

GOLD STANDARD MONITORING REPORT

Project Title: **Biomass Briquette Based Earth Stove Project**

Project ID: **GS 671**

Monitoring Period: **26/04/2009 to 31/03/2012**
(Including Both Days)

Version No.: **01**

Monitoring Period: **1ST**

Project Emission Reduction for the Period: **1,209 tCO₂e**

Date: **19/09/2012**

Table of Contents

SECTION A.	GENERAL DESCRIPTION OF THE PROJECT ACTIVITY.....	3
SECTION B.	IMPLEMENTATION OF THE PROJECT ACTIVITY	5
SECTION C.	DESCRIPTION OF THE MONITORING SYSTEM	6
SECTION D.	DATA AND PARAMETERS.....	7
SECTION E.	EMISSION REDUCTIONS CALCULATION	14
ANNEX-I		15

SECTION A. GENERAL DESCRIPTION OF THE PROJECT ACTIVITY

A.1. Brief description of the project activity:

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1. Purpose of the project activity and the measures taken to reduce greenhouse gas emissions;

The project activity uses renewable energy (biomass briquettes) to generate heat energy to satisfy commercial users' cooking needs. Biomass briquettes will displace fossil fuel based thermal energy use in the Northern and Western region of India within the project boundary.

2. Brief description of the installed technology and equipment;

The proposed project involves manufacture, sale and installation of Earth Stoves to commercial customers. The Earth Stove is a two pot gasifier stove made of a mild steel body and stainless steel combustion chamber and ceramic insulation. The stove has double walled combustion chamber for secondary air and to facilitate less flow of primary air.

3. Relevant dates for the project activity

Project commissioning: 09/11/2007
Emission reduction credit period: 26/04/2009 to 31/03/2012
Project Registered with GS: 25/04/2011
Monitoring Period: 26/04/2009 to 31/03/2012

4. Total emission reductions achieved in this monitoring period.

Project emission reductions for the crediting period 26/04/2009 to 31/03/2012: **1,209 tCO₂e**.

A.2. Project Participants

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Nishant Bioenergy Pvt. Ltd. (NBPL)	No
UK	ClimateCare Limited	No

A.3. Location of the project activity:

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Country: India
State & Coordinates: See table below.

Location	District	State	Latitude	Longitude
Delhi	Delhi	Delhi	28.37	77.13
Jandha	Vaishali	Bihar	25.42	85.13
Mahuwa	Patna	Bihar	25.4	85.22
Patepur	Vaishali	Bihar	25.42	85.13
		Punjab & Haryana		

A.4. Technical description of the project

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The proposed project involves sale and installation of Earth Stoves which is designed and manufactured by Nishant Bioenergy Pvt. Ltd. (NBPL). The Earth Stove is a two pot gasifier stove made of a mild steel body and stainless steel combustion chamber and ceramic insulation. The stove has double walled combustion chamber for secondary air and to facilitate less flow of primary air. Once the stove is ignited with small wood pieces or charcoal, a blower (a 110 watt AC fan) is started and within minutes the glowing charcoal bed is ready for cooking. In the burning phase, the fan increases efficiency of combustion.

Biomass briquettes are fed from the fuel feeding gate on the side or from the top. Once the briquettes start burning, they release combustible gases (volatiles) which get burnt by the hot secondary air coming from holes at the top of the combustion chamber. This ensures that there is almost complete combustion of fuel and less smoke is released from the burning process.

The hot gases released from the main combustion chamber are channelled to the second pot through a link tunnel for use in the slow-cooking process or food warming. Then the smoke (flue gases) is released to the atmosphere through a chimney.

Briquettes are fed to meet heat demand on need basis and ash from the combustion of briquettes remains at the bottom of the combustion chamber. A “gear and worm” arrangement is used to scrape the ash to the water filled ash pot placed below the combustion chamber.

The earth stove used for the project activity is under patent (India) and is completely developed and owned by NBPL.



Plate 1: Earth Stove Model ES4



Plate 2: Demonstration



Plate 3: Simple Briquette making machine

For this project, the stoves are manufactured in 3 different sizes i.e. ES4, ES10 and ES15. Their briquette consumption varies based on their capacities. The project started selling the Earth Stoves

initially in Chandigarh region, the capital of Punjab & Haryana state. Thereafter other states or towns of India were targeted where LPG or Coal is used as common cooking fuel. These stoves will considerably reduce greenhouse gas emissions while simultaneously offering co-benefits to end users in the form of revenue savings.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

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Project Type: I – Renewable Energy Projects

Project Category: I.C. – Thermal energy for the user with or without electricity, version 18

A.6. Registration date of the project activity:

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25/04/2011

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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Starting date of the project activity: 09/11/2007

Crediting period: Renewable of 7 years, 0 months

Starting date of the first crediting period: 26/04/2009

A.8. Name of responsible person(s)/entity(ies):

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Joash Obare,
ClimateCare,
Eden square Business Centre,
P.O. Box 856 -00606,
Nairobi.
joash.obare@climatecare.org

SECTION B. IMPLEMENTATION OF THE PROJECT ACTIVITY

B.1. Implementation status of the project activity

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1. The starting date of operation of the project activity was 09/11/2007
2. As per Table 1 of registered GS-VER-PDD, projected installations in each state was as follows-

Location	State	ES-4	ES-10	ES-15
Chandigarh	Chandigarh	50	50	4
Mohali	Punjab	20	4	0
Bhatinda	Punjab	40	10	0
Tarantaran	Punjab	0	0	16
Panchkula	Haryana	20	4	0
Karnal	Haryana	20	0	0
Kurukshetra	Haryana	20	0	0
Ambala	Haryana	20	0	0
Solan	Himachal	20	0	0
Delhi	Delhi	50	50	19
Jandha	Bihar	0	0	14
Mahuwa	Bihar	0	0	16
Patepur	Bihar	0	0	14
Bidhupur	Bihar	0	0	14

Hyderabad	Andhra Pradesh	50	20	0
Tirupati	Andhra Pradesh	50	0	0
		360	138	97

However, during actual project implementation, installation of stoves could not be done in accordance with the projected installations because of following reasons.

1. Installation of any additional earth stoves is no longer feasible due to rise in cost of biomass briquettes and rise in material cost for stove fabrication.
2. Supply chain of biomass briquettes is not well developed due to distances, logistics and cost implications.
3. Delays in maintenance of earth stoves due to unavailability of skilled manpower at site.
4. Some stoves are no longer in operation due to malfunctioning of due to distances and logistics for repair and supply of parts.
5. In some areas, the data collection on briquette consumption was not maintained as outlined in PDD. This was attributed to collapse of Siau Women group briquetting plant and also due to spread of customers to far way states, hence their actual consumption could not be established and those stoves were not included in the monitoring.
6. The Siau women briquetting factory which was to supply briquettes to the projects was not successful as anticipated during the project planning phase. Due to wrangling and mismanagement by the members, the project stopped operation and the project was therefore unable to purchase briquettes form the group. Instead, alternative sources were identified.

This is resulted into less installation of earth stoves. Type wise installation during this monitoring period (01/01/2008 to 31/03/2012) mentioned in below table.

Type	2007-08	2008-09	2009-10	2010-11	2011-12
ES4	15	39	21	154	20
ES10	2	5	2	3	0
ES15	58	90	7	6	0
Total	75	134	30	163	20
Grand Total	422				

No major event occurred within the period which will impact the applicability of the methodology.

B.2. Revision of the monitoring plan

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The monitoring plan has not been revised.

B.3. Request for deviation applied to this monitoring period

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No deviation is applied to this monitoring period.

B.4. Notification or request of approval of changes

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No request of approval of changes from the project activity as described in the registered PDD.

SECTION C. DESCRIPTION OF THE MONITORING SYSTEM

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The project proponent collects the data of briquettes bought and the quantities distributed to commercial operators. The records contain briquette invoices for briquette deliveries and also the stove sales records.

The project proponent also keeps and compiles records on stove maintenance and replacement done.

NBPL bi-annually checks Net Calorific value of the biomass briquette analyse from the national approved laboratory and maintains records for the same throughout the crediting period.

Project promoter maintains the records of training, qualification for directly employed personnel & the number of end users.

Biomass Collection and Briquettes Manufacturing Process

There are several briquette making plants operating in India. These plants supplies briquettes to various industries for use in boilers for steam generation.

Currently, NBPL or its clients buys briquettes from various suppliers. (Refer the attached list of briquette supplier in Annex-I)

During wet season, biomass waste collected will be spread to dry before briquetting. In order to cover the likely shortfall in supply of briquettes, NBPL / its client purchase more briquettes and stock them for use by customers during the wet season since briquette production volumes will decrease.

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	$TE_{v,LPG}$
Data unit:	TJ per year
Description:	Quantity of heat generation by all units during the year y
Source of data used:	Baseline survey calculations
Value applied:	11.512
Justification of the choice of data or description of measurement methods and procedures actually applied :	All the heat generated in the baseline scenario by fossil fuels will be substituted with biomass sources.
Any comment:	-

Data / Parameter:	NVC_{LPG}
Data unit:	TJ/t
Description:	Net Calorific Value of LPG
Source of data used:	IPCC values will be applied
Value applied:	0.0473
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is key in determine the overall baseline emission associated with displacement of LPG
Any comment:	-

Data / Parameter:	η_{th}
Data unit:	%
Description:	The efficiency of the plant using fossil fuel (LPG) that would have been used in the absence of the project activity.
Source of data used:	Published literature and used in PDD

Value applied:	56
Justification of the choice of data or description of measurement methods and procedures actually applied :	The efficiency of the stove using fossil fuels will be used in determining the baseline emission
Any comment:	-

Data / Parameter:	η_{th}
Data unit:	%
Description:	The efficiency of the Earth Stove burning biomass briquettes that replaces baseline fuels
Source of data used:	Project developer
Value applied:	39
Justification of the choice of data or description of measurement methods and procedures actually applied :	The efficiency of the Earth Stove burning biomass briquettes will be used in determining the amount of useful energy replacing the displacing fossil fuels based energy source
Any comment:	-

Data / Parameter:	$Q_{y, LPG}$
Data unit:	t/yr
Description:	Quantity of LPG replaced during the year y in tonnes
Source of data used:	Baseline survey calculations
Value applied:	243.39
Justification of the choice of data or description of measurement methods and procedures actually applied :	The amount of LPG replaced by biomass briquettes gives the total quantity of heat energy to be replaced with heat energy from biomass briquettes. The quantity of LPG replaced is crucial in determining the amount of energy to be replaced in the baseline.
Any comment:	The amount of LPG fuel used is computed using the energy needs equivalent per comparable Earth stove use.

Data / Parameter:	$EF_{CM,grid,y}$
Data unit:	tCO ₂ /MWh
Description:	CO ₂ emission factor of the electricity grid in the year y
Source of data to be used:	Calculated by the Central Electricity Authority, Indian Government http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value of data	0.9534
Description of measurement methods and procedures to be applied:	The data is calculated as per the procedures set out in the tool to calculate the emission factor for an electricity system.
QA/QC procedures to be applied:	The value will be updated annually through checking for the yearly updates released by the CEA.
Any comment:	Due to the very small meter of these emissions from the project. The CEA default factor has been used.

D.2. Data and parameters monitored

Sustainable Development Parameters

Job creation

The project has 50 people directly involved with the project at different levels who are either directly employed by the project or temporal basis. Several other persons are involved in downstream /allied business. Those employed directly in below mentioned processes:

1. Earth Stove making
2. Earth Stove maintenance
3. Raw Material collection and transport to briquette manufacturing facility
4. Briquette making
5. Briquette sales and transport

The briquette making plant by Siau Women group started operation during this monitoring period and the project was able to start buying briquette from the group for some time. However, due to logistical and management challenges, the power plant stopped operation. Nibhoria Bioenergy tried to intervene to ensure the plant runs smoothly but o no success. The plant eventually stooped operation.

Livelihood of the poor

Livelihood of the poor improved with this project activity through following benefits of implementation of project activity-

- (i) The biomass earth stoves give rise to employment opportunities for enterprises, manufacturing, distributing, retailing and maintenance the stoves and briquettes.
- (ii) Human capacity is raised through the business development component of the project i.e. collection, production and sale of biomass briquettes, although this aspect did not get exponential growth since the Siau Women Group briquetting plant stalled.
- (iii) The introduction of locally manufactured technology which optimizes energy efficiency helps to build technological self-reliance. This will result in improved livelihoods of the communities with secondary business stimulated by new income generating source.

Access to Energy Services

Biomass gasifier being installed by the project are aimed at ensuring that households have access to clean, reliable and cheap energy sources and this will enhance their access energy services. Each successful installation of Biomass gasifier units contributes to increase in energy access of the household.

The project has so far installed 422 biomass gasifier units and out of these, 227 are working. Of the commercial kitchens that are using the biomass gasifier it was established that they find the biomass gasifier reliable and have not switched to use of other fuels. However, cases of use other fuels were likely to occur for those commercial kitchens whose units stopped functioning or during social events where other fuels are used by commercial kitchens as the fuel consumption during this time is more than what the biomass gasifier unit can generate. However, these events do not occur to all commercial kitchens for daily and the project proponent considers them negligible to cause leakage.

Quality of Employment

Use of technicians for production of Earth stoves required training, where the training received enabled them fabricate stoves and they can also use it for replication elsewhere to manufacture other products which will be beneficial to the community. This will form a gradual transfer of knowledge and skill to several people either directly through apprentices.

The project has trained 10 employees and those who have been employed to run the project especially the project coordinator have been given quality training and skills in construction of the biomass gasifier units and management of project programme.

Air quality

Use of the stoves ensures that particulates associated with burning fossil fuels are eliminated and this improves the air quality.

Biodiversity Deforestation rate

Since the region is semi-arid and receives minimal rainfall. With introduction of the project, the amount of non-renewable biomass extraction from the nearby forest and the surrounding areas will reduce and this will help in reducing deforestation in the area. With reduced deforestation, project therefore has a positive impact on bio-diversity.

Data / Parameter:	Quantitative employment and income generation
Data unit:	-
Description:	Number of jobs created
Measured /Calculated /Default:	Measured
Source of data:	Nishant Bioenergy Limited
Value(s) of monitored parameter:	10 by 31/03/2012
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Sustainable development indicator
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Keeping records on type, training offered and number of people employed. Both permanency of jobs will be recorded and the skills of the workers. The company has established workshop for fabricating stoves and a briquette making plant is under construction. So far 8 jobs have been created in the stove making process.
Measuring/ Reading/ Recording frequency:	Ongoing
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	Livelihood of the poor
Data unit:	-
Description:	Number of jobs created, salaries and average number of dependants
Measured /Calculated /Default:	Estimated
Source of data:	Nishant Bioenergy Limited
Value(s) of monitored parameter:	Qualitative data
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Sustainable development indicator
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Survey method and record keeping of income earning groups
Measuring/ Reading/ Recording frequency:	On going
Calculation method (if applicable):	The livelihood of the poor was evaluated by determining the impact the salaries earning have on the communities and dependants of those employed.
QA/QC procedures applied:	-

Data / Parameter:	Access to affordable and clean energy services
Data unit:	422 stoves have been installed
Description:	Numbers of stoves sold and quantities of briquettes sold
Measured /Calculated /Default:	

Source of data:	Nishant Bioenergy Limited
Value(s) of monitored parameter:	227 stoves operating out of 422 stoves installed and 1,826.427 tonnes of biomass consumed.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Sustainable development indicator
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Sales data records
Measuring/ Reading/ Recording frequency:	Ongoing
Calculation method (if applicable):	Record keeping of Number of stoves sold and operating
QA/QC procedures applied:	

Data / Parameter:	Quality of employment
Data unit:	-
Description:	Type and skills of jobs created
Measured /Calculated /Default:	-
Source of data:	Nishant Bioenergy Limited
Value(s) of monitored parameter:	-
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Sustainable development indicator
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Creation of direct and indirect jobs is expected to be created downstream.
Measuring/ Reading/ Recording frequency:	Ongoing
Calculation method (if applicable):	The numbers includes skills and experience gained for those employed on permanent and casual basis.
QA/QC procedures applied:	-

Data / Parameter:	Technology transfer and technological self-reliance
Data unit:	Number of trained technicians
Description:	Technicians training
Measured /Calculated /Default:	
Source of data:	Nishant Bioenergy Limited
Value(s) of monitored parameter:	10 engaged for manufacturing and maintenance of stoves.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Sustainable development indicator
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	To expand their number to a level of sustaining quality and reliability of product supply
Measuring/ Reading/ Recording frequency:	Ongoing
Calculation method (if applicable):	Record keeping
QA/QC procedures applied:	-

Data / Parameter:	Hours of operation
Data unit:	hrs
Description:	Average operation hours of Earth stove
Source of data used:	Calculated based on amount of briquettes consumed
Value applied:	2008-09: 332 2009-10: 819 2010-11: 817 2011-12: 720
Justification of the choice of data or description of measurement methods and procedures actually applied :	The hours of operation will be used for calculation of project emissions. The hours of operation is based on the total amount of briquettes consumed divided by the average hourly consumption of briquettes by the stove.
QA/QC procedures to be applied:	Almost all of the meter logs in the stoves malfunctioned and the project proponent opted to use the total amount of briquette sold as the basis to calculate the amount of hours the stove operated. This method was considered conservative.
Any comment:	By using the amount of briquette sold as basis for calculating the operating time, the method was considered conservative since most logs malfunctioned.

Data / Parameter:	Amount of Biomass briquettes used
Data unit:	Tonnes per year
Description:	Quantity of biomass briquettes consumed by restaurant for heat generation per day
Source of data used:	Sale records
Value applied:	1,826.427
Justification of the choice of data or description of measurement methods and procedures actually applied :	The sales records will be compiled to give the total amount of biomass briquettes sold and utilised for displacement of LPG by the project
QA/QC procedures to be applied:	Data will be calculated as per the information stored & maintained in the sales records of the project promoter and counter checked with briquette orders placed, which is available at the time of verification
Any comment:	N/A

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Electricity consumed by the project activity in the year y
Source of data to be used:	Calculated based on the total number of stoves multiplied by the average running hours and fan capacity.
Value of data	0.296
Description of measurement methods and procedures to be applied:	Each stove in operation has a meter log for recording stove operation hours. The reading from the log is used to calculate the electricity consumption of the stove based on the capacity of the stove fan. The fan has also a fixed power capacity of 110 watts which can be used to calculate the running time based on fuel consumed.
QA/QC procedures to be applied:	Data will be calculated as per the number of stoves in operation and the total average running time based on the total number of briquettes sold.
Any comment:	-

Data / Parameter:	EG_y
Data unit:	MWh

Description:	Electricity for briquette making
Source of data to be used:	Average power consumption per tonne of briquette made
Value of data	50
Description of measurement methods and procedures to be applied:	Sales record for briquettes
QA/QC procedures to be applied:	Data will be calculated based on the power consumed with total tonnes of briquettes sold.
Any comment:	Sourced from Ref: http://wgbis.ces.iisc.ernet.in/energy/HC270799/RWEDP/acrobat/fd46.pdf , (Page no.15)

Data / Parameter:	Stove numbers
Data unit:	Number of stoves
Description:	Number of stove operating
Source of data to be used:	Record kept by the NBPL manager.
Value of data	227
Description of measurement methods and procedures to be applied:	Sales records, maintenance and briquettes sales records. Data is kept on stove installation and payment, maintenance and repair records.
QA/QC procedures to be applied:	The records will be updated regularly by the project manager on an ongoing basis
Any comment:	-

Data / Parameter:	Net calorific value of briquettes
Data unit:	Kcal/Kg
Description:	Net Calorific Value of Biomass Briquette
Source of data used:	Reported quarterly bi-annually by National Approved Laboratory
Value applied:	3861
Justification of the choice of data or description of measurement methods and procedures actually applied :	Standard laboratory Procedures and calculated based upon the calorific value of Biomass Briquettes. Briquettes were tested by government approved Laboratories.
QA/QC procedures to be applied:	The calorific value for briquettes will be analysed bi-annually.
Any comment:	Since the pre described NCV test has not been carried out. The previous value as per tested certificate has been applied.

Data / Parameter:	EF _{CM,grid,y}
Data unit:	tCO ₂ /MWh
Description:	CO ₂ emission factor of the electricity grid in the year y
Source of data to be used:	Calculated by the Central Electricity Authority, Indian Government, http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value of data	0.9534
Description of measurement methods and procedures to be applied:	The data is calculated as per the procedures set out in the tool to calculate the emission factor for an electricity system
QA/QC procedures to be applied:	The value will be updated annually through checking for the yearly updates released by the CEA.
Any comment:	The values used are the most recent update of the EF

SECTION E. EMISSION REDUCTIONS CALCULATION

E.1. Baseline emissions calculation

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Total baseline emission for the project activity:

$$\begin{aligned} BE_y &= 11.512 * 63.1 / 56\% \\ &= \mathbf{1,297.19 \text{ tCO}_2/\text{yr}} \end{aligned}$$

E.2. Project emission calculation

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Total baseline emission for the project activity:

$$\begin{aligned} PE_y &= EG_{p,j,y} * EF_y \\ &= 0.296 * 0.9534 \\ &= \mathbf{0.282 \text{ tCO}_2/\text{yr}} \end{aligned}$$

E.3. Leakage calculation

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Total baseline emission for the project activity:

$$\begin{aligned} LE_y &= EG_{p,j,y} * EF_y \\ &= 91.32 * 0.9534 \\ &= \mathbf{87.07 \text{ tCO}_2/\text{yr}} \end{aligned}$$

E.4. Emission reductions calculation / table

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$$\begin{aligned} ER_y &= BE_y - PE_y - LE_y \\ &= 1,297.19 - 0.282 - 87.07 \\ &= \mathbf{1,209 \text{ tCO}_2/\text{yr}} \end{aligned}$$

Monitoring Period	Total Baseline Emissions (t CO ₂ e)	Total Project Emission (t CO ₂ e)	Total Leakage (t CO ₂ e)	Total Emission Reduction (t CO ₂ e)
26/04/2009 to 31/03/2012 (Including both days)	1,297.19	0.282	87.07	1,209

E.5. Comparison of actual emission reductions with estimates in the PDD

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This section shall include a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered PDD.

Item	Values applied in ex-ante calculation of the registered PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)		
2008-09	2,997	134.877
2009-10	2,997	386.200
2010-11	2,997	370.367
2011-12	2,997	318.394
Total	11,988	1,209.00

E.6. Remarks on difference from estimated value in the PDD

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It was projected that all 595 units were to be installed before end of year 2010; however, only 422 units were installed up to 31/03/2012 out of which only 227 stoves are in operation. This led to reduction in the total number of achieved emission reduction by the project activity during this monitoring period.

ANNEX-I**List of Briquette Supplier**

Sr. No.	Name of Supplier	Location
1.	K.N agro industries	Delhi
2.	Nishant Bioenergy Pvt. Ltd.	Delhi
3.	Shri ram agro fuels	Delhi
4.	JDS agro industries	Delhi
5.	Shri balaji agro bio fuels	Delhi
6.	Vaishno enterprises	Delhi
7.	Ekta Bioenergy	Delhi
8.	Sandeep Chaudhery	Patna
9.	Jai enterprises	Patna
10.	Anand rice mill & briquettes mill	Patna