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LMS Energy Pty Ltd
1/132 Ross Court
Cleveland QLD 4163

Emission Testing – February 2015
LMS Energy Pty Ltd - Jilliby Plant

Dear Nathan McClelland,

Tests were performed 11 February 2015 to determine emissions to air from Unit 1 at the Jilliby plant of LMS Energy Pty Ltd.

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Yours faithfully
Ektimo Pty Ltd

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LICENCE COMPARISON

EPA No.	Location Description	Pollutant	Unit of measure	Licence limit	Detected values
1	Unit 1	Sulphuric acid mist & sulphur trioxide (as SO ₃)	milligrams per cubic meter (mg/m ³)	100	2.4
		Nitrogen oxides (as NO ₂)*	milligrams per cubic meter (mg/m ³)	450	420

* Nitrogen Oxides (as NO₂) licence limit and detected values reported at dry NTP corrected to 7 percent oxygen

Note: All measured analytes are below the Licence Limit set by the New South Wales EPA as per licence 20059.

EXECUTIVE SUMMARY

Ektimo was engaged by LMS Energy to perform emission monitoring to fulfil the sampling requirement of the NSW EPA Environmental Protection Licence 20059. Monitoring was performed on Unit 1 for the following parameters:

- Selection of sampling positions
- Flow rate
- Velocity
- Temperature
- Moisture
- Dry gas Density
- Molecular weight
- Carbon dioxide (CO₂)
- Oxygen (O₂)
- Carbon monoxide (CO)
- Nitrogen oxides (NO_x) as NO₂
- Sulphur dioxide (SO₂)
- Sulphur trioxide (SO₃) and sulphuric acid mist (H₂SO₄)
- Volatile organic compounds (VOC)

Volumetric flowrate was measured on Unit 1, allowing for calculation of mass emission rates for the above analytes.

The methodologies chosen by Ektimo are those prescribed in the NSW EPA publication, *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, 2007*.

There were no technical issues in terms of sampling on the days of testing.

RESULTS

EPA Point 1 – Unit 1

11 February 2015

Flow Results		Measured MW	Engine 1R000587
Date and time of flow test		11/02/2015 10:25	
Date and time of flow test		11/02/2015 11:45	
Stack dimensions at sampling plane		325	mm
Velocity at sampling plane		57	m/s
Average temperature		588	°C
Moisture content	Method4	7.6	% v/v
Flow rate at discharge conditions		4.7	m ³ /sec
Flow rate at wet NTP conditions		1.5	m ³ /sec
Flow rate at dry NTP conditions		1.4	m ³ /sec

Isokinetic Sampling Results		Engine 1R000587 83	Sampling Times	Concentration at NTP	Mass rate
Sulphur dioxide (as SO ₂)			1035-1140	15 mg/m ³	1.3 g/min
Sulphur acid mist & sulphur trioxide (as SO ₃)			1035-1140	2.4 mg/m ³	0.20 g/min
No. of sampling points				8	
Length of sampling, min				64	
Stack gas molecular weight, g/g-mole (wet)				29.3	
Stack gas density, at wet NTP				1.31	

Volatile Organic Compound (VOC) Results		Engine 1R000587 83	Sampling Times	Concentration at NTP	Mass rate
Total VOC as n-propane			1035-1135	< 0.09 mg/m ³	< 0.008 g/min

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact Ektimo (ETC) should you wish to discuss detection limits of specific undetected compounds; Ethanol, Isopropanol, Isobutanol, Butanol, 1-Methoxy-2-propanol, Cyclohexanol, 2-Butoxyethanol, Acetone, Methyl ethyl ketone, Ethyl acetate, Isopropyl acetate, Propyl acetate, MIBK, 2-Hexanone, Butyl acetate, 1-Methoxy-2-propyl acetate, Cyclohexanone, Cellosolve acetate, 2-Butoxyethyl acetate, Ethyldiglycol acetate, Diacetone alcohol, Isophorone µg/tube µg/tube Pentane, Hexane, Heptane, Pentane, Octane, Nonane, Decane, Undecane, Dodecane, Tridecane, Tetradecane Cyclohexane, 2-Methylhexane, 2,3-Dimethylpentane, 3-Methylhexane, Isooctane, Methylcyclohexane, alpha-Pinene, beta-Pinene, d-Limonene, 3-Carene, Dichloromethane, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Carbon tetrachloride, 1,1-Dichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, Trichloroethene, Tetrachloroethene, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Chlorobenzene, Fluorobenzene Benzene, Toluene, Ethylbenzene, m+p-Xylene, Styrene, o-Xylene, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, alpha-Methylstyrene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, m-Diethylbenzene, o-Diethylbenzene, p-Diethylbenzene

EPA Point 1 – Unit 1
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Continuous Analyser Results	Engine 1 R000587 83	Sampling Times	Concentration at NTP	Concentration at 7% O2	Mass rate
Oxygen (dry basis)		1035-1135	7.6 % v/v	-	-
Carbon dioxide (dry basis)		1035-1135	12.0 % v/v	-	-
Dry gas density		1035-1135	1.3 kg/m3	-	-
Molecular weight of stack gas, dry basis		1035-1135	30 g/g-mole	-	-
Nitrogen oxides as NO ₂	(Average)	1035-1135	410 mg/m3	420 mg/m3	34 g/min
Nitrogen oxides as NO ₂	(Minimum)	1035-1135	390 mg/m3	410 mg/m3	33 g/min
Nitrogen oxides as NO ₂	(Maximum)	1035-1135	420 mg/m3	440 mg/m3	35 g/min
Carbon monoxide as CO	(Average)	1035-1135	1,200 mg/m3	-	98 g/min
Carbon monoxide as CO	(Minimum)	1035-1135	1,100 mg/m3	-	95 g/min
Carbon monoxide as CO	(Maximum)	1035-1135	1,300 mg/m3	-	100 g/min

Refer to "SAMPLING PLANE OBSERVATIONS" on page 5.

SAMPLING PLANE OBSERVATIONS

EPA Point 1 – Unit 1

The sampling plane had 2 x 4 inch flange port(s). The location was determined to be “non-ideal” as per AS4323.1. It was 1 duct diameter less than the required 2 duct diameters upstream from a connection. It was 3 duct diameters less than the required 6 duct diameters downstream from a connection. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

PLANT OPERATING CONDITIONS

Plant operating conditions were supplied by LMS Energy Pty Ltd personnel.
During testing on 11 February 2015 Unit 1 was held stable at 1123 kW.

TEST METHODS

The following methods are accredited with the National Association of Testing Authorities (NATA) and are approved for the sampling and analysis of gases unless otherwise stated.

All sampling and analysis conducted in accordance with test methods (TM) prescribed for the purposes of the New South Wales Protection of the Environment Operations (Clean Air) Regulation 2010, or other approved methods (OM) unless otherwise stated.

All parameters are reported adjusted to dry NTP conditions unless otherwise stated.

Parameter	NSW TM Method	Sampling Method	Analytical Laboratory	NATA	Analytical Laboratory NATA accreditation number	Analytical Laboratory Report Number(s)
Selection of sampling positions	TM-1	AS4323.1	Ektimo	Yes	14601	R000587
Flow rate	TM-2	USEPA 2		Yes	14601	
Velocity	TM-2	USEPA 2		Yes	14601	
Temperature	TM-2	USEPA 2		Yes	14601	
Moisture	TM-22	USEPA 4		Yes	14601	
Dry gas Density	TM-23	USEPA 3		Yes	14601	
Molecular weight				Yes	14601	
Carbon dioxide (CO ₂)	TM-24	USEPA 3A		Yes	14601	
Oxygen (O ₂)	TM-25			Yes	14601	
Carbon monoxide (CO)	TM-32	USEPA 10		Yes	14601	
Nitrogen oxides (NO _x) as NO ₂	TM-11	USEPA 7E		Yes	14601	
Sulphur dioxide (SO ₂)	TM-3	USEPA 8		Yes	2562	
Sulphuric acid mist and sulphur trioxide (as SO ₃)			Yes	2562		
Volatile organic compounds (VOC)			TM-34	USEPA 18	Yes	2562

DEFINITIONS

The following symbols and abbreviations are used in test reports:

BSP	British standard pipe.
Concentration	Mass of analyte per cubic metre expressed at NTP dry conditions (ng, µg or mg/m ³).
Flow rate at discharge conditions	Volume of gas flow per unit time expressed at discharge temperature, pressure and moisture content (m ³ /min).
Flow rate at wet NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and discharge moisture content (m ³ /min).
Flow rate at dry NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and 0% moisture content (m ³ /min).
Mass rate	Mass of analyte per unit time (µg, mg or g/min).
Moisture content	Percentage of gaseous moisture in the gas expressed on a volume / volume percentage basis. This does not include moisture in the gas stream that is in the liquid phase (free moisture).
NA	Not applicable.
NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry (wet in the case of odour only) basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Sampling plane	Location at which measurements were conducted.
Velocity	Gas velocity expressed at discharge temperature, pressure and moisture content (m/s)
VOC	Any chemical compound based on carbon in the boiling range 36 to 126°C, with a vapour pressure of at least 0.010kPa at 25°C (or having a corresponding volatility under the particular conditions of use) that adsorb onto activated charcoal and desorb into CS ₂ , or that can be collected in a tedlar bag and be quantitatively recovered, and that are detected by GCMS. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are CO, CO ₂ , carbonic acid, metallic carbides and carbonate salts.
>	Greater than.
<	Less than the minimum limit of detection using the specified method.
~	Approximately.

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