

**PetroSA Biogas to Energy Project  
Monitoring Report  
First monitoring period 1 Oct 2007 -  
30 June 2008**

CDM Registration number 0446

18 July 2008



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# 1 Project Background

PetroSA Biogas to Energy Project was registered as a CDM Project by the UNFCCC on 29 September 2006 under reference number 0446 and has been commercially operational since 1 October 2007. The Project Design Document contains all the relevant background on the project and can be found on the UNFCCC website:

<http://cdm.unfccc.int/Projects/DB/PriceWaterhouseCoopers1148482596.97/view>

## 2 Monitoring Background

The calculation of emission reductions is based on methodology AMS-1.D. Grid connected renewable electricity generation (version 9). Emission reductions are achieved by replacement of fossil fuel based grid electricity with electricity produced from biogas. Monitoring is based only on continuous metering of electricity produced by the biogas. During the monitoring period the plant produced a total of 18 872.45 MWh of electricity. The monitoring methodology is detailed in section D of the PDD.

## 3 Monitoring Results

### 3.1 EMISSION REDUCTION

The calculated emission reductions amount to 18 872.45 tonnes CO<sub>2</sub>eq

### 3.2 MONITORING PERIOD

The monitoring period is 1 October 2007 to 30 June 2008.

### 3.3 CALCULATION METHODOLOGY

Emission reductions were calculated on the basis of the formulae detailed in Section E of the PDD.

The calculation entails the following:

- Net electricity produced by the project is recorded on a continuous basis and aggregated monthly
- Net electricity generated monthly is multiplied by the grid emissions factor as stated in the PDD to obtain the emission reductions for the project activity for the monitoring period
- Calculation of the emission reductions is based on parameters fixed in the PDD and justified during the validation
- The latest grid emission factor published by Eskom in their annual report for the period 1 April 2007 to 31 March 2008 is 1.00 kg/kWh.



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### **3.4 PRESENTATION OF MONITORING RESULTS**

The monitoring results are annexed hereto as follows:

Appendix A: A summary of the monitoring results

Appendix B: Calculation of emission reductions as detailed in PDD

Monthly tariff reports and raw data supporting such tariff reports are held in paper and electronically for verification and audit purposes.

# Appendix A Summary of the monitoring results

**PETROSA BIOGAS TO ENERGY PLANT  
CALCULATION OF EMISSION REDUCTIONS  
MONITORING PERIOD 1 OCT 2007 - 30 JUN 2008**

Period	Days	<sup>1</sup> Total electricity generated by plant kWh	<sup>2</sup> Electricity imported from the Grid kWh	<sup>3</sup> Net Electricity displaced by plant (1 – 2) kWh	<sup>4</sup> Net Electricity displaced by plant (3 ÷ 1000) MWh	<sup>5</sup> Grid emissions factor kg/kWh	Emission reductions (3 x 5) / 1000 tonnes CO <sub>2</sub> e
01/10/2007 - 31/10/2007	31	1794276.00	53655.30	1740620.70	1740.62	1.00	1740.62
01/11/2007 - 30/11/2007	30	1889820.00	60159.72	1829660.28	1829.66	1.00	1829.66
01/12/2007 - 31/12/2007	31	2348640.00	64135.86	2284504.14	2284.50	1.00	2284.50
01/01/2008 - 31/01/2008	31	1309212.00	44520.60	1264691.40	1264.69	1.00	1264.69
01/02/2008 - 29/02/2008	29	2114424.00	53026.86	2061397.14	2061.40	1.00	2061.40
01/03/2008 - 31/03/2008	31	1542852.00	39221.28	1503630.72	1503.63	1.00	1503.63
01/04/2008 - 30/04/2008	30	2599812.00	68602.26	2531209.74	2531.21	1.00	2531.21
01/05/2008 - 31/05/2008	31	3024648.00	74116.26	2950531.74	2950.53	1.00	2950.53
01/06/2008 - 30/06/2008	30	2775996.00	69794.70	2706201.30	2706.20	1.00	2706.20
	<b>274</b>	<b>19399680.00</b>	<b>527232.84</b>	<b>18872447.16</b>	<b>18872.45</b>		<b>18872.45</b>
<b>1. Enermax 6.6kV data 2. Enermax 380V data 3. Enermax data 6.6kV – 380V 5. Eskom Annual Report 2008</b>							



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## Appendix B Calculation of Emission Reductions per PDD

### Calculating CO<sub>2</sub> emitted as inherent in biogas

$$\begin{aligned} \text{Mass of CO}_2 \text{ emitted inherent in} &= (\text{Biogas flowrate}) * (\text{the \% CO}_2 \text{ in biogas}) * (\text{density of CO}_2) * \\ \text{biogas in tonnes for monitoring period} & \text{ days per year} * \text{ hours per day} / 1000 \\ &= 1900 \text{ m}^3/\text{hr} * 39\% * 1.82947731 \text{ kg/m}^3 * 274 * 24 / 1000 \\ &= 8\,914.71 \text{ tonnes CO}_2 \text{ for the period 1 Oct 2007 – 30 Jun 2008} \end{aligned}$$

### Calculating CO<sub>2</sub> emitted by methane combustion

$$\begin{aligned} \text{Mass of CO}_2 \text{ due to CH}_4 \text{ combustion in} &= (\text{Biogas flowrate}) * (\text{the \% CH}_4 \text{ in biogas}) * (\text{density of CH}_4) * \\ \text{tonnes per annum} & \text{ conversion factor} * \text{ days per year} * \text{ hours per day} / 1000 \\ &= 1900 \text{ m}^3/\text{hr} * 57\% * 0.666776098 \text{ kg/m}^3 * 2.74342351 * 274 * 24 \\ & \quad / 1000 \\ &= 13\,027.56 \text{ tonnes CO}_2 \text{ for the period 1 Oct 2007 – 30 Jun 2008} \end{aligned}$$

### Calculating total CO<sub>2</sub> emitted

$$\begin{aligned} \text{Total CO}_2 \text{ emitted in tonnes per annum} &= \text{mass of CO}_2 \text{ emitted inherent in biogas} + \text{mass of CO}_2 \text{ due to} \\ & \quad \text{CH}_4 \text{ combustion} \\ &= 8\,914.71 \text{ tonnes CO}_2 + 13\,027.56 \text{ tonnes CO}_2 \\ &= 21\,942.27 \text{ tonnes CO}_2 \text{ for the period 1 Oct 2007 – 30 Jun 2008} \end{aligned}$$


### Calculating Project Activity Emissions

(In accordance with par 12 of AMS 1-D(version 9) no leakage is considered as no equipment is transferred from another site)

$$\begin{aligned} \text{Project Activity emissions} &= \text{CO}_2 \text{ emissions from baseline} + \text{CO}_2 \text{ emissions from leakage} \\ &= 21\,942.27 \text{ tonnes CO}_2 + 0 \text{ tonnes CO}_2 \\ &= 21\,942.27 \text{ tonnes CO}_2 \text{ for the period 1 Oct 2007 – 30 Jun 2008} \end{aligned}$$

### Calculating Baseline Emissions

$$\begin{aligned} \text{Emissionsbaseline in tonnes} & \quad \text{Grid emissions factor} * (\text{annual generation MethCap SPV1}) + \\ \text{CO}_2/\text{MWh} & \quad \text{emissions due to flaring} \\ &= 1.00 \text{ kg/kWh} * 18\,872.45\text{MWh/y} + 21\,942.27 \text{ tonnes CO}_2 \\ &= 40\,814.72 \text{ tonnes per annum} \end{aligned}$$



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Emission reductions for Project Activity

Emissions reductions in tonnes of CO<sub>2</sub> for monitoring period for Project Activity = Grid emissions factor \* electricity generated in MWh for monitoring period + emissions due to flaring – emissions due to Project Activity

= (1.00 kg/kWh \* 18 872.45MWh) + 21 942.27 tonnes CO<sub>2</sub> – 21 942.27 tonnes CO<sub>2</sub>

= 18 872.45 tonnes CO<sub>2</sub> for the period 1 Oct 2007 – 30 Jun 2008