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Dear Mandlenkosi Mahlalela

KRIEL POWER STATION'S ANNUAL EMISSIONS REPORT

This serves as the annual report required in terms of Section 7.6 in Kriel Power Station's Atmospheric Emission License. The emissions are for Eskom's 2016/17 financial year which is from 1 April 2016 to 31 March 2017. Verified emissions of particulates, and calculated figures for SO₂, NO_x (as NO₂) and the greenhouse gases CO₂ and N₂O are also included.

1. Pollutant emission trends and greenhouse gas emissions

Particulate emissions are measured at all power stations with opacity monitors, which are correlated to obtain emission concentrations. Gaseous emissions (CO₂, N₂O, SO₂ and NO_x) are calculated from mass balance for SO₂ and CO₂, from station-specific emission factors for NO_x and from a generic emission factor for N₂O.

The emissions in the table below are for 2016/2017 financial year.

Table 1 Total emissions at Kriel Power Station 2016/2017

Power Station	Coal-fired emissions (tons/annum)	Fuel-oil emissions (tons/annum)	Total (tons/annum)
Kriel Power Station	CO ₂ : 15 903 598.00	CO ₂ : 79 358.00	CO ₂ : 15 982 956.00
	N ₂ O: 260.90	N ₂ O: not calculated	N ₂ O: 260.90
	PM: 9 625.23	PM: not calculated	PM: 9 625.23
	SO ₂ : 132 024.00	SO ₂ : 12.15	SO ₂ : 132 036.15
	NO _x : 92 414.00	NO _x : not calculated	NO _x : 92 414.00

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Table 2 Pollutant Emission Trends for 2016/2017

Month	PM (tons)	SO ₂ (tons)	NO _x (tons)	CO ₂ (tons)
Apr 2016	1 247.35	9 428.00	8 028.00	1 402 776.00
May 2016	581.27	11 674.00	8 090.00	1 402 148.00
Jun 2016	471.87	10 958.00	7 618.00	1 322 832.00
Jul 2016	764.09	11 150.00	8 149.00	1 406 885.00
Aug 2016	934.36	11 800.00	8 563.00	1 456 363.00
Sep 2016	1 151.49	12 364.00	8 172.00	1 420 146.00
Oct 2016	435.03	12 370.00	7 996.00	1 390 556.00
Nov 2016	751.01	10 477.00	7 133.00	1 227 709.00
Dec 2016	833.39	9 847.00	6 880.00	1 177 487.00
Jan 2017	767.02	10 036.00	6 637.00	1 153 953.00
Feb 2017	862.16	10 308.00	7 064.00	1 196 396.00
Mar 2017	826.19	11 613.00	8 084.00	1 346 347.00

Table 3 North and South Common Stack PM Emissions monthly average from Kriel Power Station

Month	North stack (mg/Nm ³)	South stack (mg/Nm ³)	Remarks
Apr 2016	157.26	158.7	NEMA section 30 submitted for both stacks – upset conditions resulted in monthly limit exceedance for both stacks.
May 2016	71.06	86.19	Both stacks within the licence limit; no incident reported.
Jun 2016	69.04	52.53	Both stacks within the licence limit; no incident reported.
Jul 2016	123.21	101.95	NEMA section 30 reports submitted for both North and South stacks; however, the reported incidents did not result into exceedance of monthly limit.
Aug 2016	107.04	135.06	North stack within the licence limit and no section 30 reported.
			NEMA section 30 report submitted for South stack; The incident resulted into emission limit exceedance.
Sep 2016	205.64	109.26	NEMA section 30 report submitted for North stack; The incident resulted into emission limit exceedance.
			NEMA section 30 report submitted for South stack; however, the reported incident did not result into exceedance of monthly limit.
Oct 2016	94.15	68.44	Both stacks within the licence limit; no incident reported.
Nov 2016	111.99	118.40	Both stacks within the licence limit; no incident reported.
Dec 2016	117.88	123.77	Both stacks within the licence limit; no incident reported.

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Jan 2017	107.86	128.98	North stack within the licence limit and no section 30 reported. NEMA section 30 report submitted for South stack; The incident resulted into emission limit exceedance.
Feb 2017	97.55	130.03	North stack within the licence limit and no section 30 reported. NEMA section 30 report submitted for South stack; The incident resulted into emission limit exceedance.
Mar 2017	132.66	119.66	NEMA section 30 report submitted for North stack; The incident resulted into emission limit exceedance. South stack within the licence limit and no section 30 reported.

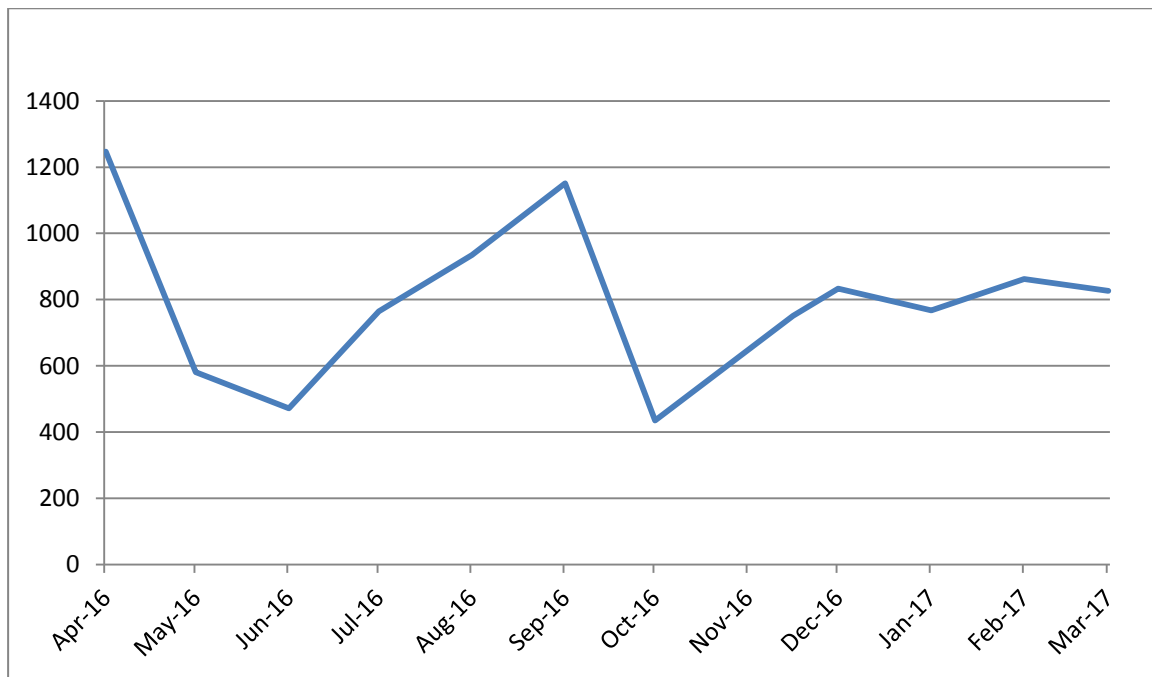


Figure 1 Monthly Particulate Emissions in tons from Kriel Power Station 2016/2017

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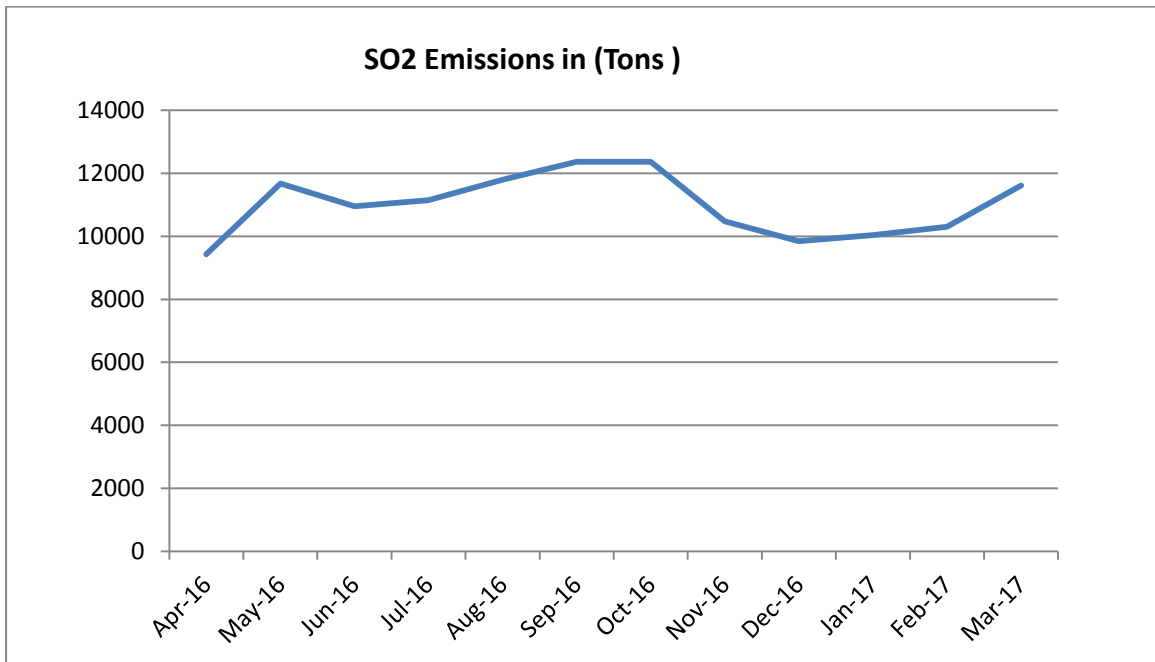


Figure 2 Monthly SO₂ Emissions in tons from Kriel Power Station 2016/2017

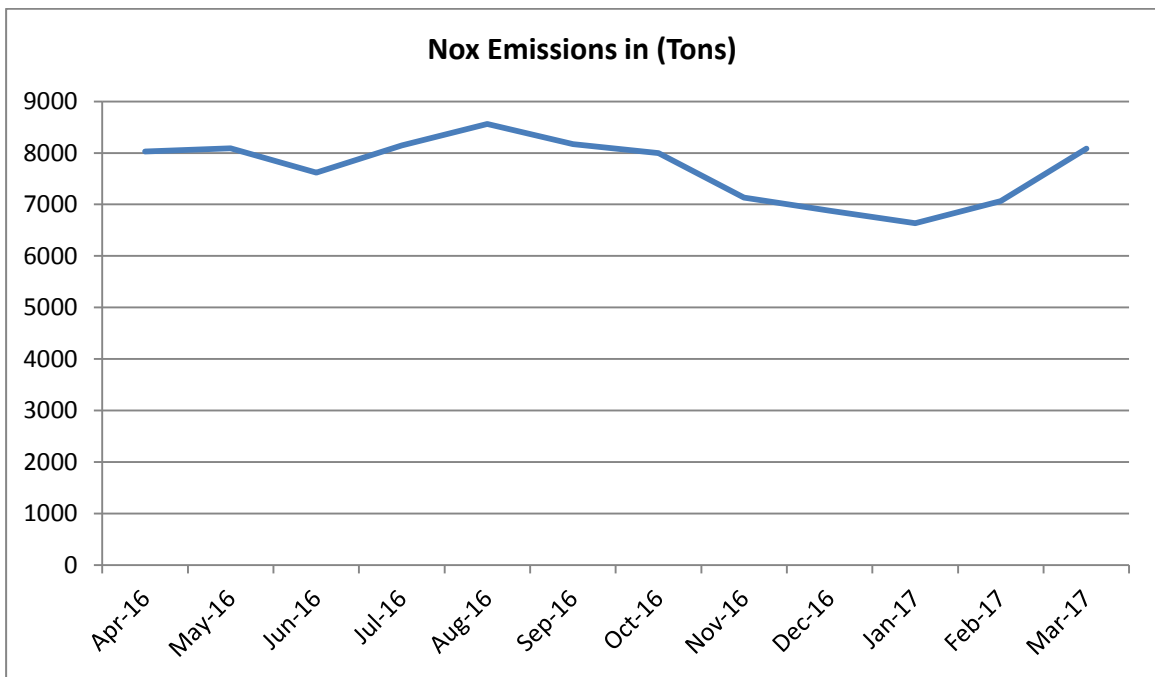


Figure 3 Monthly NO₂ Emissions in tons for Kriel Power Station 2016/2017

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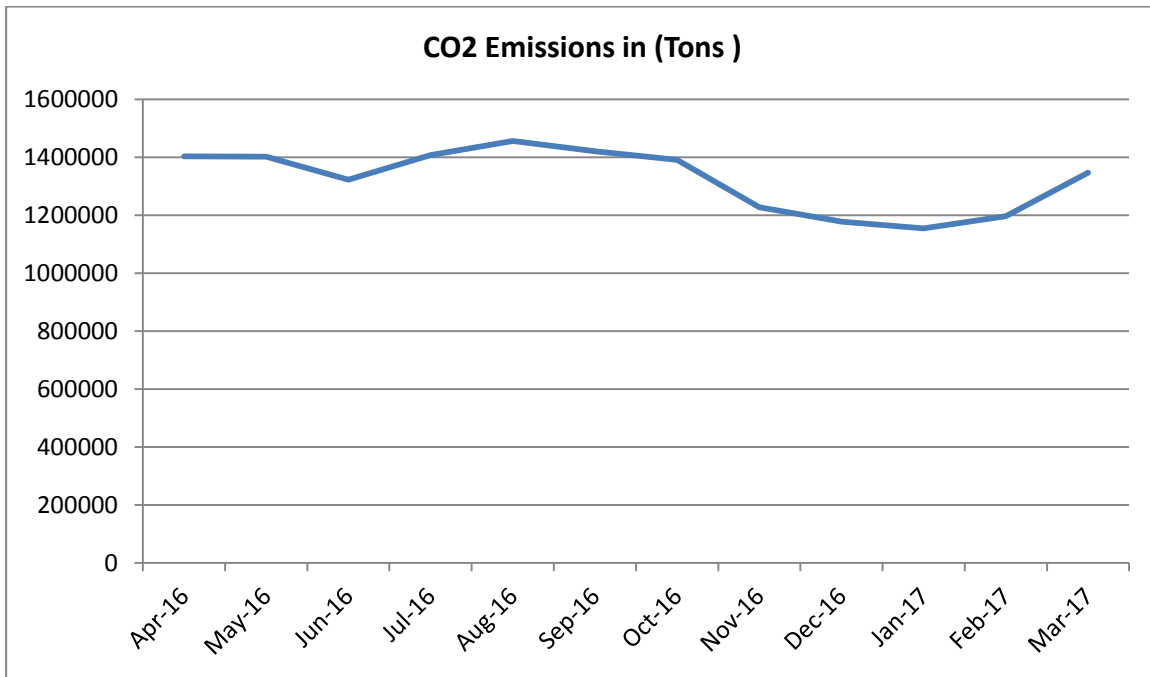


Figure 4 Monthly CO₂ Emissions in tons from Kriel Power Station 2016/2017

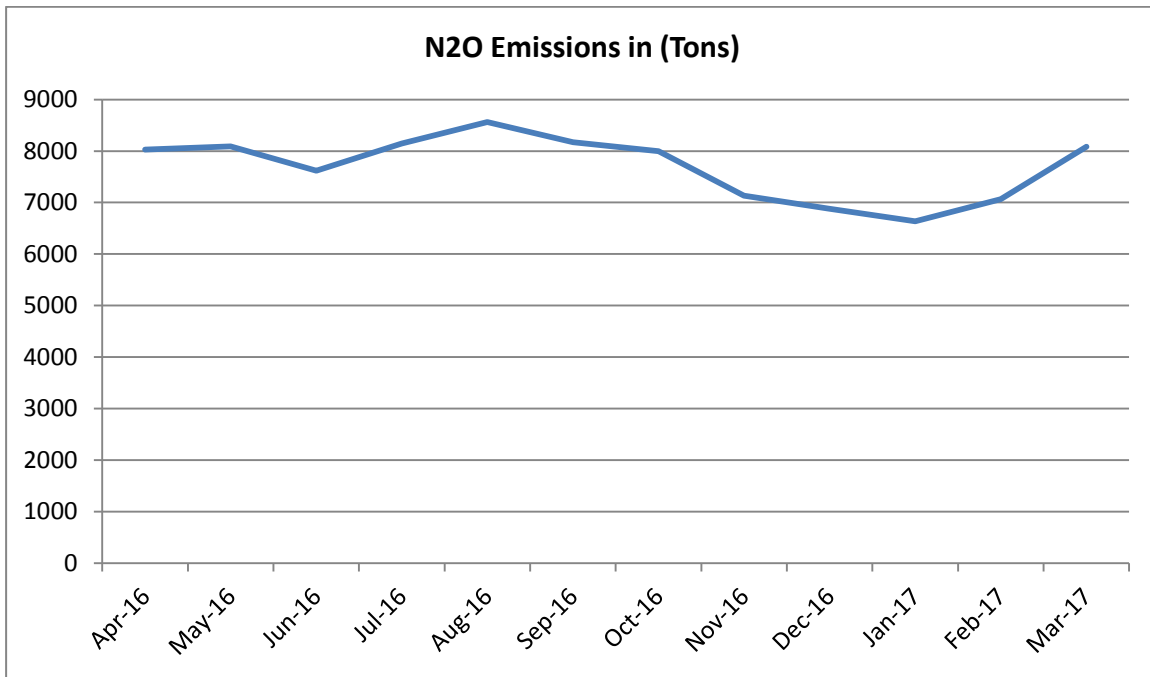


Figure 5 Monthly N₂O Emissions in tons from Kriel Power Station 2016/2017

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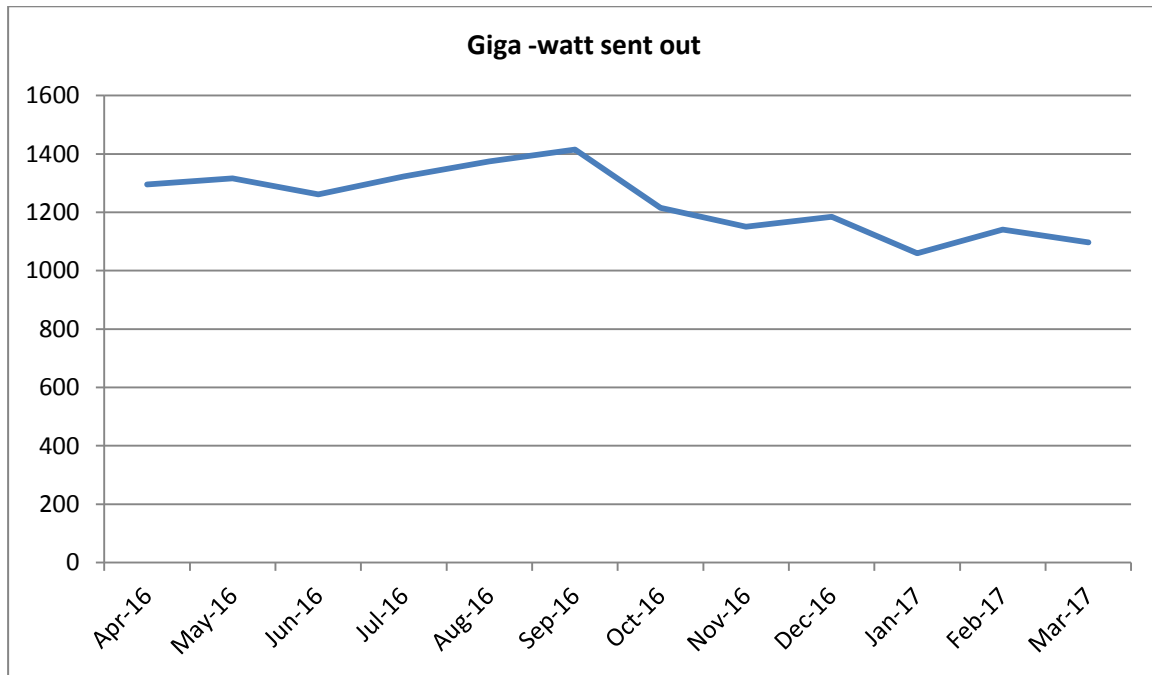


Figure 6 Monthly GWh sent out at Kriel Power Station 2016/2017

2. Compliance Audit Report (s):

CO₂ data verification audit was conducted during 2016/2017 financial year to verify CO₂ input material and associated measuring equipment.

3. Major upgrades projects:

The project of Installation of the new and effective transfer silos filtration boxes in Unit 1 &3 was completed in March 2017. The next upgrade will be installation of new high frequency transformers which is expected to commence in 2017/18 financial year.

4. Greenhouse gas emissions:

The CO₂ and N₂O emissions (Table 1 & 2) were high during the months of August and September 2016 and they decrease in November and December 2016. The CO₂ and N₂O trends correlate with the GW hours sent out per month. The minor discrepancies are primarily due to the variation in coal quality.

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5. NEMA Section 30 incidents as reported by in 2016/2017 FY

Table 4 NEMA Section 30 incidents reported as reported in 2016/17 financial year

S 30 DEA Reference Number:	submission date of initial notification	Root cause of the incident	Remediation Measure	Closing date of incident
14/13/9/5/3/2/984	25 - Apr -16	Unavailability of centag compressors 4 due to fouled intercoolers; resulted in low air pressure and subsequently seal failures at the dust handling plant	Installation of high frequency transformer Standby Compressor to be ready available on site	23/06/2016
14/13/9/5/3/2/983	25 - Apr -16	Unavailability of blow tank 3.2 resulting in the transfer silo reaching maximum level and subsequently high hopper alarms at unit 3	Installation drain system and compressor driers Installation of Hopper heater on unit DHP	23/06/2016
14/7/6/2/4/2/1033	22 –Jul -16	Compressed dries were out of commission and moisture in the air resulted in control equipment failures	Repair Dust Handling Plant control air dries Ensure all the moisture drains are functional Repair the damaged seals on unit 4,5 and 6 blow tank	28/09/2016
14/13/9/5/3/2/1031	22 –Jul -16	Compressed dries were out of commission and moisture in the air resulted in control equipment failures	Repair Dust Handling Plant control air dries Ensure all the moisture drains are functional Repair the damaged seals on unit 1, and 2 blow tank	28/09/2016
14/13/9/5/3/2/1032	29 – Aug -16	Insufficient compressed air pressure required for pneumatics system on DHP. Poor availability of unit 05	Commissioning standby compressor centac - 03 Replace SO3 blower and catalyst	28/09/2016

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		sulphur tri-oxide (SO3) plant also contributed to the incident		
14/7/6/2/4/2/1049	23 Sep 16	The conditioner shut out valve failure and higher hopper alarms.	Repair the conditioner automotive shut off valve	27/10/2016
			Clean ash spillage at 18A &B conveyer belts and return the belts to service	
			Install secondary slide gate	
			Take load loss	
14/7/6/2/4/2/1048	25 Sep 16	The conditioner shut out valve failure and higher hopper alarms.	Repair the conditioner automotive shut off valve	27/10/2016
			Clean ash spillage at 18A &B conveyer belts and return the belts to service	
			Install secondary slide gate	
			Take load loss	
14/7/6/2/4/2/109 & I3743012017	11 Jan 17	An intermitted short emanating from alternative 220 V supply. The analogue input 1 module was found to be defective, transmitting and displaying wrong values. The LV blower motor was burned, due to repeatedly starting the motor on a fault	Replacement of analogue input module and interposing relay	
			Replacement of thyristor park	
			Installation of PLC card protection from 22V Panel	
			Replacement of blower motor	
14/7/6/2/4/2/1113	28 feb 17	Damaged flexible hose for the SO3 flue gas injection lances resulting into a gas leak	Replace damaged flexible hoses	31/05/2017
			Revised maintenance strategy interval for SO3 plant hoses from 36 month to 18 month	
	24 Mar 17	Failure of the unit dosing plant pump on low sulphur flow and hopper alarms due to blow tank 2.1 vent pipe leaking	Operation Department to run the standby pump for unit 2	
			SGB cape to cover the exposed area on the unit 2 dosing pump in the pump house	
			Operating to drain the condensate drain valves from sulphur storage tank , pump house to 31mL once	

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			per shift	
			Kriel Management Team is embarking on strengthening emissions focus team for 30mg/Nm3, which will focus on the emissions abatement plant, sulphur trioxide (SO3), precipitators (ESP's) and dust handling plant (DHP)	

6. Emissions Monitor availability in terms of the minimum emissions standard annual reporting requirements

In terms of Section 17 & 18 of the Minimum Emissions Standards, it is a requirement that Kriel Power Station report on the availability of its continuous emissions monitors (PM, SO₂ and NO_x). The data for SO₂ and NO_x was not available on the South Stack from April – May 2017 due to a purge motor that was blown up. During the months of October and November 2017, the South Common Stack monitors failed due to the G-CEM 400 gas analyzer which had tripped and G-CEM 4000 cell temperature source was damaged resulting in an unreliable output signal. North Common Stack monitors were offline in September due to a rainstorm and a resulting power failure.

Table 4: Availability of Kriel Power Station continuous emission monitors in 2016/17 FY

	Monthly average monitor availability					
	North Stack			South Stack		
	PM	SOX	NOX	PM	SOX	NOX
Apr 16	100 %	80 %	80 %	100 %	15 %	15 %
May 16	100 %	100 %	100 %	100 %	73 %	15 %
Jun 16	100 %	100 %	100 %	100 %	70 %	71%
Jul 16	100 %	100 %	100 %	100 %	65 %	72 %
Aug16	100 %	100 %	100 %	100 %	80 %	80 %
Sept16	100 %	-	-	100 %	90 %	93 %
Oct 16	90.5 %	89.4 %	93.4 %	97.7 %	51.5 %	51.5 %
Nov 16	93.9 %	98.5 %	99 %	96.4 %	54.4 %	54.2 %
Dec 16	85.3 %	78.6 %	82.3 %	87.8 %	87.2 %	88.4 %
Jan 17	85.5 %	58.3 %	58.5 %	96.8 %	88 %	88.8 %
Feb 17	82.4 %	65.9 %	66.4 %	95.5 %	30.7 %	40.0 %
Mar 17	88.3 %	84.5 %	84.5 %	89.1 %	63.4 %	63.8 %

Average continuous emission monitors availability was above 80% for all parameters measures except SO_x and NO_x .The reasons for unavailability have been described above.

7. Correlation Reports

Particulate matter & parallel gaseous emission measurements were carried out on the flue of south of South Common Stack from the 21st December 2016 & 19 February 2017 by Ithuu Measurements CC. Sick Automation Southern Africa performed a calibration on the Sick SB100

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dust monitor on the 23rd of March 2016. The results of the measurements show that O2, SO2 and NO2 of the AMS on the South Stacks pass the variability test while CO2 of the AMS on South Stack fails the variability test. Furthermore a Correlation Report dated 10 March 2017 is submitted as part of annual emissions report to comply with Section 17 &18 of the minimum emission standard (Appendix A).

8. NAEIS reporting

Kiel Power Station submitted its annual report for 2016 onto the NAES system.

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

Hoping the above will meet your satisfaction.

Yours sincerely



Tshepiso Temo
PSM (acting): KRIEL POWER STATION