance | Average SOx (mg/Nm³) |
|---|---|---|---|---|---|---|
| North | 31 | 0 | 0 | 0 | 0 | 2 320.0 |
| South | 22 | 0 | 0 | 0 | 0 | 1 646.5 |

Table 5.3: Operating days in compliance to NOx AEL Limit – December 2023

| Associated Unit/Stack | Normal | Grace | Section 30 | Contravention | Total Exceedance | Average NOx (mg/Nm³) |
|---|---|---|---|---|---|---|
| North | 31 | 0 | 0 | 0 | 0 | 1 082.5 |
| South | 22 | 0 | 0 | 0 | 0 | 465.3 |

**Light up information**

**Table 6:** PM Start-up information for the month of December 2023

| **North Stack** | *Event 1* | | *Event 2* | | *Event 3* | | *Event 4* | |
|---|---|---|---|---|---|---|---|---|
| **Unit No.** | *Unit 1* | | *Unit 2* | | *Unit 2* | | *Unit 2* | |
| **Breaker Open (BO)** | | | *11:05 pm* | *2023/12/07* | *BO previously* | *BO previously* | *7:35 pm* | *2023/12/27* |
| **Draught Group (DG) Shut Down (SD)** | | | *12:40 pm* | *2023/12/08* | *n/a* | *n/a* | *8:10 am* | *2023/12/28* |
| **BO to DG SD (duration)** | | DD:HH:MM | *00:13:35* | DD:HH:MM | *n/a* | DD:HH:MM | *00:12:35* | DD:HH:MM |
| **Fires in time** | | | | | *7:55 pm* | *2023/12/13* | | |
| **Synch. to Grid (or BC)** | | | | | *10:50 am* | *2023/12/14* | | |
| **Fires in to BC (duration)** | | DD:HH:MM | | DD:HH:MM | *00:14:55* | DD:HH:MM | | DD:HH:MM |
| **Emissions below limit from BC (end date)** | | | | | *12:00 am* | *2024/01/03* | | |
| **Emissions below limit from BC (duration)** | | DD:HH:MM | | DD:HH:MM | *19:13:10* | DD:HH:MM | | DD:HH:MM |

| North Stack …Cont. | Event 1 | | Event 2 | | Event 3 | | Event 4 | |
|---|---|---|---|---|---|---|---|---|
| Unit No. | Unit 3 | | Unit 3 | | Unit 3 | | Unit 3 | |
| Breaker Open (BO) | 1:45 am | 2023/12/17 | BO previously | BO previously | 5:50 am | 2023/12/26 | BO previously | BO previously |
| Draught Group (DG) Shut Down (SD) | 5:40 am | 2023/12/17 | n/a | n/a | 7:50 am | 2023/12/26 | n/a | n/a |
| BO to DG SD (duration) | 00:03:55 | DD:HH:MM | n/a | DD:HH:MM | 00:02:00 | DD:HH:MM | n/a | DD:HH:MM |
| Fires in time | | | 2:50 pm | 2023/12/17 | | | 4:55 pm | 2023/12/26 |
| Synch. to Grid (or BC) | | | 8:15 pm | 2023/12/17 | | | 1:00 am | 2023/12/27 |
| Fires in to BC (duration) | | DD:HH:MM | 00:05:25 | DD:HH:MM | | DD:HH:MM | 00:08:05 | DD:HH:MM |
| Emissions below limit from BC (end date) | | | not > limit | not > limit | | | not > limit | not > limit |
| Emissions below limit from BC (duration) | | DD:HH:MM | n/a | DD:HH:MM | | DD:HH:MM | n/a | DD:HH:MM |

| South Stack | Event 1 | | Event 2 | | Event 3 | | Event 4 | |
|---|---|---|---|---|---|---|---|---|
| Unit No. | no event | | Unit 5 | | Unit 5 | | no event | |
| Breaker Open (BO) | | | 5:35 pm | 2023/12/04 | BO previously | BO previously | 7:00 am | 2023/12/07 |
| Draught Group (DG) Shut Down (SD) | | | 5:00 pm | 2023/12/05 | n/a | n/a | DG did not trip or SD | DG did not trip or SD |
| BO to DG SD (duration) | | DD:HH:MM | 00:23:25 | DD:HH:MM | n/a | DD:HH:MM | n/a | DD:HH:MM |
| Fires in time | | | | | 8:40 pm | 2023/12/05 | | |
| Synch. to Grid (or BC) | | | | | 2:25 am | 2023/12/06 | | |
| Fires in to BC (duration) | | DD:HH:MM | | DD:HH:MM | 00:05:45 | DD:HH:MM | | DD:HH:MM |
| Emissions below limit from BC (end date) | | | | | not > limit | not > limit | | |
| Emissions below limit from BC (duration) | | DD:HH:MM | | DD:HH:MM | n/a | DD:HH:MM | | DD:HH:MM |

| South Stack …Cont. | Event 1 | | Event 2 | | Event 3 | | Event 4 | |
|---|---|---|---|---|---|---|---|---|
| Unit No. | no event | | Unit 5 | | Unit 5 | | Unit 6 | |
| Breaker Open (BO) | | | 2:50 pm | 2023/12/18 | BO previously | BO previously | 7:30 pm | 2023/12/02 |
| Draught Group (DG) Shut Down (SD) | | | 1:35 am | 2023/12/19 | n/a | n/a | 1:35 pm | 2023/12/03 |
| BO to DG SD (duration) | | DD:HH:MM | 00:10:45 | DD:HH:MM | n/a | DD:HH:MM | 00:18:05 | DD:HH:MM |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Fires in time** | | | | | *9:10 am* | *2023/12/24* | | |
| **Synch. to Grid (or BC)** | | | | | *8:25 pm* | *2023/12/24* | | |
| **Fires in to BC (duration)** | | DD:HH:MM | | DD:HH:MM | *00:11:15* | DD:HH:MM | | DD:HH:MM |
| **Emissions below limit from BC (end date)** | | | | | *not > limit* | *not > limit* | | |
| **Emissions below limit from BC (duration)** | | DD:HH:MM | | DD:HH:MM | *n/a* | DD:HH:MM | | DD:HH:MM |

**Complaints Register**

**Table 9**: Complaints for the month of December 2023.

| Source Code/ Name | Root Cause Analysis | Calculation of Impacts/ emissions associated with the incident | Dispersion modeling of pollutants where applicable | Measures implemented to prevent reoccurrence | Date by which measure will be implemented |
|---|---|---|---|---|---|
| There was no complaint related to air quality received during the month of December 2023. | | | | | |

**General**

The particulate matter (PM10) emissions on the North Common Stack exceeded the **monthly limit**; on average emissions figure of **361.5 mg/Nm³** while South Common Stack also exceeded the **monthly limit** on the recorded PM10 monthly average figure of **371.5 mg/Nm³**. The gaseous (NOx & SOx) emissions on the North and South common Stacks were within the **daily limit** during the month of December 2023; refer to graphs above.

NB: The rest of the information demonstrating compliance with the emissions license conditions is supplied in the annual emission reports sent to your office.

Kriel Power Station's List of NEMA Section 30 Incidents for 2023/2024 Financial Year

| Month | Description of Section 30 Incidents - including the reference number | Root Cause (s) | Status of S30 Incident with DEFF (open or closed) | Remarks |
|---|---|---|---|---|
| **April-2023** | South Stack High Emissions | Unit 4 A EFP plant breakdown causing half load conditions, which calls for operating the unit with fuel oil support to badly impacting the stack emissions | Open | |

| | | | | |
|---|---|---|---|---|
| **May - 2023** | North Stack High Emissions | Unit 4 A EFP plant breakdown causing half load conditions which calls for operating the unit with fuel oil support to badly impacting the stack emissions | Open | |
| **May - 2023** | South Stack High Emissions | Unit 4 A EFP plant breakdown causing half load conditions which calls for operating the unit with fuel oil support to badly impacting the stack emissions | Open | |
| **June – 2023** | North Stack High Emissions | Units operating at half load conditions which affects the sulphur dosing and causes the plant to operate with fuel oil support because of high turbine back pressure, low final feedwater temperature, high works power loss from high usage of electric feed pump and dust handling plant because of dust transportation resulting in high stack emissions | Open | |
| **June - 2023** | South Stack High Emissions | Units operating at half load conditions which affects the sulphur dosing | Open | |

| | | | | |
|---|---|---|---|---|
| | | and causes the plant to operate with fuel oil support because of high turbine back pressure, low final feedwater temperature, high works power loss from high usage of electric feed pump and dust handling plant because of dust transportation resulting in high stack emissions | | |
| **July - 2023** | North Stack High Emissions | The north stack emissions daily average has significantly reduced as results of shutting of unit 2 outage for the planned GO outage. However, due to the isolation of cooling tower number 2 for the cooling tower fills replacement project, unit 3 is operating at low loads to condenser vacuum high. The half load conditions mean supporting the unit with oil burners to support combustion and sulphur trioxide (SO3) not in service. The south stack PM emission daily average has significantly reduced since synchronisation of | | |

| | | | | |
|---|---|---|---|---|
| | | units from half station shutdown. | | |
| **Aug - 2023** | North Stack High Emissions | The north stack emissions exceedance was due to RH1 and RH2 poor field performance (high spark rates) which resulted in ESP reduced collection efficiency. The reduced field performance on the first field was as results of high hoppers, which resulted from an ash backlog on the dust handling plant. | | |
| **Sep - 2023** | North Stack High Emissions | The North Stack emissions exceedance was due the increase of hopper alarms to 24 on Unit 1 due to blow tanks which were not available. Blow tank 1 2 discharge seal was damaged and blow tank 1 2 was leaking on the vent. Consequently, the electrostatic precipitators (ESP) performance decreased because of accumulation inside the fields. | | |
| **Oct - 2023** | North Stack high Emissions | Requested grace period to exceed the limit after the installation of New Abatement | | |

| | | | | |
|---|---|---|---|---|
| | | Technology HFTs. The station will undertake new Correlation curve and back fit accordingly and report accurately. | | |
| **Oct - 2023** | South Stack High Emissions | The ESP fields performance continued to deteriorate, with the collection efficiency below 40%. It was noted that there was significant drop in fields performance on the RHS only. The RHS poor fields performance was as results of the failure of the DE rapping system. During commissioning of the 5B transformer which was replaced on the 29th of September 2023, the phasing was not verified, and motor directions checks were not conducted thereafter. This then resulted in motor rotating in the wrong directions and consequently the failure of torque insulators which rendered most DE rappers not available. It should be noted there were other causes that contributed to the high emissions, this includes the | | |

| | | | | |
|---|---|---|---|---|
| | | saturation of the ID fans and poor dust handling plant availability as results of failure of the overland conveyors and blow tanks. | | |
| **Nov - 2023** | North High Stack Emissions | It was due to the loss of two main electric conveying air compressors, namely Demag 5 & 6. Both compressors experienced rotor crushing and bearing seizure due to inadequate oil in the mechanical components during operation. Due to a decrease in the volumetric flow rate from the compressors, the dry dust pipes and collecting vessels experienced blockages. | | |
| **Nov - 2023** | South High Stack Emissions | PM emissions daily average increased due to hopper alarms which resulted from unstable conveying air from time to time. The effect of unstable conveying air resulted in sustained hopper alarms that failed to clear. As result there was a high ash accumulation and hang ups inside the fields. The hang ups | | |

| | | | | |
|---|---|---|---|---|
| | | bridged the Discharge electrode and Collecting Electrodes plates which results in arcing and undervoltage trips. The high ash accumulation further affected the CE rapping system. The ash accumulation and hang ups resulted in a drop in ESP collection efficiency to below 30 % and consequently high PM emissions. | | |
| **Dec - 2023** | North High Stack Emissions | Accumulation of hopper levels when the ash discharge rate from the fly ash hopper is lower than the rate at which ash accumulates within the fly ash hopper. This issue stemmed from the loss of two main electric conveying air compressors, namely Demag 5 & 6. | | |
| **Dec - 2023** | South High Stack Emissions | Compressors experienced rotor crushing and bearing seizure due to inadequate oil in the mechanical components during operation. Due to a decrease in the volumetric flow rate from the compressors, the dry dust pipes and | | |

| | | | | |
|---|---|---|---|---|
| | | collecting vessels experienced blockages. | | |
| **Jan - 2024** | | | | |
| **Feb - 2024** | | | | |
| **Mar - 2024** | | | | |