Monitoring report

Title of the project activity: SIDPL Methane extraction and Power generation project
Version 03
Date: 24/06/2008
Monitoring Report: 02
Registration Reference No: FR-UNFCCC00000498CDMP
Monitoring Period: 01/01/2006 to 30/09/2007
Prepared By: Niroj Mohanty, Core CarbonX Solutions Pvt Ltd
E Mail: nirojmohanty@gmail.com
Mobile:+91-9908387772

Introduction

This monitoring report has been prepared for "SIDPL Methane extraction and Power generation project". The project activity has been registered with United Nations Framework Convention on Climate Change (UNFCCC) as a CDM project activity under article 12 of the Kyoto protocol. The purpose of the monitoring report is to calculate the Greenhouse gas emission reductions achieved by the above-mentioned project. The monitoring period covered under the report extends from 01/01/2006 to 30/09/2007

Reference

TYPE III –OTHER PROJECT ACTIVITIES
III.H. - Methane recovery in wastewater treatment
Reference: III.H./Version 01, sectoral Scope: 13, 03 March 2006

TYPE I –RENEWABLE ENERGY PROJECTS
I.D.-'Grid connected renewable electricity generation'
Reference: I.D./Version 08, sectoral Scope: 01, 03 March 2006

Definitions in the report

CDM: Clean Development Mechanism
PDD: Project Design Document
GHG: Greenhouse Gases
IPCC: Intergovernmental Panel on Climate Change

General description of the project

Project Activity

The purpose of the project activity is to extract and capture methane enriched biogas generated from the treatment of spent wash and to use the captured biogas along with biomass for generation of clean power.

This project activity is based on three complementary activities for generation of electricity as follows:

- Firstly, anaerobic treatment of distillery effluent (spentwash) and collection of methane enriched biogas in a closed digester system. This reduces methane emissions into the atmosphere that would have otherwise been emitted from the existing open lagoons.

- Secondly, combustion of methane enriched biogas extracted and captured in a boiler for renewable power, thus converting its methane content into carbon dioxide thereby reducing its greenhouse gas effect.
- Finally, the project activity also includes use of biomass viz Baggasse, Paddy Husk, Soya Husk, Rice Husk ,Wood chips, Wood dust as inputs to the boiler for electricity generation as per the availability of these resources. This supplementary fuel enables the unit to continuously generate energy even at times of failure of the anaerobic digester or non-availability of methane enriched biogas. The generation of power at M/s. Sagar Industries & Distilleries (P) Ltd. (SIDPL) displaces equivalent amount of fossil fuel power generation in the grid and its associated greenhouse gas emissions.

Project Location

The project activity is located at a site at Gat No. 48 about 3.5 km away from village Dahyane in East direction. It is geographically located at 20^0 20'N Latitude & 74^0 19'E Longitude. The premises have a gentle terrain & no prime agricultural land has been sacrificed. Sub-soil is moderately coarse & partly yellowish brown with some top cover of soil. The nearest railway stations are Nashik Road and Manmad. Neighbouring villages of Kanherwadi, Dodambe, Paregaon, Chikhalambe & Bahaduri are located within 3 km to 5 km range.

Contribution of the project activity to sustainable development

Ministry of Environment and Forests, Govt. of India has stipulated the social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[1].

Details on these four indicators were stated in the registered PDD and first monitoring report. In addition to those mentioned benefits of the project activity, which has happened, recently has been described in the individual section.

Social well being

The project has been implemented in the backward area of Chandwad taluka of Maharashtra state where farming is the major source of income for the community. SIDPL was the first industrial unit in this taluka. The unit provided direct and indirect employment generation opportunities to more than 500 different persons for different type of works for different periods of duration during the construction period of the project activity. This resulted in a disbursement of INR 2.34 million during the construction (2001-2003) of the project activity as salaries and wages for the construction workers. In addition, the project activity has created direct confirmed employment for 22 persons and contractual and temporary employment opportunity for 51 persons. Thus, the project activity has given the community of this taluka an alternative source of income, which has reduced their dependency on farming as the sole means of subsistence.

Additionally, SIDPL has created better infrastructure in the plant premises and the neigbouring areas. The initiatives undertaken include development of 4.5 km of road, 232 street lightning points, and establishment of 4 borewells and construction of 38 water harvesting structures. SIDPL has also contributed to increasing the green cover by planting 0.25 million saplings within the facilitiy's as well as the surrounding areas.

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[1] http://cdmindia.nic.in/host_approval_criteria.htm

The project activity is also sourcing biomass from the market which is collected and transported to the supplier site from the fields. This indirectly benefits the farmers by enabling them to secure a better source of income through sale of biomass at competitive rates.

More and more rural industries will be set up in the taluka as a consequence of the plant's presence in the area. This project activity will also cause further infrastructure development in the area, which ultimately leads to the rural development. This also prevents the migration of the rural poor from the taluka to cities due to opportunities created by the plant.

The project proponent has established a system where training on CDM has been organized for its employee on continuous basis. This project activity has build up a knowledge base among its employees about the CDM process and its advantages.

Economic well being

SIDPL is located in the backward area of Chandwad taluka of Maharashtra state. It is the first industrial unit in the taluka. The total investment of INR 294.6 millions has happened due to project activity which otherwise would not have happened. The management of SIDPL is also going for expansion of the plant. Thus it would lead to the development of the region and improve the socio- economic conditions of the local villagers.

Paddy Husk, Soya Husk and Wood chips are used as supplementary fuel to the boiler. These are collected from the suppliers who source it from farmers, thus generating an additional income for the farmers on account of supply of the biomass to the project. Earlier, the biomass was being under-utilized or burnt so far with no commercial value.

Environmental well being

The project activity collects and combusts methane enriched biogas for electricity generation, thus converting CH_4 to CO_2, reducing its greenhouse gas effect. It also uses biomass for power generation thus displacing a certain amount of fossil fuels used for equivalent amount of electricity generation.

The plant has installed Secondary treatment, Tertiary treatment and Reverse osmosis processes in the ETP that further purify the spent wash. Through the project activity the odour control of spentwash has been minimised.

After the registration of the project activity it has received wide publicity in the distillery sectors. Number of other distilleries unit has already adopted the anaerobic treatment systems and planning to generate steam and electricity from the biogas and biomass by considering the CDM revenue.

Technological well being

The project activity uses technologically advanced anaerobic digester, greatly reducing COD load in the subsequent aerobic process. SIDPL was also the first distillery in the region, which had installed reverse osmosis in the wastewater treatment process. This clean technology demonstration project will encourage replication of the project activity across the region.

This will encourage other distilleries, irrespective of size, to adopt technologies for high strength wastewater treatment that have a triple benefit of avoidance of methane emissions, avoidance of fossil fuel for electricity generation and reduction of environmental impacts.

Monitoring methodology and plan:

TYPE III –OTHER PROJECT ACTIVITIES
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Reference: III.H./Version 01, sectoral Scope: 13, 03 March 2006

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The below table presents the key information and data used to determine the emission reductions.

Obtained parameters according to monitoring plan

For the project, following parameters were monitored:

Data Variable	**Unit**	**Description of measurement methods and procedures to be applied**
Wastewater flows entering system (digesters, lagoons)	M^3	This parameter is monitored from a flow meter installed before the anaerobic digester.
COD value of the Spent wash entering the anaerobic treatment reactor	Kg COD/m3	Indicator of baseline wastewater methane emissions. Organic material concentration is sampled on site and tested at the onsite laboratory. Monthly off-site analysis is conducted from an outside laboratory.APHA,21st Ed, 2005,5220-B,5-15 (sampling procedure-IS 3925 (P-1) 1987, R 1998
COD of the treated waste water at the storage tank inlet	Kg COD/m3	Organic material concentration is sampled on site and tested at the onsite laboratory. Monthly off-site analysis is conducted from an outside laboratory.
Volume of biogas sent to the boilers	M^3	Biogas flow rate at gas engine inlet is measured by a flow meter. Data to be aggregated monthly and yearly. It is measured by biogas flow meter. The biogas volume and the biogas Calorific Value indicate the amount of fuel combusted. Volume in Nm^3, normalized to take into account pressure and temperature
%CH4, Volumetric content of Methane in biogas	%	The methane content of biogas is determined by using an Orsat apparatus. The data is recorded in the register. This registered is kept in the laboratory.
Pressure	Kg/cm^2	Pressure of biogas is required to measure density of methane. This is recorded from the pressure gauge in the boiler house of the plant.
Temp.	Deg C	Temperature of biogas is required to measure density of methane. This is recorded from the pressure gauge in the boiler house of the plant.
Density of Methane	Kg/N m3	It is recorded daily. It is recorded in the plant.
Generation of Electricity	MWh	Energy meters are installed to monitor the total electricity generation. Shiftwise eight hourly data is recorded in the log book which is aggregated into daily and then to monthly and yearly readings.
Auxiliary	MWh	A small percentage of the generated electricity is

Consumption		used for auxiliary consumption. Total Auxiliary load for power plant is 329.696 kw (Units). The auxiliary electricity consumption is calculated from the total rated capacity of the auxiliary equipment of the power plant. The total rated capacity is multiplied with the number of days of operation per year of the power plant gives the auxiliary power consumption figure for the year. This approach is conservative. However, the project proponent has already installed a meter to measure the auxiliary electricity consumption. The meter is commissioned on 10th January 2008 and is functioning properly.
Net electricity generated	MWh	Net Electricity supplied to SIDPL is calculated and recorded from the total electricity generation and auxiliary load data.
Biomass Quantity	tonnes	Biomass used for power generation in the project activity is weighed by weighting bridge. This quantity is also checked with the invoice supplied by the biomass supplier. This is recorded in the logbook.
Net calorific value of biomass	Kcal/.kg	Energy content of biomass is measured through Bomb Calorie meter. The data is kept in logbook and stored in the laboratory.
Power consumed in equipment in digester plant and aerobic system	MWh	The total power consumption at the wastewater treatment system is calculated by multiplication of the total rated capacity of all the equipments of the wastewater treatment system with the number of days of operation per year of the wastewater treatment system. This approach is conservative. However, the project proponent has already installed a meter to measure the electricity consumption at the wastewater treatment system. The meter is commissioned on 10th January 2008 and is.

Quality Control (QC) and Quality Assurance (QA)

Quality Management System

The project is operated and managed by SIDPL who is the project proponent. The site has built up a CDM project activity-monitoring plan. SIDPL has ensured safety in operation of the plant as per plant management plan prepared for the site.

Director, SIDPL has constituted the CDM project team, which is responsible for the project activity. The monitoring and verification of the project activity is assigned to the eight-member team, which is responsible for monitoring, verification and recording of the data. On a daily basis the monitoring reports is checked by the operation head of power plant and ETP plant. On a monthly basis the consolidated report is forwarded to the Director. The data will be archived for at least two years following the end of the crediting period

The personnel have been trained by the technology and equipment suppliers.

Quality control (QC) and quality assurance (QA) procedures that are being undertaken for data monitored

The QA & QC procedures are equivalent to applicable National and International Standards as well as standards given by the technology supplier. The QA & QC procedures are set and implemented in order to:

- Secure a good consistency through planning to implementation of this CDM project
- Stipulate who has responsibility for what and,
- Avoid any misunderstanding between people and organization involved.
- Collection of data as part of normal plant level operations.
- Cross- checking parameters /variable with other internal company report.

Calibration/Maintenance of Measuring and Analytical Instruments

All measuring and analytical instruments are being calibrated as per national and international standards procedures.

The maintenance methods and procedures have been incorporated as part of the plant operating procedures and form an integral part of the systems and procedures for the organization.

GHG Calculations

Emission Reductions

As suggested by the methodology AMS I D and AMS III H, the GHG emission reduction, (ER_y), achieved by the project activity for a given year is
Emission Reductions 1
AMS IIIH
ERy=BEy –PEy- LEy
Emission Reductions 2
AMS I D
The total baseline emissions BE_y (tCO_2/yr) = $EG_{NET} * EF_y$
Total Emission Reduction = Emission reductions 1 + Emission Reductions 2

Calculations of Project Emissions

AMS.III.H
$PEy = PE_{y, power} + PE_{y,ww,treated} + PE_{y,s,final} + PE_{y,fugitive} + PE_{y,dissolved}$
where:
PEy: project activity emissions in the year “y” (tonnes of CO_2 equivalent)
$PE_{y,power}$ emissions through electricity or diesel consumption in the year “y”
$PE_{y,ww,treated}$ emissions through degradable organic carbon in treated wastewater in year “y”
$PE_{y,s,final}$ emissions through anaerobic decay of the final sludge produced in the year “y”. If the sludge is controlled combusted, disposed in a landfill with methane recovery, or used for soil application, this term can be neglected, and the destiny of the final sludge will be monitored during the crediting period.
$PE_{y,fugitive}$ emissions through methane release in capture and flare systems in year “y”.
$PE_{y,dissolved}$ emissions through dissolved methane in treated wastewater in year “y”
$PE_{y,ww,treated} = Q_{y,ww} * COD_{y,ww,treated} * Bo_{,ww} * MCF_{ww} * GWP\_CH_4$
where:
$Q_{y,ww}$ volume of wastewater treated in the year “y” (m^3)

$COD_{y,ww,treated}$ chemical oxygen demand of the treated wastewater in the year "y" (tonnes/m^3)
$B_{o,ww}$ methane generation capacity of the treated wastewater (IPCC default value of 0.25 kg CH_4/kg.COD)
$MCF_{ww,treated}$ methane conversion factor for the anaerobic decay of wastewater. (Default value of 0.5 is suggested)1.
GWP_CH_4 Global Warming Potential for CH4 (value of 21 is used)
$PE_{y,s,final} = S_{y,fina}l * DOC_{y,s,final} * DOC_F * F * 16/12 * GWP\_CH_4$
where:
$PE_{y,s,final}$ Methane emissions from the anaerobic decay of the final sludge generated in the wastewater system in the year "y" (tonnes of CO_2 equivalent)
$S_{y,final}$ Amount of final sludge generated by the wastewater treatment in the year y (tonnes).
$DOC_{y,s,final}$ Degradable organic content of the final sludge generated by the wastewater treatment in the year y (mass fraction). It can be measured by sampling and analysis of the sludge produced, or the IPCC default value for solid wastes of 0.3 is used.
DOC_F Fraction of DOC dissimilated to biogas (IPCC default value is 0.77).
F Fraction of CH_4 in landfill gas (IPCC default is 0.5).

PEy,fugitive = $PE_{y,fugitive,ww} + PE_{y,fugitive,s}$
where:
$PE_{y,fugitive,ww}$ Fugitive emissions through capture and flare inefficiencies in the anaerobic wastewater treatment in the year "y" (tonnes of CO_2 equivalent)
PEy,fugitive,s Fugitive emissions through capture and flare inefficiencies in the anaerobic sludge treatment in the year "y" (tonnes of CO_2 equivalent)
$PE_{y,fugitive,ww} = (1 – CFEww) * ME_{y,ww,untreated} * GWP\_CH_4$
where:
CFE_{ww} capture and flare efficiency of the methane recovery and combustion equipment in the wastewater treatment (a default value of 0.9 shall be used, given no other appropriate value)
$ME_{y,ww,untreated}$ methane emission potential of the untreated wastewater in the year "y" (tonnes)
$ME_{y,ww,untreated} = Q_{y,ww} * COD_{y,ww,untreated} * B_{o,ww} * MCF_{ww,untreated}$
where:
$COD_{y,ww,untreated}$ Chemical oxygen demand of the wastewater entering the anaerobic treatment reactor/system with methane capture in the year "y" (tonnes/m3)
$MCF_{ww,untreated}$ methane conversion factor for the anaerobic decay of the untreated wastewater (IPCC default value of 1.0 for anaerobic systems. If the untreated wastewater is discharged to the environment, the default value of 0.5 is suggested).
PEy,fugitive,s = (1 – CFEs) * $ME_{y,s,untreated} * GWP\_CH_4$
where:
CFEs capture and flare efficiency of the methane recovery and combustion equipment in the sludge treatment (a default value of 0.9 shall be used, given no other appropriate value)
$ME_{y,s,untreated}$ methane emission potential of the untreated sludge in the year "y" (tonnes)
$ME_{y,s,untreated} = S_{y,untreated} * DOC_{y,s,untreated} * DOC_F * F * 16/12$
where:
$S_{y,untreated}$ amount of untreated sludge generated in the year "y" (tonnes)
$DOC_{y,s,untreated}$ Degradable organic content of the untreated sludge generated in the year y (mass fraction). It can be measured by sampling and analysis of the sludge produced, or the IPCC default value for solid wastes of 0.3 is used.
$PE_{y,dissolved} = Q_{y,ww} * [CH_4]_{y,ww,treated} * GWP\_CH_4$
where:
$[CH_4]_{y,ww,treated}$ dissolved methane content in the treated wastewater (tonnes/m^3). In aerobic wastewater treatment default value is zero, in anaerobic treatment it can be measured, or a default value of 10e-4 tonnes/m^3 can be used.

AMS I.D.

The project activity is a biogas and biomass based power generation project, hence there will be no GHG emissions of from the project activity. Therefore, no calculation is required here.

Calculation of Leakage

As per the AMS III.H: If the used technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects at the site of the other activity are to be considered.
As per category AMS ID leakage estimation is required if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity. These are not applicable for the project activity.

Calculation of Baseline Emissions

AMS III.H.
For the case of introduction of methane recovery and combustion unit to an existing anaerobic wastewater or sludge treatment, the baseline emissions consists of the methane generation potential of the untreated wastewater and or sludge
$BEy = ME_{y,ww,untreated} + ME_{y,s,untreated}$
$ME_{y,ww,untreated}$ methane emission potential of the untreated wastewater in the year "y" (tonnes)
$ME_{y,s,untreated}$ methane emission potential of the untreated sludge in the year "y" (tonnes)

$ME_{y,ww,untreated} = Q_{y,ww} * COD_{y,ww,untreated} * Bo,_{ww} * MCF_{ww,untreated}$
where:
$COD_{y,ww,untreated}$ Chemical oxygen demand of the wastewater entering the anaerobic treatment reactor/system with methane capture in the year "y" (tonnes/m3)
$MCF_{ww,untreated}$ methane conversion factor for the anaerobic decay of the untreated wastewater (IPCC default value of 1.0 for anaerobic systems. If the untreated wastewater is discharged to the environment, the default value of 0.5 is suggested).

$ME_{y,s,untreated} = S_{y,untreated} * DOC_{y,s,untreated} * DOC_F * F * 16/12$
where:
Sy,untreated amount of untreated sludge generated in the year "y" (tonnes)
DOCy,s,untreated Degradable organic content of the untreated sludge generated in the year y (mass fraction). It can be measured by sampling and analysis of the sludge produced, or the IPCC default value for solid wastes of 0.3 is used.

AMS I.D
The biogas and biomass are used as input fuels to boilers. The steam generated in the boiler is used in steam turbine for electricity generation. The electricity generated is exported to the regional electricity grid and is used by the SIDPL. Hence the applicable baseline, as Per Type I-D Project, is the kWh or MWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh or t CO_2equ/MWh) calculated in a transparent and conservative manner as:

The total baseline emissions BE_y (tCO_2/yr) = $EG_{NET} * EF_y$
Where
BE_y = Baseline emissions in year *y* (tCO_2).
EG_{NET} (MWh/yr) = Net Electricity generated by the project in year y;
$EG_{NET} = EG_{GEN} – EG_{AUX}$
$EG_Y = EG_{GEN} – EG_{AUX}$
EG_{GEN}=Generation of the electricty by the project activity
EG_{AUX}=Auxilairy Eelctricty Consumption
EF_y (tCO_2/MWh) = CO_2 emission factor of the Western Region Grid

The emission factor EF_y of the Western Region Grid is a fixed value over the projects crediting period and is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):
The emission factor EF_y is estimated to be 0.883 tCO_{2e}/MWh or kg CO_2/kWh.

GHG Emission Reductions

Emission reduction from the methane extraction and capture achieved during monitoring period covered in the report has been presented in the following table.

Year	Total Baseline Emissions (tCO_2e/year)	Total Project Emissions (tCO_2e/year)	Emission Reductions (tCO_2e/year)
2006	47359	15024	32336
2007	46210	15204	31006
Total	93569	30228	63341

Emission reduction from the power generation during monitoring period covered in the report has been presented below.

Consolidated Report on Electricity Generation

Consolidated Report on Electricity Generation

Month	Gross Electricity Generated	Auxiliary Electricity Consumed (from the rated capacity)	Net Electricity Generated
	kWh	kWh	kWh
January,06	483812	237381	246431
February,06	415498	221556	193942
March,06	783960	245294	538666
April,06	623700	221556	402144
May,06	800760	245294	555466
June,06	667980	213643	454337
July,06	228480	79127	149353
August,06	0	0	0
September,06	221580	118691	102889
October,06	255300	110778	144522
November,06	399420	189905	209515
December,06	750780	245294	505486
January,07	701820	221556	480264
February,07	663000	213643	449357
March,07	660300	245294	415006
April,07	721380	237381	483999
May,07	699660	245294	454366
June,07	600600	197818	402782
July,07	756540	245294	511246
August,07	395280	158254	237026
September,07	626040	229468	396572
Total			7333371

EFy for this Project Activity (CO_2 emission factor of the Western Region Grid) as reported in the registered project design document (PDD) is 0.883 kg CO_2/MWh. Accordingly:
Emission reduction calculation for the monitoring period:
EGy (Net supply to grid) = 7333.371 MWh
ER = 7333.371 (MWh) * 0.883 (tCO_{2e}/MWh)
= 6475 tCO_2e

Calculation of total emission Reductions

The total emission reduction achieved by this project activity for the monitoring period from 01/01/2006 to 30/09/2007 is therefore,

Emission Reductions = 63341 t CO_{2e} +6475 t CO_{2e} =69817 t CO_{2e}

Appendix 1

All the parameters are monitored on daily basis as per the registered PDD and later averaged out on monthly basis.

Biomass consumption data	
Month Name	QTY in Tons
Jan-06	4140.540
Feb-06	4599.590
Mar-06	2541.650
Apr-06	3371.920
May-06	4613.800
Jun-06	4103.290
Jul-06	3916.200
Aug-06	1787.875
Sep-06	1825.680
Oct-06	1454.430
Nov-06	2622.200
Dec-06	3827.960
Total	38805.135
Month Name	**QTY in Tons**
Jan-07	4223.521
Feb-07	3709.657
Mar-07	3079.805
Apr-07	3655.495
May-07	3359.560
Jun-07	2705.975
Jul-07	3550.881
Aug-07	2385.500
Sep-07	3802.455
Total	30472.849

Total Biogas Quantity Used	
Month Name	Quantity
	Nm3
Jan-06	833640
Feb-06	563890
Mar-06	754390
Apr-06	755116
May-06	772637
Jun-06	621549

Jul-06	431251
Aug-06	0
Sep-06	564509
Oct-06	361857
Nov-06	645047
Dec-06	896615
Total	7200501
Month Name	**Quantity**
	Nm3
Jan-07	906618
Feb-07	817831
Mar-07	848561
Apr-07	908561
May-07	912576
Jun-07	611093
Jul-07	858006
Aug-07	395394
Sep-07	581538
Total	6840178

Parameters associated with biogas (**Pressure, Temperature, Density and Methane content of Biogas**)

Month	CH4%	Pressure	Temperature	Density
	%	Kg/cm2	Deg C	Kg/Nm3
Jan-06	63.9	0.19	36.16	1.34
Feb-06	63.4	0.19	38.95	1.33
Mar-06	63.8	0.19	36.16	1.34
Apr-06	63.7	0.19	36.07	1.34
May-06	63.6	0.19	36.23	1.34
Jun-06	63.7	0.19	36.07	1.34
Jul-06	63.6	0.19	36.17	1.34
Aug-06	0.0	0.00	0.00	0.00
Sep-06	63.7	0.19	36.12	1.34

Oct-06	63.7	0.19	36.11	1.34
Nov-06	63.7	0.19	36.15	1.34
Dec-06	63.8	0.19	36.02	1.34
Date	**CH4%**	**Pressure**	**Temperature**	**Density**
Jan-07	63.5	0.19	36.29	1.34
Feb-07	63.6	0.19	36.17	1.34
Mar-07	63.6	0.19	36.26	1.34
Apr-07	63.6	0.19	36.18	1.34
May-07	63.6	0.19	36.19	1.34
Jun-07	63.6	0.19	36.22	1.34
Jul-07	63.6	0.19	36.25	1.34
Aug-07	63.5	0.19	36.34	1.34
Sep-07	63.2	0.19	36.60	1.34

	Biogas NCV	Biomass NCV
Month	**Kcal/NM3**	**Kcal/kg**
Jan-06	4748	2495
Feb-06	4757	2521
Mar-06	4659	2557
Apr-06	4562	2609
May-06	4675	2501
Jun-06	4562	2524
Jul-06	4665	2561
Aug-06	0	0
Sep-06	4674	2497
Oct-06	4663	2526
Nov-06	4653	2499
Dec-06	4646	2542
Jan-07	4636	2622
Feb-07	4655	2465
Mar-07	4650	2573
Apr-07	4639	2506
May-07	4640	2519
Jun-07	4652	2512
Jul-07	4657	2535
Aug-07	4615	2501
Sep-07	4650	2484