INTHUU MEASUREMENTS CC

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Date	Your Reference	Our Reference	Enquiries
02 June 2014	Purchase Order No.: 3070173784	RCCS210 QCCS2014 01 01 rev1	CC Scheepers Cell: 082 572 2380 e-mail: coen@inthuu.co.za

Madam

REPORT – 2014/04/21CCS221
KRIEL POWER STATION: EMISSION MONITOR CORRELATION ON THE SOUTH STACK

Herewith the finalized report for the correlation tests carried out on the South Stack at Kriel Power Station. Measurements were carried out over two periods: firstly from the 26th to 27th of March and again from the 8th until the 13th of April 2014.

We thank you for the opportunity to be of service and trust that your requirements have been interpreted correctly. If you have any queries, please contact us at the above numbers, we will gladly assist.

Yours faithfully
Inthuu Measurements cc

CC Scheepers

INTHUU MEASUREMENTS CC

Submitted by:	Checked by:	Approved by:
Signature:.....	Signature:.....	Signature:……..
CC Scheepers		**CC Scheepers**

REPORT

CUSTOMER	**:**	KRIEL POWER STATION
TITLE	:	CORRELATION OF THE EMISSION MONITOR SITUATED ON THE SOUTH STACK AT KRIEL POWER STATION
ORDER No.	:	3070173784
REPORT No.	:	2014/04/21CCS210
REPORT DATE	:	02 JUNE 2014

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SUMMARY

See next page

SUMMARY

Inthuu Measurements were contracted by Kriel Power Station to carry out emission monitor correlation measurements on the South Stack.

The monitor was calibrated by Sick Automation Southern Africa (Pty) Ltd on the 12th of December 2013. Inthuu Measurements did not have the opportunity to witness the calibration of the monitor prior to the tests. The survey was conducted over two periods: firstly from the 26th to 27th of March and was continued again between the 8th and the 13th of April 2014.

Weather conditions were favourable for testing on the common flue stack. Plant problems were however experienced throughout and the coal was often too wet to operate the boilers at the intended load.

Eleven of the seventeen tests performed were used to develop the linear regression. The correlation coefficient is higher than that required by the Eskom standard. The correlation coefficient may be improved if the stability of plant operation can be achieved.

Two analogue outputs from the dust monitor were available. Both channels were recorded and the correlation curves are based on the individual recordings. The particulate emissions are described by the formulae, $y_2 = m_2x_2 + c_2$ for the monitor's output AO 2 and by $y_3 = m_3x_3 + c_3$ for the monitor's output AO 3. The gas flow is given by $g = na + k$. Values for constants n and k are given in the Table below.

This table is applicable for Normalisation to 6% O_2

The South Stack	Emissions correlation curve constants				Gas flow correlation curve constants	
	m_2	c_2	m_3	c_3	n	k
	Range: 4 – 400 SL		Range: 0 – 1500 SL			
As found	9.044	-36.76	32.106	-127.14	0.9513	-0.5377
Correlation coefficient (R)	0.96		0.95		1.00	

Where

Y_2 = Emission [mg/Nm^3 (d) at 6% O_2]
Y_3= Emission [mg/Nm^3 (d) at 6% O_2]
X_2 = Monitor output AO2 [mA]
X_3= Monitor output AO3 [mA]
g = Gas flow [m^3/s] at Normalised to 6% O_2
a = Control Room indication of Total air flow [%]

This table is applicable for Normalisation to 10% O_2

The South Stack	Emissions correlation curve constants				Gas flow correlation curve constants	
	m_2	c_2	m_3	c_3	n	k
	Range: 4 – 400 SL		Range: 0 – 1500 SL			
As found	6.6322	-26.957	23.544	-93.236	1.2972	-0.7332
Unit 4					1.2936	-2.6452
Unit 5					1.2837	0.6672
Unit 6					1.2879	-0.7053
Correlation coefficient (R)	0.96		0.95		1.00	

Where

Y_2 = Emission [mg/Nm^3 (d) at 10% O_2]
Y_3= Emission [mg/Nm^3 (d) at 10% O_2]
X_2 = Monitor output AO2 [mA]
X_3= Monitor output AO3 [mA]
g = Gas flow [m^3/s] at Normalised to 10% O_2
a = Control Room indication of Total air flow [%]

Glossary

The following abbreviations were used in the text, tables and figures:

AO	Analogue Output
FFP	Fabric Filter Plant
MCR	Maximum Continuous Rating
°C	Degrees Celsius
Pa (g)	Gauge pressure in Pascal
kPa (abs)	Absolute pressure in kilo Pascal
% v/v	Percentage on a Volume-by-Volume basis
Am^3	**Actual** Cubic Metres
Nm^3	**Normal** Cubic Metres
Am^3(w)	**Actual** Cubic Metres on a wet basis
Nm^3(w)	**Normal** Cubic Metres on a wet basis
Am^3(d)	**Actual** Cubic Metres on a dry basis
Nm^3(d)	**Normal** Cubic Metres on a dry basis
ATPD	Actual Temperature and Pressure – Dry
NTPD	Normalised Temperature and Pressure - Dry
g/s	Grams per second
mg/s	Milligrams per second
ppm	Parts per million
Dp	Differential pressure
VDI	Verein Deutscher Ingenieure

- **'Actual'** refers to the measured temperature and pressure conditions of the gases in the duct.
- **'Normal'**refers to the actual conditions being normalised to 0 °C and 101,325 kPa.

1. INTRODUCTION

Inthuu Measurements were contracted by Kriel Power Station to carry out emission monitor correlation measurements on the South Stack. The survey was conducted over two periods: firstly from the 26th to 27th of March and was continued again between the 8th until the 13th of April 2014.

Sick Automation Southern Africa performed a calibration on the Sick SB100 dust monitor on the 12th of December 2013. Inthuu Measurements did not have the opportunity to witness the calibration of the monitor prior to the tests. Two analogue outputs from the dust monitor were available for recording monitor output.

Weather conditions were favourable for testing on the common flue stack. Plant problems were however experienced throughout and the coal was often too wet to run the boilers at the intended load.

This report shows the Emission Monitor correlation on a dry basis, normalized for Temperature and Pressure and also normalised to both 6 and 10% O_2.

2. METHOD OF MEASUREMENT

Particulate emission measurements were carried out employing procedures and equipment which comply with the requirements of EN 13284-1 (Reference 9.1).

Eskom's Technical note (Reference 9.2) is incorporated in Eskom's standard for Emission Monitoring and Reporting (Reference 9.3). Reference 9.3 was followed with particular reference to the Quartz micro-fibre high purity thimble filters.

The VDI correlation procedure (Reference 9.4) was followed in the determination of the confidence and tolerance bands of the linear regression.

3. PROCEDURES

Inthuu Measurements were contracted to provide the service of isokinetic dust sampling and reporting of results only. Inthuu was not required to perform any adjustments or optimisation on the boiler or ESPs for the purpose of the correlation tests. The plant was set up by Kriel Power Station personnel (it was in other words under the normal control of the operating personnel) and tested at the conditions presented and tabulated in this report.

Inthuu Measurements proposed the basis for a range of plant conditions according to which a variation in emissions could be achieved from which a linear regression would be developed. This included:

- Maximum load – Tests carried out during normal running conditions
- Maximum load – Tests carried out during soot blowing of the boilers
- Maximum load – Tests carried out while the excess air was set higher than the normal running condition to reduce the ESP efficiency for a higher range of emissions.
- Midrange load – Tests carried out at 80 % of the maximum possible load.
- Minimum load - Tests carried out at 60 % of the maximum possible load.

Boilers 4, 5 and 6 could not achieve the maximum rated load due to a variety of long term problems with the plant.

The excess air could not be increased due to limited ID fan capacity.

The soot blowing on the three boilers had to be staggered so that soot blowing would be in progress throughout the entire test period for that day.

Efforts to run at partial loads were fruitless as the demand for electricity dictated that the units could not reduce load for the sake of the tests.

The measurement range is 0.0 – 400 mg/Nm^3 for analogue output 1 (AO 2). The measurement range is 0.0 – 1500 mg/Nm^3 for analogue output 2 (AO 3).

The data logger used on the South Stack was of the dual channel configuration. The data logger was connected to both the output channels of the emission monitor for the recording of the monitor milliamp output signal during sampling. One channel was connected to AO 2 of the dust monitor and the other to AO 3.

17 tests were carried out at the plant conditions prevalent at the time of test. Only one test could not be carried out on the 27th of March 2014 due to bad weather conditions forcing the test teams off the stack for reasons of safety.

4. MONITOR INFORMATION AND CALIBRATIONS

The emissions values in Table 4.1 are given in mg/Nm^3 (d) **Normalised to 6% O_2**. The table gives the constants for the linear regression formula, which describes the emissions in accordance the dust monitor's channels No. 2 and 3 (AO 2 and AO3).

Table 4.1

Plant:	**Units 4, 5 & 6**	
Location of Monitor	South Stack	
Make:	SICK	
Model:	SB100	
Monitor serial number:	11198617	
MCU serial number:	11228520	
Channel	**Analogue Output AO 2:**	**Analogue Output AO 3:**
Measuring range	400	1500
DCS measuring range (mg/Nm3) at 6 %O_2	144.1	515.0
Output range (mA):	4 - 20	4 - 20
Info for DCS		
mA	Emission	Emission
4.00	-0.6	1.3
10.10	54.6	197.1
20.00	144.1	515.0
Constants for Linear function (mA)		
m_{mA} =	9.044	32.106
c_{mA} =	-36.76	-127.14

The emissions values in Table 4.2 are given in mg/Nm^3 (d) **Normalised to 10% O_2**. The table gives the constants for the linear regression formula, which describes the emissions in accordance the dust monitor's channels No. 2 and 3 (AO 2 and AO3).

Table 4.2

Plant:	**Units 4, 5 & 6**	
Location of Monitor	South Stack	
Make:	SICK	
Model:	SB100	
Monitor serial number:	11198617	
MCU serial number:	11228520	
Channel	**Analogue Output AO 2:**	**Analogue Output AO 3:**
Measuring range	400	1500
DCS measuring range (mg/Nm3) at 10 %O_2	105.7	377.6
Output range (mA):	4 - 20	4 - 20
Info for DCS		
mA	Emission	Emission
4.00	-0.4	0.9
10.10	40.0	144.6
20.00	105.7	377.6
Constants for Linear function (mA)		
m_{mA} =	6.6322	23.544
c_{mA} =	-26.957	-93.236

5. RESULTS

The South Stack test results at 6% O_2

The emissions values are measured in mg/Nm^3 on a dry basis normalised to 6 % O_2 and are described by the formulae for the monitor's channel No. 2 and 3.

Analogue Output 2 (Range: 0 – 400 mg/Nm^3)	Y = 9.044(x) – 36.76
Analogue Output 3 (Range: 0 – 1500 mg/Nm^3)	Y = 32.106(x) – 127.14
Gas flow curve	g = 0.9513(a) – 0.5377
Correlation co-efficient, R	R = 0.96
Face velocity	4.3 – 7.1 m/s
Iso-kineticity	91.2 – 104.3 %

Where

y = Emission [mg/Nm^3 (d) at 6% O_2].
x = Monitor output [mA]
g = gas flow [Nm^3/s (d) at 6% O_2]
a = Air flow recorded in the control room [kg/s]

The South Stack test results at 10% O_2

The emissions values are measured in mg/Nm^3 on a dry basis normalised to 10 % O_2 and are described by the formulae for the monitor's channel No. 2 and 3.

Analogue Output 2 (Range: 0 – 400 mg/Nm^3)	Y = 6.6322(x) – 26.957
Analogue Output 3 (Range: 0 – 1500 mg/Nm^3)	Y = 23.544(x) – 93.236
Gas flow curve Units 4, 5 & 6 combined	g = 1.2972 (a) – 0.7332
Gas flow curve Unit 4	g = 1.2936 (a) – 2.6452
Gas flow curve Unit 5	g = 1.2837 (a) – 0.6672
Gas flow curve Unit 6	g = 1.2879 (a) – 0.7053
Correlation co-efficient, R	R = 0.96
Face velocity	4.3 – 7.1 m/s
Iso-kineticity	91.2 – 104.3 %

Where

y = Emission [mg/Nm^3 (d) at 10% O_2].
x = Monitor output [mA]
g = gas flow [Nm^3/s (d) at 10% O_2]
a = Air flow recorded in the control room [kg/s]

Figures:

- **Figure** 1 - Emission Monitor correlation curve normalised to 6% O_2
- **Figure** 2 - The relationship between Air flow and gas flow normalised to 6% O_2
- **Figure** 3 - Emission Monitor correlation curves normalised to 10% O_2.
- **Figure** 4 - The relationship between Air flow and gas flow normalised to 10% O_2
- **Figure 5** - The relationship between Air flow and gas flow normalised to 10% O_2 for individual units.

Appenices:

- **Appendix A** - Detailed results of the correlation tests
  - Tables A1 & A2
- **Appendix B** - Monitor calibration certificate
- **Appendix C** -Plant parameters
  - Tables C1 and C2
- **Appendix D** - Plant Status Reports
  - Provided by Ms. Nombuso Gasa on a daily basis.

6. DISCUSSION

Weather conditions were favourable for testing on the common flue stack. Bad weather influenced testing procedures only on the 27th of March 2014. Only two tests could be performed and the field blank procedure could not be carried out as the stack had to be vacated due to lightning.

The Statistical correlation co-efficient is 0.95, which complies with the requirements of the Eskom standard. The correlation coefficient can improve if the plant could be operated with fewer disturbances. Erratic boiler operation prevents the ESPs from settling into a steady emission.

Erratic operations include:

1. Boiler load changed during the tests.
2. Boiler ashing must happen between tests.
3. Boiler load varied from day to day and also between tests on a particular day.

4. Coal was frequently too wet to sustain the load intended for the tests condition on the day.
5. From the attached Plant Status Reports it can be seen that the ESPs were not performing at an optimal condition.
6. The spread of high and low emissions were limited due to the load requirements necessitating full load on days when 80 or 60 %MCR was arranged.

7. RECOMMENDATIONS

It is recommended that:

- The emissions are reported to AEL using the formulae given in report.

8. ACKNOWLEDGEMENTS

The author expresses appreciation for the co-operation and assistance provided by Ms. Nombuso Gasa and the operating personnel on Units 4, 5 and 6 at Kriel Power Station during the test period.

9. REFERENCES

9.1 BS EN 13284-1: 2002, Stationary source emissions – Determination of low range mass concentration of dust.
9.2 Hansen, RS 1985, Iso-kinetic Dust Sampling Train as Developed by Mechanical Test & Research Rosherville, TR/M85/006.
9.3 Unique Identifier: 474-187 Standard for Emission Monitoring and Reporting Revision: 1
9.4 VDI 2066, Part 4, January 1989, Measurement of Particulate Matter in Flowing Gases – Determination of Dust load by Continuous Measurement of optical Transmission

KRIEL POWER STATION

Emission Monitor Correlation Certificate

Plant: Units 4, 5 & 6
Location of monitor: South Stack
Monitor information:
Make of Monitor: Sick
Model: SB100
Serial Numbers:
Optical head: 11198617
MCU: 11228520

Limits of validity:
Lower limit 61.98 Nm3/s (d) at 6 %O_2 [as an hourly average]
Upper limit 115.18 Nm3/s (d) at 6 %O_2 [as an hourly average]
Hourly cycle checks are not included in linear regression

Operational data:
Path length: Not measured mm [Stack flange to Stack flange]
Monitor range: 4 - 20 mA
Analogue Output AO 2: 400 SL
Analogue Output AO 3: 1500 SL AEL Limit 125 mg/Nm3@6% O2

Dates:
Calibration date: 12-Dec-13
Correlation dates: 26 - 27 March and 08 - 13 April 2014

Linear function:
E_{AO2} = 9.044x - 36.76 Correlation coefficient(R) = 0.96
E_{AO3} = 32.106x - 127.14
where: E = Emission [mg/Nm^3(d)@ 6% O_2]
x = Monitor output [mA]

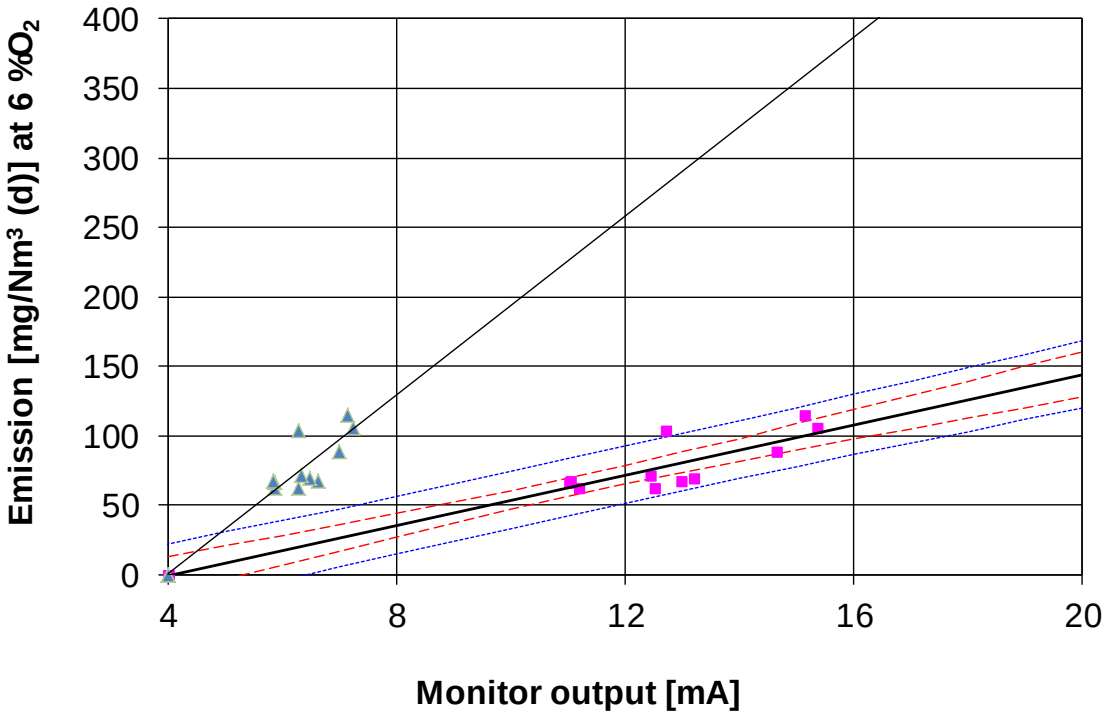

FIGURE 1

Prepared by:

Inthuu Measurements

KRIEL POWER STATION

Stack Gas Flow Correlation Certificate

Plant: Units 4, 5 & 6
Location of monitor: South Stack
Monitor information:
Make of Monitor: Kriel DCS
Model: N/A
Serial Numbers:
Optical head: N/A
Reflector: N/A

Limits of validity:
Lower limit 1317.8 Nm3/s (d) at 6 %O_2 [as an hourly average]
Upper limit 1513.8 Nm3/s (d) at 6 %O_2 [as an hourly average]

Operational data:
Stack internal diameter 17.1 m
Monitor range: N/A -

Dates:
Calibration date: N/A
Correlation dates: 26 - 27 March and 08 - 13 April 2014

Linear function:
g = 0.9513a - 0.5377 Correlation coefficient(R) = 1.00

where: g = Stack exit gas flow [$Nm^3/s(d)$@ 6 % O_2]
a = Total air flow from DCS [kg/s]

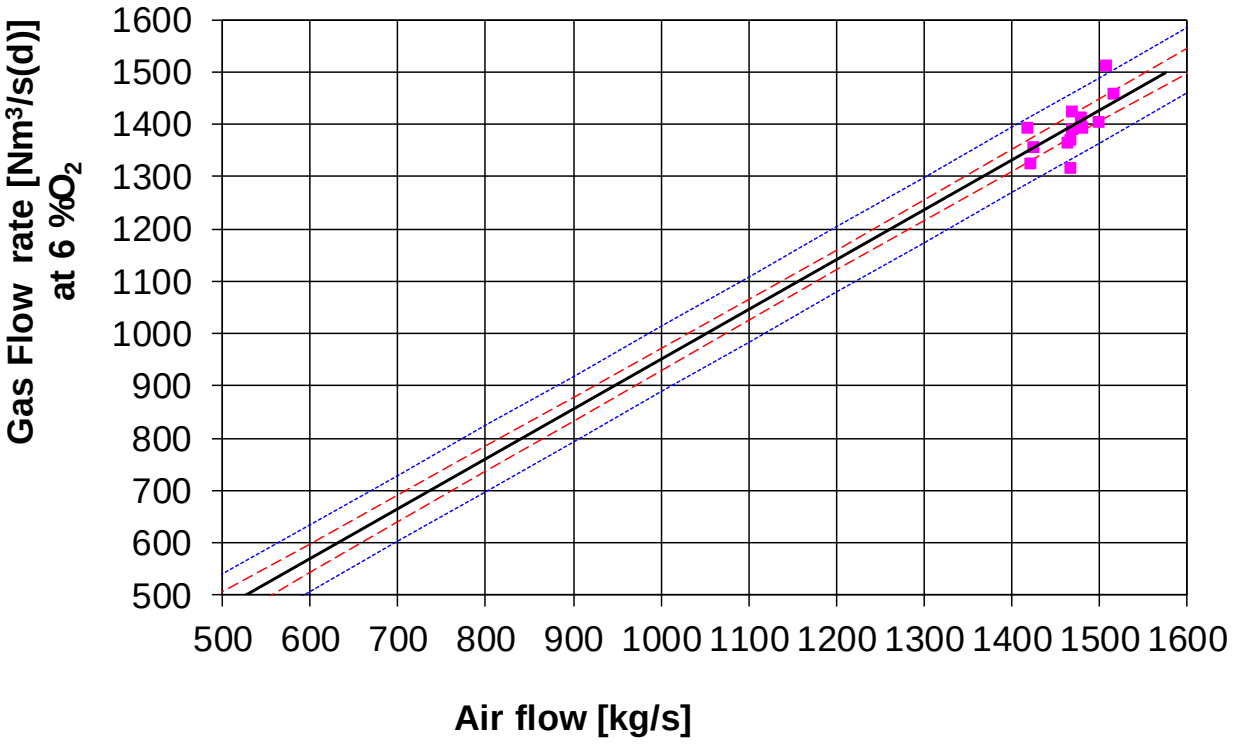

FIGURE 2

Prepared by:

Inthuu Measurements

KRIEL POWER STATION

Emission Monitor Correlation Certificate

Plant: Units 4, 5 & 6
Location of monitor: South Stack
Monitor information:

Make of Monitor: Sick
Model: SB100
Serial Numbers:
Optical head: 11198617
MCU: 11228520

Limits of validity:

Lower limit 45.45 Nm3/s (d) at 10 %O_2 [as an hourly average]
Upper limit 84.46 Nm3/s (d) at 10 %O_2 [as an hourly average]
Hourly cycle checks are not included in linear regression

Operational data:

Path length: Not measured mm [Stack flange to Stack flange]
Monitor range: 4 - 20 mA
Analogue Output AO 2: 400 SL
Analogue Output AO 3: 1500 SL AEL Limit 125 mg/Nm3@10% O2

Dates:

Calibration date: 12-Dec-13
Correlation dates: 26 - 27 March and 08 - 13 April 2014

Linear function:

E_{AO2} = 6.6322x - 26.957 Correlation coefficient(R) = 0.96
E_{AO3} = 23.544x - 93.236
where: E = Emission [mg/Nm^3(d)@ 10% O_2]
x = Monitor output [mA]

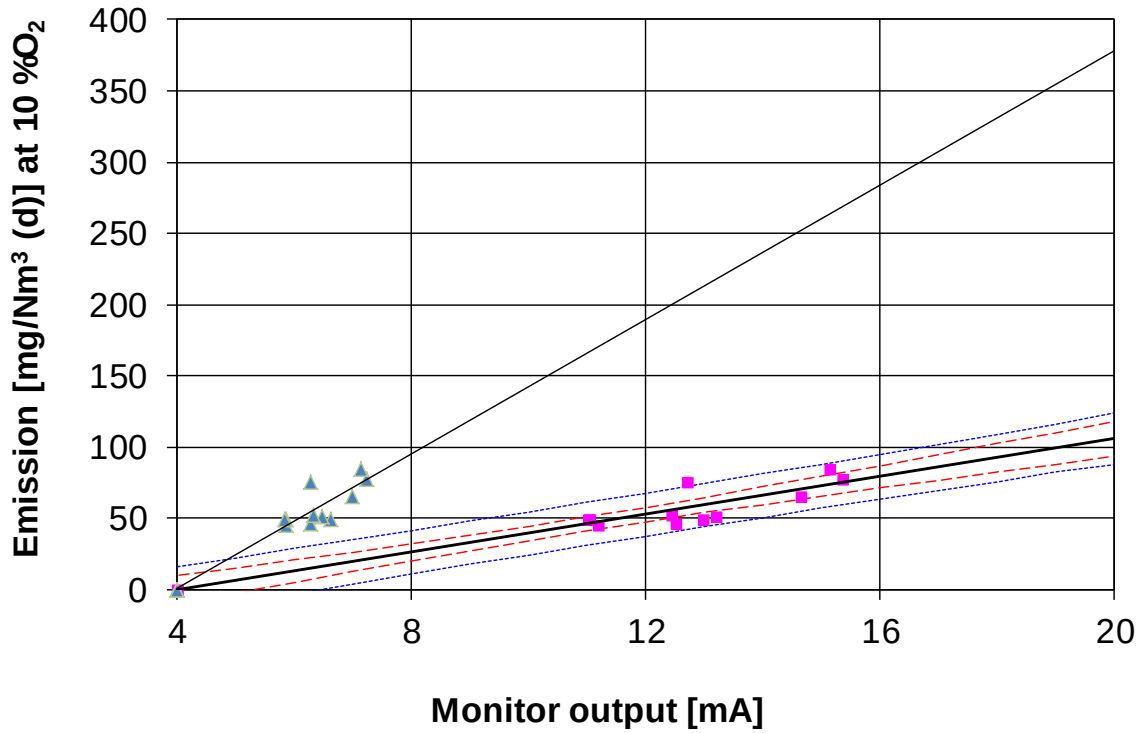

FIGURE 3

Prepared by:

Inthuu Measurements

KRIEL POWER STATION

Stack Gas Flow Correlation Certificate

Plant: Units 4, 5 & 6
Location of monitor: South Stack
Monitor information:
Make of Monitor: Kriel DCS
Model: N/A
Serial Numbers:
Optical head: N/A
Reflector: N/A

Limits of validity:
Lower limit 1796.9 Nm3/s (d) at 10 %O_2 [as an hourly average]
Upper limit 2064.3 Nm3/s (d) at 10 %O_2 [as an hourly average]

Operational data:
Stack internal diameter 17.1 m
Monitor range: N/A -

Dates:
Calibration date: N/A
Correlation dates: 26 - 27 March and 08 - 13 April 2014

Linear function:
g =1.2972a - 0.7332 Correlation coefficient(R) = 1.00

where: g = Stack exit gas flow [$Nm^3/s(d)$@ 10 % O_2]
a = Total air flow from DCS [kg/s]

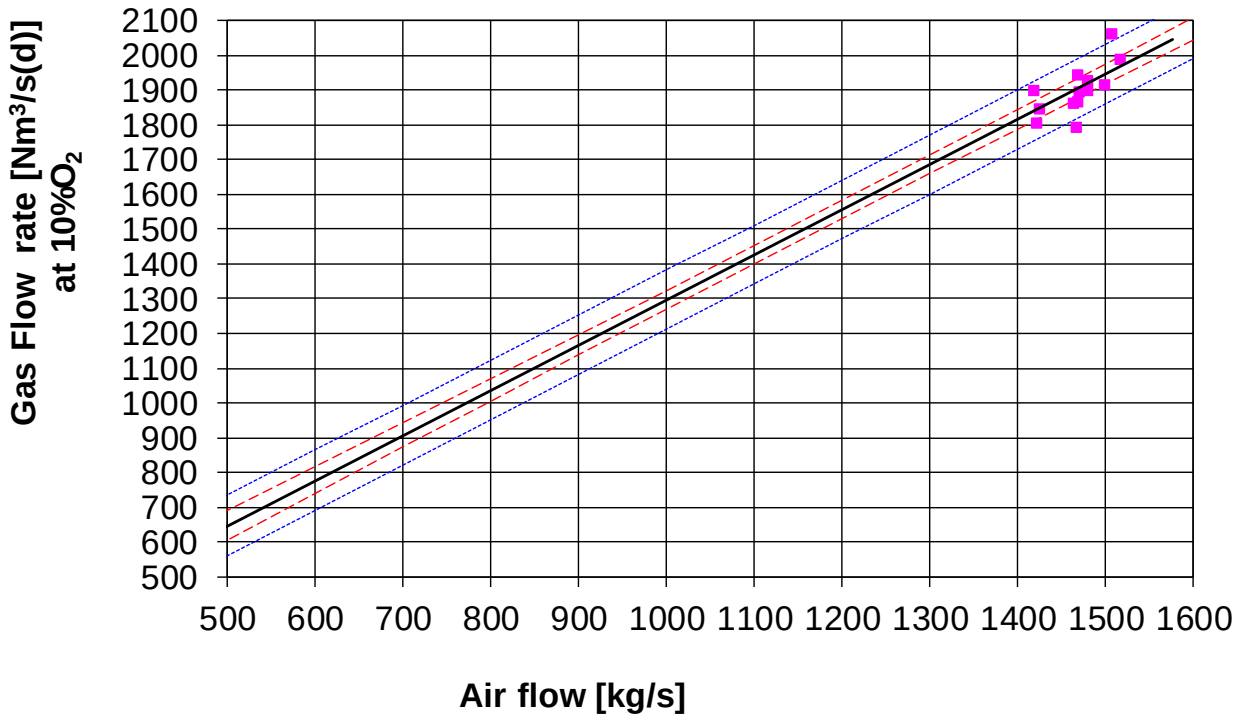

FIGURE 4

Prepared by:

Inthuu Measurements

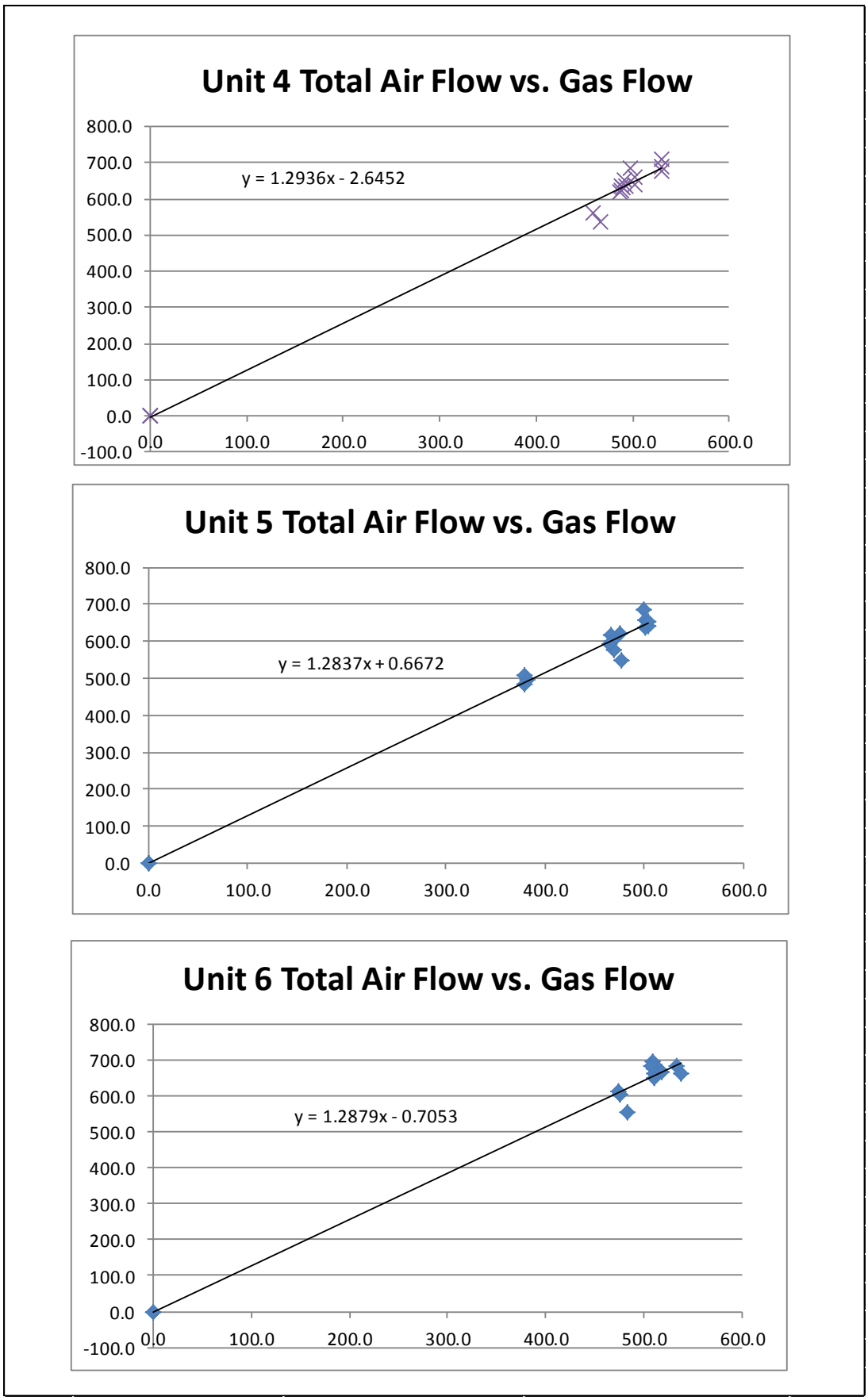
Unit 4 Total Air Flow vs. Gas Flow
y = 1.2936x - 2.6452
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
-100.0
0.0
100.0
200.0
300.0
400.0
500.0
600.0
Unit 5 Total Air Flow vs. Gas Flow
y = 1.2837x + 0.6672
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
0.0
100.0
200.0
300.0
400.0
500.0
600.0
Unit 6 Total Air Flow vs. Gas Flow
y = 1.2879x - 0.7053
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
-100.0
0.0
100.0
200.0
300.0
400.0
500.0
600.0

FIGURE 5

APPENDIX A

DETAILED ISOKINETIC DUST SAMPLING RESULTS

Table A1

Test No.		1	1	1	2	2	2	3	3	3
Stack tester:		AVM	KWM	Summary	AVM	KWM	Summary	AVM	KWM	Summary
Date	yy-mm-dd	2014//03/26	2014/03/26	2014/03/26	2014/03/26	2014/03/26	2014/03/26	2014/03/26	2014/03/26	2014/03/26
Start Time	HH:mm	10H30	10H53	10H30	10H30	13H15	10H30	15H20	15H15	15H15
End Time	HH:mm	11H49	11H59	11H59	11H49	14H26	14H26	16H34	16H20	16H34
Boiler load	MW	As found	As found	As found	As found	As found	As found	As found	As found	As found
Outlet Conditions.										
Gas Temperature	°C	121.4	119.2	120.3	119.3	121.1	120.2	121.7	120.6	121.1
Barometric pressure	kPa (g)	81.8	82.0	81.9	83.0	81.7	82.3	81.5	81.6	81.5
Duct pressure	Pa	-102.3	-123.2	-112.8	-103.8	-102.4	-103.1	-151.5	-114.9	-133.2
Duct pressure	kPa (abs)	81.7	81.8	81.8	82.9	81.6	82.2	81.3	81.5	81.4
Moisture Mass	mg	39.2	27.5	33.4	34.0	34.0	34.0	29.0	31.0	30.0
Moisture	%v/v	4.5	4.1	4.3	5.1	5.0	5.1	4.5	4.3	4.4
Oxygen	%	9.6	9.7	9.6	9.6	10.0	9.8	10.3	10.6	10.5
Velocity	m/s	17.77	14.74	16.26	17.60	14.19	15.90	17.83	15.12	16.48
Duct area	m2	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52
Gas Volume Flow (Qact)	Am3/s	4078.82	3383.82	3731.32	4040.75	3256.45	3648.60	4092.63	3471.53	3782.08
Gas Volume Flow (Qnw)	Nm3/s	2277.02	1903.17	2090.10	2300.06	1816.51	2058.29	2272.03	1936.75	2104.39
Gas Volume Flow (Qnd)	Nm3/s	2174.26	1824.29	1999.62	2183.27	1725.00	1954.18	2170.74	1853.14	2012.06
Gas Volume Flow (Qnd)	Nm3/s @ 6% O_2	1655.09	1373.53	1513.84	1661.95	1264.07	1459.79	1547.99	1284.02	1414.48
Gas Volume Flow (Qnd)	Nm3/s @ 10% O_2	2256.94	1873.00	2064.33	2266.30	1723.73	1990.62	2110.89	1750.93	1928.84
Gas flow rate	kg/s	2694.54	2471.56	2583.05	2721.83	2371.10	2546.47	2694.54	2505.20	2599.87
Thimbles used		OE2	OE 1		OE4	OE 3		OE6	OE 5	
Gas density in duct	kg/m3	0.721	0.730	0.726	0.736	0.728	0.732	0.719	0.722	0.720
Sampling time	Minutes	60	60	60	60	60	60	60	60	60
Nozzle diameter	mm	6.5	6.0		5.5	6.0		5.5	6.0	
Field Blank used		OE8	OE 7		OE8	OE 7		OE8	OE 7	
Mass gain by F/B	mg	-2.42	-2.40	-4.83	-2.42	-2.40	-4.83	-2.43	-2.46	-4.89
Mass in Rinse	mg									
Mass in Filter	mg	89.93	95.74	185.66	83.77	60.36	144.13	59.40	54.32	113.73
Dust mass	mg	92.35	98.14	190.49	86.19	62.76	148.95	61.84	56.78	118.62
Gas Volume Sampled (Vact)	Am3 (w)	1.9391	1.4688	3.4079	1.4660	1.5063	2.9723	1.4588	1.6025	3.0613
Gas Volume Sampled (Vnw)	Nm3 (w)	1.0814	0.8261	1.9075	0.8337	0.8402	1.6739	0.8099	0.8940	1.7039
Gas Volume Sampled (Vad)	Am3 (d)	1.8516	1.4079	3.2595	1.3916	1.4304	2.8220	1.3938	1.5333	2.9271
Gas Volume Sampled (Vnd)	Nm3 (d)	1.0326	0.7918	1.8245	0.7913	0.7979	1.5892	0.7738	0.8554	1.6292
Dust Concentration	mg/Am3 (w)	47.6	66.8	55.9	58.8	41.7	50.1	42.4	35.4	38.7
Dust Concentration	mg/Nm3 (w)	85.4	118.8	99.9	103.4	74.7	89.0	76.4	63.5	69.6
Dust Concentration	mg/Am3 (d)	49.9	69.7	58.4	61.9	43.9	52.8	44.4	37.0	40.5
Dust Concentration	mg/Nm3 (d)	89.4	123.9	104.4	108.9	78.7	93.7	79.9	66.4	72.8
Measured O2	%	9.6	9.7	9.6	9.6	10.0	9.8	10.3	10.6	10.5
O2 @ 6 %		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
O2 @ 10 %		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Correction factor		1.3	1.3	1.3	1.3	1.4	1.3	1.4	1.4	1.4
Correction factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0
Dust Concentration Normalised to 6% O2	mg/Nm3 (d) @ 6% O2	117.5	164.6	137.9	143.1	107.3	125.5	112.1	95.8	103.6
Dust Concentration Normalised to 10% O2	mg/Nm3 (d) @ 10% O2	86.2	120.7	101.1	104.9	78.7	92.0	82.2	70.3	75.9
Outlet Dust Flowrate	mg/s	194258.6	226101.2	208572.4	237564.9	135690.0	182846.9	173479.0	123004.1	146544.3
Moisture Concentration	mg/Nm3 (d)	38.0	34.7	36.3	43.0	42.6	42.8	37.5	36.2	36.9
Average Face velocity	cm/s	7.1	5.0	6.1	5.1	4.9	5.0	5.1	5.2	5.2
Isokineticity	%	91.2	97.9	94.6	97.3	104.3	100.8	95.7	104.1	99.9
Average O/M Signal AO 1	% of output			6.96			6.64			6.27
Average O/M Signal AO 2	% of output			14.75			13.99			12.71

Table A2

Test No.		4	4	4	5	5	5
Stack tester:		AVM	KWM	Summary	AVM	KWM	Summary
Date	yy-mm-dd	2014/03/27	2014/03/27	2014/03/27	2014/03/27	2014/03/27	2014/03/27
Start Time	HH:mm	12H15	10H32	10H32	12H15	12H15	12H15
End Time	HH:mm	11H45	11H37	11H37	13H30	13H23	13H23
Boiler load	MW	As found	As found	As found	As found	As found	As found
Outlet Conditions.							
Gas Temperature	°C	115.0	114.3	114.7	116.5	116.3	116.4
Barometric pressure	kPa (g)	82.0	82.1	82.0	81.9	81.9	81.9
Duct pressure	Pa	-132.4	-108.2	-120.3	-144.9	-104.1	-124.5
Duct pressure	kPa (abs)	81.8	82.0	81.9	81.7	81.8	81.8
Moisture Mass	mg	32.0	40.0	36.0	34.5	33.5	34.0
Moisture	%v/v	5.5	5.6	5.6	5.7	4.7	5.2
Oxygen	%	9.7	9.4	9.6	9.8	10.3	10.1
Velocity	m/s	15.47	14.89	15.18	15.97	15.14	15.56
Duct area	m2	229.52	229.52	229.52	229.52	229.52	229.52
Gas Volume Flow (Qact)	Am3/s	3550.44	3418.01	3484.23	3666.51	3474.23	3570.37
Gas Volume Flow (Qnw)	Nm3/s	2017.98	1948.87	1983.43	2073.20	1968.27	2020.73
Gas Volume Flow (Qnd)	Nm3/s	1906.80	1839.48	1873.12	1955.03	1875.25	1915.40
Gas Volume Flow (Qnd)	Nm3/s @ 6% O_2	1430.65	1419.35	1425.34	1458.28	1333.17	1395.22
Gas Volume Flow (Qnd)	Nm3/s @ 10% O_2	1950.88	1935.48	1943.65	1988.57	1817.96	1902.57
Gas flow rate	kg/s	2395.97	2541.00	2468.49	2447.67	2556.10	2501.88
Thimbles used		OE10	OE 9		OE12	OE 11	
Gas density in duct	kg/m3	0.737	0.743	0.740	0.729	0.736	0.733
Sampling time	Minutes	60	60	60	60	60	60
Nozzle diameter	mm	5.5	6.0		5.5	6.0	
Field Blank used							
Mass gain by F/B	mg			0.00			0.00
Mass in Rinse	mg						
Mass in Filter	mg	35.2	36.5	71.71	57.7	61.7	119.41
Dust mass	mg	35.20	36.51	71.71	57.72	61.69	119.41
Gas Volume Sampled (Vact)	Am3 (w)	1.2723	1.5559	2.8282	1.3327	1.5579	2.8906
Gas Volume Sampled (Vnw)	Nm3 (w)	0.7231	0.8872	1.6103	0.7536	0.8826	1.6361
Gas Volume Sampled (Vad)	Am3 (d)	1.2022	1.4686	2.6708	1.2567	1.4842	2.7410
Gas Volume Sampled (Vnd)	Nm3 (d)	0.6833	0.8374	1.5206	0.7106	0.8409	1.5515
Dust Concentration	mg/Am3 (w)	27.7	23.5	25.4	43.3	39.6	41.3
Dust Concentration	mg/Nm3 (w)	48.7	41.2	44.5	76.6	69.9	73.0
Dust Concentration	mg/Am3 (d)	29.3	24.9	26.9	45.9	41.6	43.6
Dust Concentration	mg/Nm3 (d)	51.5	43.6	47.2	81.2	73.4	77.0
Measured O2	%	9.7	9.4	9.6	9.8	10.3	10.1
O2 @ 6 %		6.0	6.0	6.0	6.0	6.0	6.0
O2 @ 10 %		10.0	10.0	10.0	10.0	10.0	10.0
Correction factor		1.3	1.3	1.3	1.3	1.4	1.4
Correction factor		1.0	1.0	1.0	1.0	1.0	1.0
Dust Concentration Normalised to 6% O2	mg/Nm3 (d) @ 6% O2	68.7	56.5	62.0	108.9	103.2	105.7
Dust Concentration Normalised to 10% O2	mg/Nm3 (d) @ 10% O2	50.4	41.4	45.4	79.9	75.7	77.5
Outlet Dust Flowrate	mg/s						
Moisture Concentration	mg/Nm3 (d)	46.8	47.8	47.3	48.5	39.8	44.2
Average Face velocity	cm/s	4.5	5.1	4.8	4.6	5.2	4.9
Isokineticity	%	96.2	102.7	99.4	97.5	101.1	99.3
Average O/M Signal AO 1	% of output			5.86			7.24
Average O/M Signal AO 2	% of output			11.18			15.36

Table A3

Test No.		6	6	6	8	7	7	8	8	8
Stack tester:		MTM	AVM	Summary	MTM	AVM	Summary	MTM	AVM	Summary
Date	yy-mm-dd	2014/04/08	2014/04/08	2014/04/08	2014/04/08	2014/04/08	2014/04/08	2014/04/08	2014/04/08	2014/04/08
Start Time	HH:mm	12H15	11H20	11H20	13H00	13H00	13H00	15H20	15H21	15H20
End Time	HH:mm	13H30	12H28	12H28	14H15	14H02	14H15	16H31	16H27	16H31
Boiler load	MW	As found	As found	As found	As found	As found	As found	As found	As found	As found
Outlet Conditions.										
Gas Temperature	°C	116.5	110.1	113.3	111.0	110.1	110.5	111.8	111.5	111.6
Barometric pressure	kPa (g)	81.9	82.7	82.3	82.6	82.5	82.5	82.6	82.5	82.5
Duct pressure	Pa	-144.9	-118.2	-131.6	-139.0	-125.7	-132.4	-144.0	-122.4	-133.2
Duct pressure	kPa (abs)	81.7	82.5	82.1	82.4	82.4	82.4	82.4	82.4	82.4
Moisture Mass	mg	34.5	38.0	36.3	36.0	37.0	36.5	32.0	33.0	32.5
Moisture	%v/v	5.8	5.5	5.6	6.0	5.3	5.7	5.4	4.7	5.1
Oxygen	%	9.8	10.1	9.9	10.4	10.2	10.3	10.9	10.2	10.5
Velocity	m/s	15.97	14.48	15.23	15.48	14.92	15.20	15.11	15.13	15.12
Duct area	m2	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52
Gas Volume Flow (Qact)	Am3/s	3666.51	3323.75	3495.13	3552.88	3424.58	3488.73	3468.33	3473.84	3471.09
Gas Volume Flow (Qnw)	Nm3/s	2073.20	1929.89	2001.54	2054.87	1984.69	2019.78	2002.05	2004.92	2003.49
Gas Volume Flow (Qnd)	Nm3/s	1953.61	1823.75	1888.78	1930.75	1880.26	1905.64	1892.98	1911.62	1902.30
Gas Volume Flow (Qnd)	Nm3/s @ 6% O_2	1457.23	1330.45	1393.38	1361.02	1351.12	1356.34	1273.34	1378.88	1325.88
Gas Volume Flow (Qnd)	Nm3/s @ 10% O_2	1987.13	1814.25	1900.06	1855.93	1842.44	1849.55	1736.37	1880.29	1808.02
Gas flow rate	kg/s	2447.67	2506.25	2476.96	2421.95	2559.97	2490.96	2357.04	2588.99	2473.01
Thimbles used		OE14	OE 13		OE16	OE 15		OE18	OE 17	
Gas density in duct	kg/m3	0.729	0.754	0.742	0.745	0.748	0.746	0.742	0.745	0.744
Sampling time	Minutes	60	60	60	60	60	60	60	60	60
Nozzle diameter	mm	5.5	6.0		5.5	6.0		5.5	6.0	
Field Blank used		OE20	OE19		OE20	OE19		OE20	OE19	
Mass gain by F/B	mg	-0.77	-1.40	-2.17	-0.77	-1.40	-2.17	-0.77	-1.40	-2.17
Mass in Rinse	mg									
Mass in Filter	mg	34.5	39.0	73.49	60.3	62.7	122.98	87.9	59.6	147.58
Dust mass	mg	35.27	40.39	75.65	61.03	64.12	125.15	88.71	61.04	149.75
Gas Volume Sampled (Vact)	Am3 (w)	1.3169	1.4815	2.7985	1.2830	1.5106	2.7936	1.2669	1.5297	2.7966
Gas Volume Sampled (Vnw)	Nm3 (w)	0.7447	0.8602	1.6049	0.7420	0.8755	1.6175	0.7313	0.8829	1.6142
Gas Volume Sampled (Vad)	Am3 (d)	1.2410	1.4001	2.6410	1.2055	1.4311	2.6366	1.1979	1.4585	2.6564
Gas Volume Sampled (Vnd)	Nm3 (d)	0.7017	0.8129	1.5146	0.6972	0.8294	1.5266	0.6915	0.8418	1.5332
Dust Concentration	mg/Am3 (w)	26.8	27.3	27.0	47.6	42.4	44.8	70.0	39.9	53.5
Dust Concentration	mg/Nm3 (w)	47.4	47.0	47.1	82.2	73.2	77.4	121.3	69.1	92.8
Dust Concentration	mg/Am3 (d)	28.4	28.8	28.6	50.6	44.8	47.5	74.1	41.9	56.4
Dust Concentration	mg/Nm3 (d)	50.3	49.7	49.9	87.5	77.3	82.0	128.3	72.5	97.7
Measured O2	%	9.8	10.1	9.9	10.4	10.2	10.3	10.9	10.2	10.5
O2 @ 6 %		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
O2 @ 10 %		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Correction factor		1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.4
Correction factor		1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1
Dust Concentration Normalised to 6% O2	mg/Nm3 (d) @ 6% O2	67.4	68.1	67.7	124.2	107.6	115.2	190.7	100.5	140.1
Dust Concentration Normalised to 10% O2	mg/Nm3 (d) @ 10% O2	49.4	49.9	49.7	91.1	78.9	84.5	139.9	73.7	102.8
Outlet Dust Flowrate	mg/s									
Moisture Concentration	mg/Nm3 (d)	49.2	46.7	48.0	51.6	44.6	48.1	46.3	39.2	42.7
Average Face velocity	cm/s	4.6	5.0	4.8	4.5	5.1	4.8	4.3	5.2	4.8
Isokineticity	%	96.4	100.5	98.4	96.9	99.5	98.2	98.0	99.3	98.7
Average O/M Signal AO 1	% of output			6.61			7.14			6.82
Average O/M Signal AO 2	% of output			12.99			15.13			14.78

Table A4

Test No.		9	9	9	10	10	10	11	11	11
Stack tester:		MTM	AVM	Summary	MTM	AVM	Summary	MTM	AVM	Summary
Date	yy-mm-dd	2014/04/09	2014/04/09	2014/04/09	2014/04/09	2014/04/09	2014/04/09	2014/04/09	2014/04/09	2014/04/09
Start Time	HH:mm	11H00	11H00	11H00	13H45	13H45	13H45	15H20	15H25	15H20
End Time	HH:mm	12H16	12H06	12H16	14H57	14H54	14H57	16H28	16H30	16H30
Boiler load	MW	As found	As found	As found	As found	As found	As found	As found	As found	As found
Outlet Conditions.										
Gas Temperature	°C	111.7	111.8	111.7	114.2	113.9	114.0	112.3	111.9	112.1
Barometric pressure	kPa (g)	82.8	82.7	82.7	82.6	82.5	82.6	82.6	82.5	82.6
Duct pressure	Pa	-124.9	-116.6	-120.7	-119.9	-122.4	-121.1	-132.4	-116.6	-124.5
Duct pressure	kPa (abs)	82.7	82.5	82.6	82.4	82.4	82.4	82.5	82.4	82.5
Moisture Mass	mg	42.5	43.0	42.8	34.0	38.0	36.0	35.0	39.0	37.0
Moisture	%v/v	6.4	5.7	6.1	5.5	5.2	5.3	5.5	5.4	5.5
Oxygen	%	9.5	9.9	9.7	9.8	9.6	9.7	10.1	9.7	9.9
Velocity	m/s	17.35	15.75	16.55	16.44	15.71	16.08	15.66	15.05	15.35
Duct area	m2	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52
Gas Volume Flow (Qact)	Am3/s	3982.54	3615.68	3799.11	3773.70	3606.15	3689.93	3593.31	3454.46	3523.89
Gas Volume Flow (Qnw)	Nm3/s	2307.09	2090.12	2198.61	2165.52	2070.29	2117.90	2073.51	1993.44	2033.48
Gas Volume Flow (Qnd)	Nm3/s	2160.41	1970.03	2065.55	2047.26	1962.71	2005.05	1958.78	1885.06	1921.94
Gas Volume Flow (Qnd)	Nm3/s @ 6% O_2	1661.08	1455.47	1557.10	1529.32	1496.20	1513.13	1427.89	1417.43	1423.10
Gas Volume Flow (Qnd)	Nm3/s @ 10% O_2	2265.11	1984.74	2123.31	2085.43	2040.27	2063.36	1947.12	1932.86	1940.59
Gas flow rate	kg/s	2716.18	2699.03	2707.60	2543.78	2667.40	2605.59	2448.05	2594.68	2521.37
Thimbles used		OE22	OE 21		OF1	OF2		OF3	OF4	
Gas density in duct	kg/m3	0.745	0.746	0.746	0.736	0.740	0.738	0.744	0.751	0.748
Sampling time	Minutes	60	60	60	60	60	60	60	60	60
Nozzle diameter	mm	5.5	6.0		5.5	6.0		5.5	6.0	
Field Blank used		OF5	OF6		OF5	OF6		OF5	OF6	
Mass gain by F/B	mg	1.01	6.60	7.61	1.01	6.60	7.61	1.01	6.60	7.61
Mass in Rinse	mg									
Mass in Filter	mg	33.4	32.6	65.96	44.8	69.5	114.28	42.7	38.3	80.96
Dust mass	mg	32.39	25.96	58.35	43.82	62.85	106.67	41.68	31.67	73.35
Gas Volume Sampled (Vact)	Am3 (w)	1.4366	1.6119	3.0484	1.3507	1.5859	2.9366	1.3647	1.5477	2.9124
Gas Volume Sampled (Vnw)	Nm3 (w)	0.8322	0.9318	1.7640	0.7751	0.9105	1.6856	0.7875	0.8931	1.6806
Gas Volume Sampled (Vad)	Am3 (d)	1.3452	1.5193	2.8645	1.2769	1.5035	2.7804	1.2892	1.4636	2.7528
Gas Volume Sampled (Vnd)	Nm3 (d)	0.7793	0.8782	1.6575	0.7328	0.8631	1.5959	0.7439	0.8446	1.5885
Dust Concentration	mg/Am3 (w)	22.5	16.1	19.1	32.4	39.6	36.3	30.5	20.5	25.2
Dust Concentration	mg/Nm3 (w)	38.9	27.9	33.1	56.5	69.0	63.3	52.9	35.5	43.6
Dust Concentration	mg/Am3 (d)	24.1	17.1	20.4	34.3	41.8	38.4	32.3	21.6	26.6
Dust Concentration	mg/Nm3 (d)	41.6	29.6	35.2	59.8	72.8	66.8	56.0	37.5	46.2
Measured O2	%	9.5	9.9	9.7	9.8	9.6	9.7	10.1	9.7	9.9
O2 @ 6 %		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
O2 @ 10 %		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Correction factor		1.3	1.4	1.3	1.3	1.3	1.3	1.4	1.3	1.4
Correction factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust Concentration Normalised to 6% O2	mg/Nm3 (d) @ 6% O2	54.1	40.0	46.7	80.0	95.5	88.6	76.9	49.9	62.4
Dust Concentration Normalised to 10% O2	mg/Nm3 (d) @ 10% O2	39.6	29.3	34.2	58.7	70.1	65.0	56.4	36.6	45.7
Outlet Dust Flowrate	mg/s									
Moisture Concentration	mg/Nm3 (d)	54.5	49.0	51.7	46.4	44.0	45.2	47.0	46.2	46.6
Average Face velocity	cm/s	5.0	5.4	5.2	4.7	5.4	5.1	4.5	5.2	4.8
Isokineticity	%	96.8	100.5	98.7	96.1	99.2	97.6	101.9	101.0	101.5
Average O/M Signal AO 1	% of output			6.49			7.00			6.26
Average O/M Signal AO 2	% of output			12.30			14.66			12.52

Table A5

Test No.		12	12	12	13	13	13	14	14	14
Stack tester:		MTM	AVM	Summary	MTM	AVM	Summary	MTM	AVM	Summary
Date	yy-mm-dd	2014/04/10	2014/04/10	2014/04/10	2014/04/10	2014/04/10	2014/04/10	2014/04/10	2014/04/10	2014/04/10
Start Time	HH:mm	11H13	11H10	11H10	13H37	13H35	13H35	15H20	15H20	15H20
End Time	HH:mm	12H21	12H18	12H21	14H51	14H40	14H51	16H31	16H29	16H31
Boiler load	MW	As found	As found	As found	As found	As found	As found	As found	As found	As found
Outlet Conditions.										
Gas Temperature	°C	109.1	108.6	108.9	108.0	107.2	107.6	110.3	109.5	109.9
Barometric pressure	kPa (g)	82.7	82.7	82.7	82.7	82.6	82.6	82.6	82.5	82.5
Duct pressure	Pa	-124.1	-113.2	-118.6	-125.7	-104.9	-115.3	-121.6	-101.6	-111.6
Duct pressure	kPa (abs)	82.6	82.6	82.6	82.5	82.5	82.5	82.5	82.4	82.4
Moisture Mass	mg	28.5	36.5	32.5	32.5	37.5	35.0	33.0	33.0	33.0
Moisture	%v/v	4.8	5.6	5.2	5.5	5.6	5.5	5.3	4.8	5.1
Oxygen	%	10.7	11.8	11.2	10.7	10.1	10.4	10.5	9.8	10.1
Velocity	m/s	15.30	13.80	14.55	15.42	13.96	14.69	16.19	14.47	15.33
Duct area	m2	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52
Gas Volume Flow (Qact)	Am3/s	3512.22	3166.77	3339.50	3539.62	3204.16	3371.89	3717.09	3320.32	3518.70
Gas Volume Flow (Qnw)	Nm3/s	2045.58	1847.86	1946.72	2066.26	1873.62	1969.94	2155.21	1926.86	2041.03
Gas Volume Flow (Qnd)	Nm3/s	1948.30	1745.11	1846.31	1953.60	1768.01	1860.72	2041.15	1833.65	1937.66
Gas Volume Flow (Qnd)	Nm3/s @ 6% O_2	1338.24	1072.75	1201.57	1341.88	1289.79	1317.75	1432.14	1373.76	1405.61
Gas Volume Flow (Qnd)	Nm3/s @ 10% O_2	1824.88	1462.85	1638.51	1829.84	1758.80	1796.93	1952.92	1873.31	1916.74
Gas flow rate	kg/s	2415.08	2405.19	2410.13	2449.15	2415.37	2432.26	2544.50	2503.73	2524.11
Thimbles used		OF7	OF8		OF9	OF10		OF11	OF12	
Gas density in duct	kg/m3	0.751	0.760	0.755	0.756	0.754	0.755	0.748	0.754	0.751
Sampling time	Minutes	60	60	60	60	60	60	60	60	60
Nozzle diameter	mm	5.5	6.0		5.5	6.0		5.5	6.0	
Field Blank used		OF15	OF14		OF15	OF14		OF15	OF14	
Mass gain by F/B	mg	0.28	-0.92	-0.64	0.28	-0.92	-0.64	0.28	-0.92	-0.64
Mass in Rinse	mg									
Mass in Filter	mg	49.3	44.7	94.00	30.2	39.3	69.44	24.9	52.3	77.23
Dust mass	mg	49.01	45.63	94.64	29.91	40.18	70.09	24.61	53.26	77.88
Gas Volume Sampled (Vact)	Am3 (w)	1.2811	1.4006	2.6817	1.2712	1.4165	2.6877	1.3389	1.4635	2.8024
Gas Volume Sampled (Vnw)	Nm3 (w)	0.7461	0.8173	1.5634	0.7421	0.8283	1.5704	0.7763	0.8493	1.6256
Gas Volume Sampled (Vad)	Am3 (d)	1.2202	1.3227	2.5429	1.2019	1.3366	2.5385	1.2681	1.3927	2.6608
Gas Volume Sampled (Vnd)	Nm3 (d)	0.7107	0.7718	1.4825	0.7016	0.7816	1.4832	0.7352	0.8082	1.5435
Dust Concentration	mg/Am3 (w)	38.3	32.6	35.3	23.5	28.4	26.1	18.4	36.4	27.8
Dust Concentration	mg/Nm3 (w)	65.7	55.8	60.5	40.3	48.5	44.6	31.7	62.7	47.9
Dust Concentration	mg/Am3 (d)	40.2	34.5	37.2	24.9	30.1	27.6	19.4	38.2	29.3
Dust Concentration	mg/Nm3 (d)	69.0	59.1	63.8	42.6	51.4	47.3	33.5	65.9	50.5
Measured O2	%	10.7	11.8	11.2	10.7	10.1	10.4	10.5	9.8	10.1
O2 @ 6 %		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
O2 @ 10 %		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Correction factor		1.5	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.4
Correction factor		1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0
Dust Concentration Normalised to 6% O2	mg/Nm3 (d) @ 6% O2	100.4	96.2	98.1	62.1	70.5	66.7	47.7	88.0	69.6
Dust Concentration Normalised to 10% O2	mg/Nm3 (d) @ 10% O2	73.6	70.5	71.9	45.5	51.7	48.9	35.0	64.5	51.0
Outlet Dust Flowrate	mg/s									
Moisture Concentration	mg/Nm3 (d)	40.1	47.3	43.7	46.3	48.0	47.2	44.9	40.8	42.9
Average Face velocity	cm/s	4.4	4.7	4.6	4.4	4.8	4.6	4.7	5.0	4.8
Isokineticity	%	97.9	99.7	98.8	96.4	99.7	98.0	96.7	99.4	98.0
Average O/M Signal AO 1	% of output			6.23			5.86			6.47
Average O/M Signal AO 2	% of output			11.90			11.02			13.19

Table A6

Test No.		16	15	15	16	16	16	17	17	17
Stack tester:		MTM	AVM	Summary	MTM	AVM	Summary	MTM	AVM	Summary
Date	yy-mm-dd	2014/04/13	2014/04/13	2014/04/13	2014/04/13	2014/04/13	2014/04/13	2014/04/13	2014/04/13	2014/04/13
Start Time	HH:mm	11H13	11H13	11H13	13H23	13H20	13H20	16H10	16H10	16H10
End Time	HH:mm	12H23	12H20	12H23	14H31	14H25	14H31	17H19	17H14	17H19
Boiler load	MW	As found	As found	As found	As found	As found	As found	As found	As found	As found
Outlet Conditions.										
Gas Temperature	°C	112.6	112.2	112.4	113.6	113.4	113.5	114.4	113.8	114.1
Barometric pressure	kPa (g)	82.5	82.6	82.5	82.4	82.4	82.4	82.4	82.4	82.4
Duct pressure	Pa	-128.2	-109.1	-118.6	-124.9	-111.6	-118.2	-134.9	-109.9	-122.4
Duct pressure	kPa (abs)	82.3	82.5	82.4	82.3	82.3	82.3	82.2	82.3	82.3
Moisture Mass	mg	32.0	28.5	30.3	35.0	31.5	33.3	33.5	31.5	32.5
Moisture	%v/v	5.2	4.4	4.8	5.7	4.8	5.2	5.3	4.9	5.1
Oxygen	%	9.6	9.7	9.7	9.9	9.7	9.8	10.0	9.7	9.9
Velocity	m/s	15.87	14.05	14.96	16.34	13.88	15.11	16.54	14.14	15.34
Duct area	m2	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52	229.52
Gas Volume Flow (Qact)	Am3/s	3642.87	3223.86	3433.37	3750.53	3185.24	3467.88	3796.96	3244.89	3520.92
Gas Volume Flow (Qnw)	Nm3/s	2096.30	1859.67	1977.99	2151.19	1828.00	1989.60	2171.81	1859.86	2015.83
Gas Volume Flow (Qnd)	Nm3/s	1986.98	1778.22	1883.09	2028.50	1740.65	1885.32	2055.68	1769.61	1913.03
Gas Volume Flow (Qnd)	Nm3/s @ 6% O_2	1394.14	1334.17	1367.05	1423.27	1309.79	1370.73	1442.34	1332.55	1391.40
Gas Volume Flow (Qnd)	Nm3/s @ 10% O_2	1901.09	1819.33	1864.16	1940.82	1786.08	1869.18	1966.83	1817.12	1897.37
Gas flow rate	kg/s	2477.73	2416.45	2447.09	2544.05	2372.59	2458.32	2561.21	2408.46	2484.84
Thimbles used		OF13	OF16		OF17	OF18		OF19	OF20	
Gas density in duct	kg/m3	0.743	0.750	0.746	0.741	0.745	0.743	0.737	0.742	0.740
Sampling time	Minutes	60	60	60	60	60	60	60	60	60
Nozzle diameter	mm	5.5	6.0		5.5	6.0		5.5	6.0	
Field Blank used		OF21	OF22		OF21	OF22		OF21	OF22	
Mass gain by F/B	mg	0.28	2.49	2.77	0.28	2.49	2.77	0.28	2.49	2.77
Mass in Rinse	mg									
Mass in Filter	mg	28.3	47.9	76.19	26.5	54.3	80.78	55.5	47.9	103.38
Dust mass	mg	28.05	45.37	73.42	26.20	51.81	78.01	55.24	45.37	100.62
Gas Volume Sampled (Vact)	Am3 (w)	1.3276	1.4043	2.7319	1.3320	1.4300	2.7620	1.3637	1.4100	2.7737
Gas Volume Sampled (Vnw)	Nm3 (w)	0.7640	0.8101	1.5740	0.7640	0.8207	1.5847	0.7800	0.8082	1.5882
Gas Volume Sampled (Vad)	Am3 (d)	1.2584	1.3428	2.6012	1.2560	1.3617	2.6177	1.2908	1.3416	2.6324
Gas Volume Sampled (Vnd)	Nm3 (d)	0.7241	0.7746	1.4987	0.7204	0.7815	1.5019	0.7383	0.7690	1.5073
Dust Concentration	mg/Am3 (w)	21.1	32.3	26.9	19.7	36.2	28.2	40.5	32.2	36.3
Dust Concentration	mg/Nm3 (w)	36.7	56.0	46.6	34.3	63.1	49.2	70.8	56.1	63.4
Dust Concentration	mg/Am3 (d)	22.3	33.8	28.2	20.9	38.1	29.8	42.8	33.8	38.2
Dust Concentration	mg/Nm3 (d)	38.7	58.6	49.0	36.4	66.3	51.9	74.8	59.0	66.8
Measured O2	%	10.5	9.7	10.1	10.5	9.7	10.1	10.5	9.7	10.1
O2 @ 6 %		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
O2 @ 10 %		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Correction factor		1.4	1.3	1.4	1.4	1.3	1.4	1.4	1.3	1.4
Correction factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust Concentration Normalised to 6% O2	mg/Nm3 (d) @ 6% O2	55.2	78.1	67.5	51.8	88.1	71.4	106.6	78.4	91.8
Dust Concentration Normalised to 10% O2	mg/Nm3 (d) @ 10% O2	40.5	57.3	49.5	38.0	64.6	52.4	78.2	57.5	67.3
Outlet Dust Flowrate	mg/s									
Moisture Concentration	mg/Nm3 (d)	44.2	36.8	40.5	48.6	40.3	44.4	45.4	41.0	43.2
Average Face velocity	cm/s	4.6	4.8	4.7	4.7	4.8	4.7	4.8	4.8	4.8
Isokineticity	%	97.8	98.2	98.0	95.3	101.2	98.3	96.4	98.0	97.2
Average O/M Signal AO 1	% of output			5.84			6.32			5.98
Average O/M Signal AO 2	% of output			11.03			12.44			11.60

APPENDIX B

MONITOR CALIBRATION CERTIFICATE

SICK Automation
Southern Africa (PTY) Ltd

1011 Katrol Ave, Robertville Ext
Roodepoort, Gauteng
South Africa 1709
www.sickautomation.co.za
TEL : 27 11 472 3733
FAX : 27 11 472 3078

Electronic Calibration Certificate:

SB100

Customer data:		Certificate:	SB100-EC02-12122013-DN001
Customer:	Eskom Kriel	Customer no:	
Country:	South Africa	City:	
Plant:	Kriel	Location:	South Stack

1. Device data:

Device type :	SB100	Device type MCU:	NWODNO 1000 N/NE
Serial no:	11198617	Serial No:	11228520
Firmware no. :	01.00.02	Firmware no. MCU:	01.04.04
Measuring Units:	Scattered Light (SL)	Measuring Range AO2/AO3:	0 – 400 SL / 0 – 1500 SL

2. Filter linearity Check

Filter [%]	Measured value [%]	Deviation [%]	Allowable deviation +/-[%]
78.6	76.9	-1.7	2.0
57.1	55.6	-1.5	2.0
41.1	39.6	-1.5	2.0
21.1	21.0	-0.1	2.0
0.0	-0.2	-0.2	2.0

Remarks:

Monitor checked in preparation for correlation

Date :	12-12-2013	Name:	Signed:
Valid until:	12-12-2014	Engineer: Dustin Naicker	

APPENDIX C

PLANT PARAMETERS

Table C1
Plant Parameters – Tests 1, 2 and 3

Test No.			1	2	3
Stack tester:			Summary	Summary	Summary
Date	dd-mm-yy		2014/03/26	2014/03/26	2014/03/26
Start Time	HH:mm		10H30	13H15	15H15
End Time	HH:mm		11H59	14H26	16H34
load	AP10W901-XQ01-OUT	04AP10W901-XQ01-OUT	420.0	419.9	400.1
steam flow	NA60F001-XQ01-out	04NA60F001-XQ01-out	356.4	358.9	342.3
total airflow	NG00F901-XQ01-out	04NG00F901-XQ01-out	498.3	502.4	487.8
lh o2	NH10A001-XQ01-out	04NH10A001-XQ01-out	3.7	3.6	3.8
rh o2	NH20A001-XQ01-out	04NH20A001-XQ01-out	3.5	3.5	3.6
lh air heater out temp	NR10T002-XQ01-out	04NR10T002-XQ01-out	123.2	124.2	123.4
rh airheater out temp	NR20T002-XQ01-out	04NR20T002-XQ01-out	130.4	131.7	130.3
lh id current	NR11D001-XQ01-out	04NR11D001-XQ01-out	405.6	408.8	386.5
rh id current	NR21D001-XQ01-out	04NR21D001-XQ01-out	424.9	429.7	404.7
coal flow	NM00U003-XQ66-OUT	04NM00U003-XQ66-OUT	56.9	57.9	54.6
mills	NM00E901-XQ01-OUT	04NM00E901-XQ01-OUT	5.0	5.0	5.0
load	NG00F901-XQ01-out	05NG00F901-XQ01-out	410.8	411.2	390.5
steam flow	NH10A001-XQ01-out	05NH10A001-XQ01-out	357.2	357.6	339.6
total airflow	NH20A001-XQ01-out	05NH20A001-XQ01-out	500.1	500.6	475.5
lh o2	NR10T002-XQ01-out	05NR10T002-XQ01-out	3.3	3.3	3.5
rh o2	NR20T002-XQ01-out	05NR20T002-XQ01-out	2.9	2.8	3.1
lh air heater out temp	NR11D001-XQ01-out	05NR11D001-XQ01-out	122.9	125.2	123.3
rh airheater out temp	NR21D001-XQ01-out	05NR21D001-XQ01-out	117.3	119.3	118.7
lh id current	NM00U003-XQ66-OUT	05NM00U003-XQ66-OUT	422.5	429.4	399.7
rh id current	NM00E901-XQ01-OUT	05NM00E901-XQ01-OUT	441.6	446.7	421.6
coal flow	NL00C005-XQ06-OUT	05NL00C005-XQ06-OUT			
mills		05	5.0	5.0	5.0
			11.0	11.3	10.7
Coal flow alternate			55.1	56.3	53.6
load	NG00F901-XQ01-out	06NG00F901-XQ01-out	409.8	410.0	410.2
steam flow	NH10A001-XQ01-out	06NH10A001-XQ01-out	349.7	352.3	352.7
total airflow	NH20A001-XQ01-out	06NH20A001-XQ01-out	508.7	513.5	515.1
lh o2	NR10T002-XQ01-out	06NR10T002-XQ01-out	4.1	4.0	4.0
rh o2	NR20T002-XQ01-out	06NR20T002-XQ01-out	3.5	3.5	3.5
lh air heater out temp	NR11D001-XQ01-out	06NR11D001-XQ01-out	121.6	123.3	123.9
rh airheater out temp	NR21D001-XQ01-out	06NR21D001-XQ01-out	120.2	122.2	122.6
lh id current	NM00U003-XQ66-OUT	06NM00U003-XQ66-OUT	421.4	432.9	437.7
rh id current	NM00E901-XQ01-OUT	06NM00E901-XQ01-OUT	423.0	431.0	434.5
coal flow	NL00C005-XQ06-OUT	06NL00C005-XQ06-OUT			
mills			5.0	5.0	5.0
			11.4	12.0	12.0
Coal flow alternate			57.2	59.9	59.8

Table C2
Plant Parameters – Tests 4 and 5

Test No.			4	5
Stack tester:			Summary	Summary
Date	dd-mm-yy		2014/03/27	2014/03/27
Start Time	HH:mm		10H32	12H15
End Time	HH:mm		11H37	13H30
load	AP10W901-XQ01-OUT	04AP10W901-XQ01-OUT	399.8	400.0
steam flow	NA60F001-XQ01-out	04NA60F001-XQ01-out	344.5	346.4
total airflow	NG00F901-XQ01-out	04NG00F901-XQ01-out	491.5	493.3
lh o2	NH10A001-XQ01-out	04NH10A001-XQ01-out	3.8	3.8
rh o2	NH20A001-XQ01-out	04NH20A001-XQ01-out	3.5	3.6
lh air heater out temp	NR10T002-XQ01-out	04NR10T002-XQ01-out	117.2	119.0
rh airheater out temp	NR20T002-XQ01-out	04NR20T002-XQ01-out	124.0	125.9
lh id current	NR11D001-XQ01-out	04NR11D001-XQ01-out	388.1	391.5
rh id current	NR21D001-XQ01-out	04NR21D001-XQ01-out	404.7	409.0
coal flow	NM00U003-XQ66-OUT	04NM00U003-XQ66-OUT	54.6	55.3
mills	NM00E901-XQ01-OUT	04NM00E901-XQ01-OUT	5.0	5.0
			11.1	11.0
			55.4	55.2
load	NG00F901-XQ01-out	05NG00F901-XQ01-out	370.1	370.0
steam flow	NH10A001-XQ01-out	05NH10A001-XQ01-out	338.3	340.2
total airflow	NH20A001-XQ01-out	05NH20A001-XQ01-out	466.0	468.2
lh o2	NR10T002-XQ01-out	05NR10T002-XQ01-out	3.2	3.2
rh o2	NR20T002-XQ01-out	05NR20T002-XQ01-out	3.2	3.2
lh air heater out temp	NR11D001-XQ01-out	05NR11D001-XQ01-out	117.4	118.6
rh airheater out temp	NR21D001-XQ01-out	05NR21D001-XQ01-out	112.8	114.2
lh id current	NM00U003-XQ66-OUT	05NM00U003-XQ66-OUT	390.1	394.7
rh id current	NM00E901-XQ01-OUT	05NM00E901-XQ01-OUT	412.2	417.2
coal flow	NL00C005-XQ06-OUT	05NL00C005-XQ06-OUT		
mills		05	4.0	4.0
			13.0	13.2
Coal flow alternate			51.9	52.8
load	NG00F901-XQ01-out	06NG00F901-XQ01-out	409.8	410.0
steam flow	NH10A001-XQ01-out	06NH10A001-XQ01-out	349.1	355.2
total airflow	NH20A001-XQ01-out	06NH20A001-XQ01-out	510.1	518.2
lh o2	NR10T002-XQ01-out	06NR10T002-XQ01-out	4.1	3.9
rh o2	NR20T002-XQ01-out	06NR20T002-XQ01-out	3.5	3.4
lh air heater out temp	NR11D001-XQ01-out	06NR11D001-XQ01-out	119.1	120.7
rh airheater out temp	NR21D001-XQ01-out	06NR21D001-XQ01-out	117.9	119.0
lh id current	NM00U003-XQ66-OUT	06NM00U003-XQ66-OUT	425.6	440.5
rh id current	NM00E901-XQ01-OUT	06NM00E901-XQ01-OUT	424.0	436.6
coal flow	NL00C005-XQ06-OUT	06NL00C005-XQ06-OUT		
mills			5.0	5.0
			11.8	12.1
Coal flow alternate			59.2	60.7

Table C3
Plant Parameters – Tests 6, 7 and 8

Test No.			6	7	8
Stack tester:			Summary	Summary	Summary
Date	dd-mm-yy		2014/04/08	2014/04/08	2014/04/08
Start Time	HH:mm		11H20	13H00	15H20
End Time	HH:mm		12H28	14H15	16H31
load	AP10W901-XQ01-OUT	04AP10W901-XQ01-OUT	450.0	450.0	450.0
steam flow	NA60F001-XQ01-out	04NA60F001-XQ01-out	382.1	382.5	382.4
total airflow	NG00F901-XQ01-out	04NG00F901-XQ01-out	530.0	530.5	530.1
lh o2	NH10A001-XQ01-out	04NH10A001-XQ01-out	3.6	3.6	3.5
rh o2	NH20A001-XQ01-out	04NH20A001-XQ01-out	3.2	3.2	3.3
lh air heater out temp	NR10T002-XQ01-out	04NR10T002-XQ01-out	116.1	117.8	119.1
rh airheater out temp	NR20T002-XQ01-out	04NR20T002-XQ01-out	123.3	124.7	126.3
lh id current	NR11D001-XQ01-out	04NR11D001-XQ01-out	438.9	444.0	445.5
rh id current	NR21D001-XQ01-out	04NR21D001-XQ01-out	459.0	464.1	466.8
coal flow	NM00U003-XQ66-OUT	04NM00U003-XQ66-OUT	62.1	63.2	63.3
mills	NM00E901-XQ01-OUT	04NM00E901-XQ01-OUT	5.0	5.0	5.0
load	NG00F901-XQ01-out	05NG00F901-XQ01-out	240.4	239.5	239.9
steam flow	NH10A001-XQ01-out	05NH10A001-XQ01-out	223.2	222.6	223.3
total airflow	NH20A001-XQ01-out	05NH20A001-XQ01-out	379.1	382.6	379.7
lh o2	NR10T002-XQ01-out	05NR10T002-XQ01-out	5.3	5.4	5.3
rh o2	NR20T002-XQ01-out	05NR20T002-XQ01-out	4.8	4.8	4.9
lh air heater out temp	NR11D001-XQ01-out	05NR11D001-XQ01-out	103.3	105.1	105.7
rh airheater out temp	NR21D001-XQ01-out	05NR21D001-XQ01-out	99.8	102.0	102.4
lh id current	NM00U003-XQ66-OUT	05NM00U003-XQ66-OUT	324.0	325.2	324.4
rh id current	NM00E901-XQ01-OUT	05NM00E901-XQ01-OUT	339.1	341.4	340.5
coal flow	NL00C005-XQ06-OUT	05NL00C005-XQ06-OUT			
mills		05	3.0	3.0	3.0
			11.6	12.0	11.9
Coal flow alternate			34.7	36.0	35.8
load	NG00F901-XQ01-out	06NG00F901-XQ01-out	429.9	430.4	430.3
steam flow	NH10A001-XQ01-out	06NH10A001-XQ01-out	350.9	354.4	357.5
total airflow	NH20A001-XQ01-out	06NH20A001-XQ01-out	508.1	510.8	510.7
lh o2	NR10T002-XQ01-out	06NR10T002-XQ01-out	4.2	4.1	4.2
rh o2	NR20T002-XQ01-out	06NR20T002-XQ01-out	2.8	2.9	2.9
lh air heater out temp	NR11D001-XQ01-out	06NR11D001-XQ01-out	115.1	117.3	117.5
rh airheater out temp	NR21D001-XQ01-out	06NR21D001-XQ01-out	114.4	115.4	116.1
lh id current	NM00U003-XQ66-OUT	06NM00U003-XQ66-OUT	417.1	422.7	423.1
rh id current	NM00E901-XQ01-OUT	06NM00E901-XQ01-OUT	422.8	426.0	426.8
coal flow	NL00C005-XQ06-OUT	06NL00C005-XQ06-OUT			
mills			5.0	5.0	5.0
			12.5	12.7	13.0
Coal flow alternate			62.3	63.5	65.2

Table C4
Plant Parameters – Tests 9, 10 and 11

Test No.			9	10	11
Stack tester:			Summary	Summary	Summary
Date	dd-mm-yy		2014/04/09	2014/04/09	2014/04/09
Start Time	HH:mm		11H00	13H45	15H20
End Time	HH:mm		12H16	14H57	16H30
load	AP10W901-XQ01-OUT	04AP10W901-XQ01-OUT	449.9	449.7	382.9
steam flow	NA60F001-XQ01-out	04NA60F001-XQ01-out	378.8	379.0	317.9
total airflow	NG00F901-XQ01-out	04NG00F901-XQ01-out	526.6	523.2	477.7
lh o2	NH10A001-XQ01-out	04NH10A001-XQ01-out	3.9	3.3	3.7
rh o2	NH20A001-XQ01-out	04NH20A001-XQ01-out	3.2	3.2	3.9
lh air heater out temp	NR10T002-XQ01-out	04NR10T002-XQ01-out	118.0	119.3	114.9
rh airheater out temp	NR20T002-XQ01-out	04NR20T002-XQ01-out	124.6	125.5	121.4
lh id current	NR11D001-XQ01-out	04NR11D001-XQ01-out	444.2	438.6	368.5
rh id current	NR21D001-XQ01-out	04NR21D001-XQ01-out	464.7	458.9	382.3
coal flow	NM00U003-XQ66-OUT	04NM00U003-XQ66-OUT	63.0	63.4	53.8
mills	NM00E901-XQ01-OUT	04NM00E901-XQ01-OUT	5.0	5.0	4.0
load	NG00F901-XQ01-out	05NG00F901-XQ01-out			
steam flow	NH10A001-XQ01-out	05NH10A001-XQ01-out			
total airflow	NH20A001-XQ01-out	05NH20A001-XQ01-out			
lh o2	NR10T002-XQ01-out	05NR10T002-XQ01-out			
rh o2	NR20T002-XQ01-out	05NR20T002-XQ01-out			
lh air heater out temp	NR11D001-XQ01-out	05NR11D001-XQ01-out			
rh airheater out temp	NR21D001-XQ01-out	05NR21D001-XQ01-out			
lh id current	NM00U003-XQ66-OUT	05NM00U003-XQ66-OUT			
rh id current	NM00E901-XQ01-OUT	05NM00E901-XQ01-OUT			
coal flow	NL00C005-XQ06-OUT	05NL00C005-XQ06-OUT			
mills		05			
Coal flow alternate					
load	NG00F901-XQ01-out	06NG00F901-XQ01-out	429.8	430.0	430.0
steam flow	NH10A001-XQ01-out	06NH10A001-XQ01-out	353.9	357.3	360.4
total airflow	NH20A001-XQ01-out	06NH20A001-XQ01-out	513.7	514.2	514.7
lh o2	NR10T002-XQ01-out	06NR10T002-XQ01-out	3.9	3.9	4.1
rh o2	NR20T002-XQ01-out	06NR20T002-XQ01-out	3.0	3.0	2.9
lh air heater out temp	NR11D001-XQ01-out	06NR11D001-XQ01-out	116.6	117.9	117.3
rh airheater out temp	NR21D001-XQ01-out	06NR21D001-XQ01-out	114.9	116.0	115.2
lh id current	NM00U003-XQ66-OUT	06NM00U003-XQ66-OUT	433.2	435.6	433.9
rh id current	NM00E901-XQ01-OUT	06NM00E901-XQ01-OUT	435.3	437.0	433.2
coal flow	NL00C005-XQ06-OUT	06NL00C005-XQ06-OUT			
mills			5.0	5.0	5.0
			12.8	12.8	12.9
Coal flow alternate			64.1	64.1	64.3

Table C5
Plant Parameters – Tests 12, 13 and 14

Test No.			12	13	14
Stack tester:			Summary	Summary	Summary
Date	dd-mm-yy		2014/04/10	2014/04/10	2014/04/10
Start Time	HH:mm		11H10	13H35	15H20
End Time	HH:mm		12H21	14H51	16H31
load	AP10W901-XQ01-OUT	04AP10W901-XQ01-OUT	379.1	369.9	414.8
steam flow	NA60F001-XQ01-out	04NA60F001-XQ01-out	326.0	317.5	355.1
total airflow	NG00F901-XQ01-out	04NG00F901-XQ01-out	466.6	458.5	501.5
lh o2	NH10A001-XQ01-out	04NH10A001-XQ01-out	4.2	4.4	3.6
rh o2	NH20A001-XQ01-out	04NH20A001-XQ01-out	3.9	3.8	3.4
lh air heater out temp	NR10T002-XQ01-out	04NR10T002-XQ01-out	110.8	109.6	114.5
rh airheater out temp	NR20T002-XQ01-out	04NR20T002-XQ01-out	117.4	116.3	120.7
lh id current	NR11D001-XQ01-out	04NR11D001-XQ01-out	358.2	350.5	403.9
rh id current	NR21D001-XQ01-out	04NR21D001-XQ01-out	371.2	362.4	419.7
coal flow	NM00U003-XQ66-OUT	04NM00U003-XQ66-OUT	54.5	53.3	59.1
mills	NM00E901-XQ01-OUT	04NM00E901-XQ01-OUT	4.4	4.0	4.8
load	NG00F901-XQ01-out	05NG00F901-XQ01-out	359.3	350.1	350.1
steam flow	NH10A001-XQ01-out	05NH10A001-XQ01-out	308.1	302.3	302.3
total airflow	NH20A001-XQ01-out	05NH20A001-XQ01-out	477.5	469.3	464.6
lh o2	NR10T002-XQ01-out	05NR10T002-XQ01-out	3.8	3.7	3.8
rh o2	NR20T002-XQ01-out	05NR20T002-XQ01-out	3.9	3.8	3.7
lh air heater out temp	NR11D001-XQ01-out	05NR11D001-XQ01-out	110.1	108.6	110.6
rh airheater out temp	NR21D001-XQ01-out	05NR21D001-XQ01-out	104.0	103.7	105.2
lh id current	NM00U003-XQ66-OUT	05NM00U003-XQ66-OUT	407.0	383.7	381.1
rh id current	NM00E901-XQ01-OUT	05NM00E901-XQ01-OUT	417.1	400.2	397.1
coal flow	NL00C005-XQ06-OUT	05NL00C005-XQ06-OUT			
mills		05	4.3	4.0	4.0
			13.6	13.6	13.2
Coal flow alternate			57.3	54.5	53.0
load	NG00F901-XQ01-out	06NG00F901-XQ01-out	389.4	445.1	450.2
steam flow	NH10A001-XQ01-out	06NH10A001-XQ01-out	330.5	371.9	376.2
total airflow	NH20A001-XQ01-out	06NH20A001-XQ01-out	483.0	538.1	533.1
lh o2	NR10T002-XQ01-out	06NR10T002-XQ01-out	4.6	3.4	3.8
rh o2	NR20T002-XQ01-out	06NR20T002-XQ01-out	3.3	3.2	2.7
lh air heater out temp	NR11D001-XQ01-out	06NR11D001-XQ01-out	110.4	118.2	120.7
rh airheater out temp	NR21D001-XQ01-out	06NR21D001-XQ01-out	113.3	114.2	116.5
lh id current	NM00U003-XQ66-OUT	06NM00U003-XQ66-OUT	385.3	476.2	475.0
rh id current	NM00E901-XQ01-OUT	06NM00E901-XQ01-OUT	395.7	471.9	470.5
coal flow	NL00C005-XQ06-OUT	06NL00C005-XQ06-OUT			
mills			4.0	5.0	5.0
			14.9	13.2	13.7
Coal flow alternate			59.7	66.2	68.3

Table C6
Plant Parameters – Tests 15, 16 and 17

Test No.			15	16	17
Stack tester:			Summary	Summary	Summary
Date	dd-mm-yy		2014/04/13	2014/04/13	2014/04/13
Start Time	HH:mm		11H13	13H20	16H10
End Time	HH:mm		12H23	14H31	17H19
load	AP10W901-XQ01-OUT	04AP10W901-XQ01-OUT	400.0	399.8	400.0
steam flow	NA60F001-XQ01-out	04NA60F001-XQ01-out	335.7	336.0	336.8
total airflow	NG00F901-XQ01-out	04NG00F901-XQ01-out	486.4	487.9	489.7
lh o2	NH10A001-XQ01-out	04NH10A001-XQ01-out	3.8	3.7	3.7
rh o2	NH20A001-XQ01-out	04NH20A001-XQ01-out	3.6	3.7	3.7
lh air heater out temp	NR10T002-XQ01-out	04NR10T002-XQ01-out	114.7	115.7	115.9
rh airheater out temp	NR20T002-XQ01-out	04NR20T002-XQ01-out	121.4	122.2	122.7
lh id current	NR11D001-XQ01-out	04NR11D001-XQ01-out	369.5	371.4	373.4
rh id current	NR21D001-XQ01-out	04NR21D001-XQ01-out	383.2	385.6	388.2
coal flow	NM00U003-XQ66-OUT	04NM00U003-XQ66-OUT	53.2	53.3	53.6
mills	NM00E901-XQ01-OUT	04NM00E901-XQ01-OUT	5.0	5.0	5.0
load	NG00F901-XQ01-out	05NG00F901-XQ01-out	400.1	400.0	399.9
steam flow	NH10A001-XQ01-out	05NH10A001-XQ01-out	344.8	345.1	345.4
total airflow	NH20A001-XQ01-out	05NH20A001-XQ01-out	501.1	504.1	504.4
lh o2	NR10T002-XQ01-out	05NR10T002-XQ01-out	3.4	3.5	3.4
rh o2	NR20T002-XQ01-out	05NR20T002-XQ01-out	3.2	3.3	3.2
lh air heater out temp	NR11D001-XQ01-out	05NR11D001-XQ01-out	115.7	116.5	116.4
rh airheater out temp	NR21D001-XQ01-out	05NR21D001-XQ01-out	108.6	109.1	109.5
lh id current	NM00U003-XQ66-OUT	05NM00U003-XQ66-OUT	445.3	455.8	445.8
rh id current	NM00E901-XQ01-OUT	05NM00E901-XQ01-OUT	458.0	466.8	455.9
coal flow	NL00C005-XQ06-OUT	05NL00C005-XQ06-OUT			
mills		05	5.0	5.0	5.0
			11.6	11.7	11.7
Coal flow alternate			58.2	58.3	58.3
load	NG00F901-XQ01-out	06NG00F901-XQ01-out	400.1	399.8	400.0
steam flow	NH10A001-XQ01-out	06NH10A001-XQ01-out	316.3	321.1	330.5
total airflow	NH20A001-XQ01-out	06NH20A001-XQ01-out	475.1	475.2	474.5
lh o2	NR10T002-XQ01-out	06NR10T002-XQ01-out	4.1	4.1	4.2
rh o2	NR20T002-XQ01-out	06NR20T002-XQ01-out	3.5	3.5	3.5
lh air heater out temp	NR11D001-XQ01-out	06NR11D001-XQ01-out	117.8	118.7	120.4
rh airheater out temp	NR21D001-XQ01-out	06NR21D001-XQ01-out	118.6	119.7	121.4
lh id current	NM00U003-XQ66-OUT	06NM00U003-XQ66-OUT	399.6	398.9	400.6
rh id current	NM00E901-XQ01-OUT	06NM00E901-XQ01-OUT	405.8	404.9	406.0
coal flow	NL00C005-XQ06-OUT	06NL00C005-XQ06-OUT			
mills			5.0	5.0	5.0
			11.6	11.5	11.6
Coal flow alternate			58.2	57.7	58.0

APPENDIX D

PLANT STATUS REPORTS

South stack Correlation test plant status

25/03/2014

Unit 4

Load: 420 MW

Precips: LH 2, 4, 6 & 8 has low amps

RH 7 has low amps

SO_3 plant in-service

Unit 5

Load: 390 MW

Precips: LH 4, 5 has low amps

RH 2, 4 and 7 has no indication

SO_3 plant in-service

Unit 6

Load: 407 MW

Precips: LH 1, 2, 8 and RH 1, 2, 6 and 8 has low amps

SO_3 plant in-service

26/03/2014

Unit 4

Load: 402 MW

Precips: LH 2, 4, 6 & 8 has low amps

RH 7 has low amps

SO_3 plant in-service

Unit 5

Load: 370 MW

Precips: LH 4, 5 has low amps

RH 2, 4 and 7 has no indication

SO_3 plant in-service

Unit 6

Load: 412MW

Precips: LH 1, 2, 8 and RH 1, 2, 6 and 8 has low amps

SO_3 plant in-service

<u>08/04/2014</u>

Unit 4

Load: 450 MW

Precips: LH 2, 4, 6 & 8 has low amps

RH 7 has low amps

SO_3 plant in-service

Unit 5

Load: 400 MW

Precips: LH 1, 2, 3, 4, 5 has low amps

RH 1 and 7 has no indication

SO_3 plant in-service

Unit 6

Load: 430 MW

Precips: LH 1, 2, 3, 8 and RH 1, 2, 3 and 6 has low amps

SO_3 plant in-service

<u>09/04/2014</u>

Unit 4

Load: 450 MW

Precips: LH 2, 4, 6 & 8 has low amps

RH 7 has low amps

SO_3 plant in-service

Unit 5

Load: 400 MW

Precips: LH 1, 2, 3, 4, 5 has low amps

RH 1 and 7 has no indication

SO_3 plant in-service

Unit 6

Load: 430 MW

Precips: LH 1, 2, 3, 8 and RH 1, 2, 3 and 6 has low amps

SO_3 plant in-service

<u>10/04/2014</u>

Unit 4

Load: 400 MW

Precips: LH 2, 4, 6 & 8 has low amps

RH 7 has low amps

SO_3 plant in-service

Unit 5

Load: 400 MW

Precips: LH 1, 2, 3, 4, 5 has low amps

RH 1 and 7 has no indication

SO_3 plant in-service

Unit 6

Load: 400 MW

Precips: LH 1, 2, 3, 8 and RH 1, 2, 3 and 6 has low amps

SO_3 plant in-service

13/04/2014

Unit 4

Load: 400.2 MW

Precips: LH 2, 4, 6 & 8 has low amps

RH 3 and 7 has low amps

SO_3 plant in-service

Unit 5

Load: 400 MW

Precips: LH 2, 3, 4, 5 and RH 2 has low amps

RH 1 and 7 has no indication

SO_3 plant in-service

Unit 6

Load: 430 MW

Precips: LH 1, 2, 8 and RH 2, 3, 6 and 8 has low amps

SO_3 plant in-service

9. DISTRIBUTION LIST

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