**CLEAN DEVELOPMENT MECHANISM**
**PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)**
**Version 03 - in effect as of: 22 December 2006**

## CONTENTS

## SECTION A. General description of project activity

### A.1 Title of the small scale project activity:

>> Kolar District Biogas Project
version 1
December 26th 2006

### A.2. Description of the small scale project activity:

>> The purpose of this CDM project activity is to set up 12000 biogas plants (digesters) of 2 $m^3$ capacity each for single households in Kolar District, Karnataka, India and in this way replace kerosene for cooking and hot water heating with biogas, a renewable energy. This is one of the most backward Districts of India and deserves a special attention and proper planning for all out development.
Each household will install a 2 $m^3$ biogas plant and feed cow dung, organic waste and biomass waste into the anaerobic digester. The technology is tried and tested in India, and has been in use for many years. By utilizing these various sources of biogenic waste in a controlled anaerobic digestion and combustion system, biogas will be available for cooking energy and heating hot water to replace kerosene. The biogas will be used on a two-ring gas stove with a flame temperature of 870$^o$C, supplied as part of the project activity. All households willing to collect biogenic waste from agriculture and household can participate in the project. The list of suitable and interested households is available. Implementation of the project depends on the successful validation and registration of the project as a CDM project activity since the project is financed to a large extent from the carbon revenues. There are social, environmental, economic and technological benefits which contribute to sustainable development.
Social benefits:

- Avoided health hazards associated with unmanaged waste in back yards and village streets
- Avoided health hazards from indoor air pollution; and reduced drudgery

Environmental benefits:

- Avoided local environmental pollution through a better waste management system; and soil improvement by providing high quality manure
- Avoided global environmental pollution by switching from kerosene to biogas, leading to reduction of GHG emissions

Economic benefits:

- Savings to national economy by providing renewable cooking fuel instead of kerosene
- Higher productivity of workers as they have adequate cooking fuel supply

Technological benefits:

- Better biogas digester models, thus improving biogas yield and eliminating any residual methane emissions.
- Training in chemistry of biogas for masons and users leading to improved scientific temper in community.

### A.3. Project participants:

>>

| 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) | CER India Pvt. Ltd. | No |

**A.4. Technical description of the small scale project activity:**

**A.4.1. Location of the small scale project activity:**

>> Kolar District

**A.4.1.1. Host Party(ies):**

>>India

**A.4.1.2. Region/State/Province etc.:**

>>Karnataka

**A.4.1.3. City/Town/Community etc:**

>> Kolar District

**A.4.1.4. Detail of physical location, including information allowing the unique identification of this small scale project activity (maximum one page):**

>> Households with cattle in all the Gram Panchayats of all the Talukas of Kolar District in Karnataka, India. The District extends over an area of 8225 sq. km divided into 11 taluks.

| District | Latitude | Longitude |
|---|---|---|
| Kolar | 12°46' to 13°58' North | 77°21' to 78°35' East |


Map of India showing Karnataka


Map of Karnataka showing Kolar District


Map of Kolar District

**A.4.2. Type and Category(ies) and Technology/Measure of the small scale project activity:**

>> Scope 1; TYPE I - RENEWABLE ENERGY PROJECTS, I.C. Thermal energy for the user, Version 9, EB 28.

Biogas is a mixture of methane and carbon dioxide. It also has traces of hydrogen sulphide, ammonia, oxygen, hydrogen, water vapour etc., depending upon feed materials and other conditions. Biogas is generated by fermentation of cellulose rich organic matter under anaerobic conditions. In anaerobic conditions, the methane-producing bacteria become and more active. Thus, the gas produced becomes rich in methane. The optimum utilization depends upon the successful physical installations, which in turn depend upon plant design and its selection. The basic conversion principle is that when a non-ligneous biomass is kept in a closed chamber for a few days, it ferments and produces an inflammable gas. The anaerobic digestion consists of three stages:

I Hydrolysis
II Acid formation
II Methane fermentation

The processes are carried out by two sets of bacteria namely acid forming bacteria and methane formers. The acidogenic phase I is the combined hydrolysis and acid formation stages in which the organic wastes are converted mainly into acetate, and phase II is the methanogenic phase in which methane and carbon dioxide are formed. The better the three stages merge with each other, the shorter the digestion process. Pressure is controlled to ensure dome does not burst, by matching generation to requirement. A valve ensures that no gas flows to the stove when the stove is not lit.

Users prepare batches of slurry in the mixing tank, before allowing the final mixture to flow into the digester for methane formation phase. After digestion, the Ph of the evacuated slurry is checked, and re-used in the process. The recovered gas is combusted and used for cooking and water heating. By providing fuel-efficient cooking devices, mainly pressure cookers, rice steamers and water boilers, optimal efficient cooking and heating water arrangements for the users can be provided. The chosen

methane recovery and combustion system is the time tested Deenabandhu model biogas technology which is well-known in India. The project activity will organise the 12000 users to collect biogenic household and agricultural waste and utilise it in individual household methane recovery systems. The 12000 individual plants consist a mixing chamber where waste water, cow dung and leachate from organic waste are mixed, an inlet pipe to feed the slurry into the reactor, the main biogas reactor / digester where methane formation / recovery takes place, a slurry outlet pipe, an outlet chamber, and a slurry platform. The outlet pipe and tank are provided to remove the digested / treated sludge or fermentation residue, and the slurry platform is provided to maintain the treated slurry in clean condition and allow it to be recycled back into the digester after Ph control.

**A.4.3. Estimated amount of emission reductions over the chosen crediting period:**

>>

| Operating year | Certified Emission Reductions (tonnes of $CO_2$) |
|---|---|
| 2007 | 34250 |
| 2008 | 34250 |
| 2009 | 34250 |
| 2010 | 34250 |
| 2011 | 34250 |
| 2012 | 34250 |
| 2013 | 34250 |
| 2014 | 34250 |
| 2015 | 34250 |
| 2016 | 34250 |
| TOTAL estimated reductions (tonnes of $CO_2$e) | 342500 |
| Total number of crediting years | 10 |
| Annual average over the crediting period of estimated reductions (tonnes of $CO_2$ e) | 34250 |

**A.4.4 Public funding of the small scale project activity:**

>>None

**A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:**

>>

This proposed small-scale project activity is not a debundled component of a large project activity as there is no registered small-scale CDM project activity or a request for registration by another small-scale project activity:

•By the same project participants;

•In the same project category and technology/measure; and

•Registered within the previous 2 years; and

•Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

## SECTION B. Application of a baseline and monitoring methodology

### B.1. Title and reference of the approved baseline and monitoring methodology applied to the small scale project activity:

>> Scope 1; TYPE I - RENEWABLE ENERGY PROJECTS, I.C. Thermal energy for the user, Version 9, EB 28.

### B.2 Justification of the choice of the project category:

>>

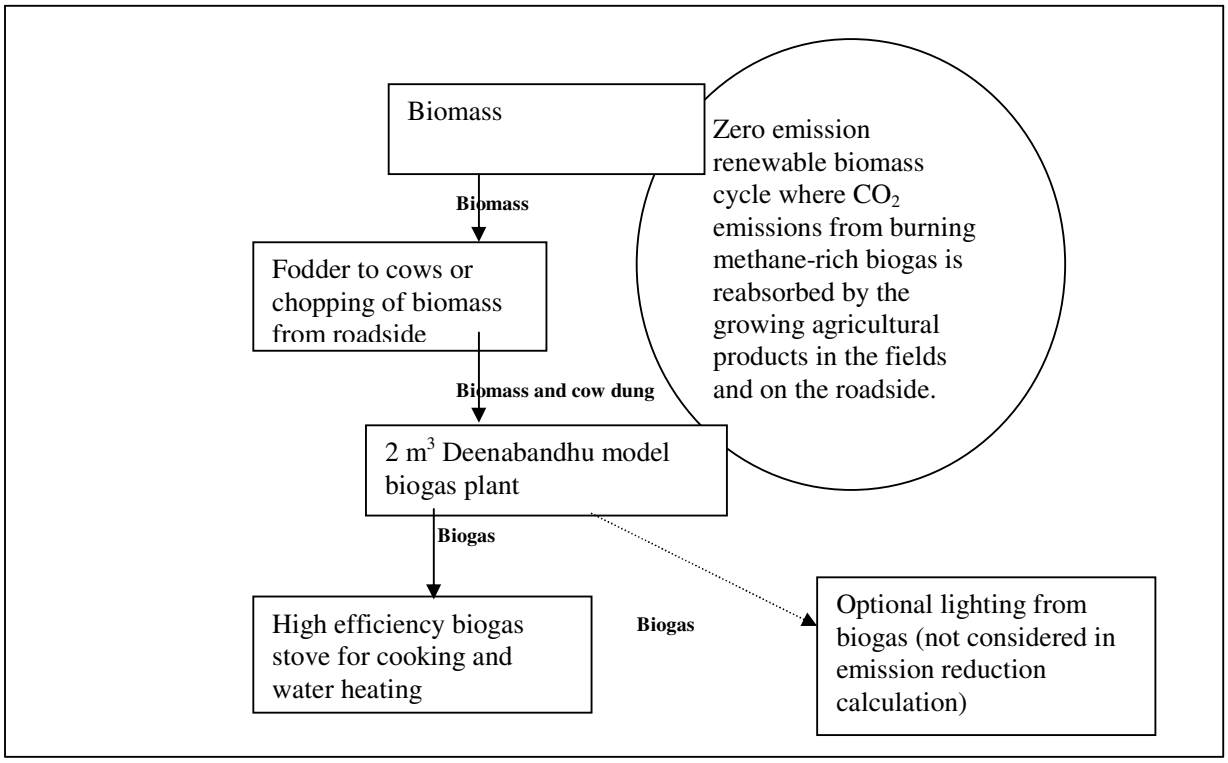
| Capacity of Project Activity below 45 $MW_{thermal}$ | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| Rating of biogas stove | 2572 | W | manufacturer |
| Number of systems | 12000 | - | measured |
| Total capacity of project | 30.87 | $MW_{thermal}$ | calculated |

Thus the size of the project is within the 45 $MW_{th}$ limit.

### B.3. Description of the project boundary

>>

Project boundary of a single biogas plant



**B.4. Description of the baseline and its development:**

>>This is a renewable energy technology that displaces fossil fuels, and the simplified baseline is the fuel consumption of the side tank type kerosene stove that would have been used in the baseline case times the emission coefficient for kerosene. The biogas stove is rated at 2.57 kW. (See Annex 3). It is operated for 1500 hours a day for cooking, and hot water heating, with manure as a bi-product. Thus the energy output of the stove to the pot annually is 13890 MJ per year. In the baseline case, a typical side tank type kerosene stove with 35% efficiency would have been used, consuming 1085 litres of kerosene every year. With an emission factor of 2.63 tonnes of carbon dioxide per litre of kerosene, not taking into account the emissions associated with the total life-cycle pollution associated with extraction, production and distribution of the fossil fuel raw materials of kerosene and kerosene itself, the project activity results in an emission reduction of 34250 tonnes of carbon dioxide per annum from 12000 biogas stoves.

Date of completion of the baseline: December 26th 2006.

| Private and/or public entity(ies) project participants (as applicable) |
|---|
| CER India Pvt. Ltd. – the project participant |

**B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small scale CDM project activity:**

>> In the absence of the project activity, the users would be forced to use cheap but inefficient kerosene wick stoves, thus consuming scarce and polluting fossil fuels which cause Greenhouse Gas emissions.

**National policies and circumstances:** The identified alternatives are in compliance with applicable legal and regulatory requirements as identified in India's CDM Policy[1], Integrated Energy Policy[2] and Electricity Policy.[3] The relevant elements of the policy which imply that the alternatives are a real possibility available to the project participants are in the Integrated Energy Policy, which guarantees all households in India who are in need of cooking fuel a minimum amount of kerosene or LPG or electricity for cooking. However, not many people cook with electricity in India, LPG is not available in large quantities in rural areas and kerosene is only slowly reaching all the people. India is all in favour of Renewable Energy Technologies (RETs) for cooking, but without a pro-active and hard-hitting international climate change mitigation policy regime and relevant incentives it is not possible to disseminate suitable RETS stoves and fuels such as biogas stove on a large enough scale.

**Barriers:** The project suffers from an investment barrier. Before project inception the project proponent made a detailed study of the cost of kerosene, both the capital cost and the recurring cost to the consumer, and the reasons preventing rural consumers from switching from kerosene to biogas. It is clear that kerosene is not a preferred option for cooking and water heating. With no other fuel used in a household, the costs come to around Rs 60 per day in the open market, more than the daily wage. Thus one daily wage in a two income agricultural labourer family goes on cooking energy. In the long run biogas is more attractive, as running costs are less. There is no fuel cost, only capital cost. Thus even without CDM revenue the loan repayment on a biogas plant which would be the only running cost, if it

I. Government Of India, Planning Commission, National Action Plan For Operationalising CDM In India, New Delhi, December 2003.

II. Government Of India, Planning Commission, Integrated Energy Policy, Report Of The Expert Committee, New Delhi, August 2006.

III. The Gazette Of India, Ministry Of Power, New Delhi, 12.02.2005, Resolution No. 23/40/2004-R&R (Vol.Ii), 1.1 In Compliance With Section 3 Of The Electricity Act 2003, Central Government Notifies The National Electricity Policy.

were possible to get a loan for marginal farmer type consumers, would be 12.5 Rs per day. But loan finance is not possible as no bank lends even on priority lending basis to families who do not have secure monthly salary. And biogas capital cost is 12500 Rs compared to Rs 100 for side tank type kerosene stove, thus it is not possible to switch to biogas without a loan. Thus because of lack of loan finance, and the low capital investment for the stove, the financially more viable alternative to the project activity is kerosene, and this would have led to higher emissions. CDM benefit will overcome this problem, as project participants can get a loan for the total project on behalf of all the users, channelising CDM income towards contributing the major portion of the loan repayment including interest for the biogas plants.

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

>>Biogas displaces kerosene stoves, and the simplified baseline is the fuel consumption of kerosene which would have been used in the absence of the project activity times the emission coefficient for kerosene.

### B.6.2. Data and parameters that are available at validation:

*(Copy this table for each data and parameter)*

| **Data / Parameter:** | Rating of stove |
|---|---|
| Data unit: | kW |
| Description: | Capacity of biogas stove. This is the rating of the stove based on how quickly the stoves boils water from ambient to boiling point. |
| Source of data used: | Manufacturer / project proponent |
| Value applied: | 2.57 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| **Data / Parameter:** | Hours of operation |
|---|---|
| Data unit: | Hours/yr |
| Description: | Hours of operation of one 2-ring stove per year given that a family of five needs one such 2-burner stove to cook and also boil all the water needed for bathing. 3 hours during the day and 1.1 hour in the evening and night on average. |
| Source of data used: | Manufacturer |
| Value applied: | 1500 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| Data / Parameter: | Efficiency of kerosene stove |
|---|---|
| Data unit: | Eff |
| Description: | This efficiency is given by the manufacturers and tested independently by Petroleum Ministry. |
| Source of data used: | Manufacturer, Ministry of Petroleum |
| Value applied: | 35% |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This stove is substantially cheaper than higher efficiency Nuten Ambika stove. It is the most common kerosene stove in the area. |
| Any comment: | |

**B.6.3 Ex-ante calculation of emission reductions:**

>>

| 0. Rating of Biogas stove - 2 ring | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| Temperature rise | 80 | degrees C | manufacturer |
| mass of water | 12 | kg | 2 rings @ 6 litres each |
| time taken to reach boiling | 26.0 | minutes | manufacturer |
| specific heat capacity water | 4.18 | kJ/kg/K | http://www.simetric.co.uk/si_liquids.htm |
| Power | 2.57 | kJ/second | calculated |
| power in kW | 2.57 | kW | calculated |

| 1. Energy Output Of Biogas stove | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| hours of operation/yr | 1500 | hours | 3 hours daytime / 1.1. Hours evening time |
| output/yr | 13890.46 | MJ/yr | calculated |

| 2. Energy Consumed In Absence Of Project Activity | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| n.c.v of kerosene | 44.75 | $TJ/10^3$ tonnes | IPCC 1996, 1.6., Table 1.3 |
| Density | 817.15 | kg/m3 | http://www.simetric.co.uk/si_liquids.htm |
| | 36.57 | MJ/litre | calculated |
| side tank single burner stove | 35% | efficiency of stove | manufacturer |
| | 39687.03 | MJ/yr required input | calculated |
| | 1085.23 | litres kerosene replaced | calculated |

| 3. Emission in baseline | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| Emission Factor Kerosene | 19.6 | TC/TJ | IPCC 1996, 1.6., Table 1.2 |
| Net Calorific Value Kerosene | 44.75 | TJ/$10^3$ tonnes | IPCC 1996, 1.6., Table 1.3 |
| Density Kerosene | 817.15 | kg/$m^3$ | http://www.simetric.co.uk/si_liquids.htm |
| | 44/12 | kg $CO_2$/kgC | |
| | 2.63 | kg$CO_2$/litre | Calculation |
| | 12000 | Number of units | |
| t$CO_2$ emission in baseline | 34250 | t $CO_2$/year | Calculation |

### B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

| Year | Baseline emissions | Project emissions | Emission Reductions (t$CO_2$) |
|---|---|---|---|
| 2007 | 34250 | 0 | 34250 |
| 2008 | 34250 | 0 | 34250 |
| 2009 | 34250 | 0 | 34250 |
| 2010 | 34250 | 0 | 34250 |
| 2011 | 34250 | 0 | 34250 |
| 2012 | 34250 | 0 | 34250 |
| 2013 | 34250 | 0 | 34250 |
| 2014 | 34250 | | 34250 |
| 2015 | 34250 | 0 | 34250 |
| 2016 | 34250 | 0 | 34250 |
| TOTAL estimated reductions (tonnes of $CO_2$ e) | 342500 | 0 | 342500 |
| Total number of crediting years | | | 10 |
| Annual average over the crediting period of estimated reductions (tonnes of $CO_2$ e) | | | 34250 |

## B.7 Application of the monitoring methodology and description of the monitoring plan:

### B.7.1 Data and parameters monitored:

| *(Copy this table for each data and parameter)* | |
|---|---|
| **Data / Parameter:** | Number of operating systems |
| Data unit: | number |
| Description: | Number of operating systems |

| | |
|---|---|
| Source of data to be used: | Project participant |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 12000 |
| Description of measurement methods and procedures to be applied: | House to house survey during routine operation and maintenance service. |
| QA/QC procedures to be applied: | Internal |
| Any comment: | |

| *(Copy this table for each data and parameter)* | |
|---|---|
| **Data / Parameter:** | Hours of operation |
| Data unit: | Hours |
| Description: | Number of hours each system runs |
| Source of data to be used: | Project participant |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 1500 |
| Description of measurement methods and procedures to be applied: | House to house survey of sample of plants requiring an operation and service personnel to spend one full day from sunrise to night at the house, recording the operating time. Service and maintenance personnel will also do this in their own homes. |
| QA/QC procedures to be applied: | Internal |
| Any comment: | |

**B.7.2 Description of the monitoring plan:**

>>As the emissions reduction per system is less than 5 tonnes of $CO_2$ a year, CER India will (i) record annually the number of systems operating by monitoring every single participating household and making sure the stove is working and being used exclusively for cooking and water heating; and will (ii) estimate the annual hours of operation of an average system, by surveying 10% of users by visiting them randomly and regularly and observing one day's stove use. The annual hours of operation will be calculated by multiplying the observed average minutes of daily use by 365 days.

**B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)**

>>

Date of completion of the baseline: December 26th 2006.

| Private and/or public entity(ies) project participants (as applicable) |
|---|
| CER India Pvt Ltd. – the project participant |

## SECTION C. Duration of the project activity / crediting period

### C.1 Duration of the project activity:

#### C.1.1. Starting date of the project activity:

>>31st March 2007

#### C.1.2. Expected operational lifetime of the project activity:

>>25-y-0-m

### C.2 Choice of the crediting period and related information:

#### C.2.1. Renewable crediting period

##### C.2.1.1. Starting date of the first crediting period:

>>N/A

##### C.2.1.2. Length of the first crediting period:

>> N/A

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

>>31st March 2007

##### C.2.2.2. Length:

>>10-y-0-m

## SECTION D. Environmental impacts

>>

### D.1. If required by the host party, documentation on the analysis of the environmental impacts of the project activity:

>>N/A

### D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>N/A

## SECTION E. Stakeholders' comments

>>

### E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

Stakeholders:

- Department for Rural Development and Panchayati Raj, Kolar District
- Villagers in Kolar District
- Local Gram Panchayat (statutory elected body covering a few villages) and Taluk Panchayats in Kolar GPs
- CEO, Kolar District
- Forest Department, Kolar District

Meeting Dates and Events in stakeholder consultation process:

| Date | Name of stakeholders | Comments received |
|---|---|---|
| 24th April 2005 | project idea | Need for biogas energy identified for India |
| 2nd May 2005 | project concept launched | 1 project registered with old methodology |
| 20th June 2005 Monday | discussion about approach to cooking fuel supply for Kolar | Great scarcity of fuel |
| 13th July 2005 | Inspection of pilot schemes | Community plants may not be the solution due irregular supply of cow dung |
| 15th July 2005 | Meeting with CEO, Kolar District | Project should be developed for users with cows |
| 8th Dec 2005 | Montreal CoP11 | NRB thrown out by CoP11. |
| 22nd Jan 2006 | Kolar District surveyed for cows | List identified |
| August 16th 2006 | Meth Panel | Rejects Non-Renewable Biomass Methodology for Nagapattinam Project |
| 19th Oct 2006 | MoEF DNA | LoA agreed – with revised PDD |
| 26th Dec 2006 | PDD finalised | |

### E.2. Summary of the comments received:

>>The main problem area identified by the target users concerns waste availability. Questions were raised about usefulness of collecting biogenic material, also suitability and availability of the material for methane recovery in chosen methane recovery system; questions of correct quality and quantity of substrate for methane recovery, especially in such rural and forested areas.

### E.3. Report on how due account was taken of any comments received:

>>

Users decided that biogas was so useful they would buy cows so that they can get the multiple benefits from cows. Thus one of the main concerns of the users, viz., lack of substrate, including lack of agricultural waste, was overcome.

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
| Organization: | CER India Pvt. Ltd. |
| Street/P.O.Box: | 32/2 Kempapura Road |
| Building: | Hebbal |
| City: | Bangalore |
| State/Region: | Karnataka |
| Postcode/ZIP: | 560024 |
| Country: | India |
| Telephone: | +91 80 23637007 |
| FAX: | +91 80 23611485 |
| E-Mail: | |
| URL: | |
| Represented by: | |
| Title: | - |
| Salutation: | Ms. |
| Last Name: | Sharan-Meili |
| Middle Name: | Susan |
| First Name: | Anandi |
| Department: | - |
| Mobile: | +91 9448034562 |
| Direct FAX: | +91 80 23611485 |
| Direct tel: | +91 80 23624546 |
| Personal E-Mail: | anandi.sharan@gmail.com |

## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

No public funding is expected for this project. Loan is serviced mainly through CER revenue and user contribution.

## Annex 3

## BASELINE INFORMATION

| 0. Rating of Biogas stove - 2 ring | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| Temperature rise | 80 | degrees C | manufacturer |
| mass of water | 12 | Kg | manufacturer |
| time taken to reach boiling | 26.0 | minutes | manufacturer |
| specific heat capacity water | 4.18 | kJ/kg/K | http://www.simetric.co.uk/si_liquids.htm |
| Power | 2.57 | kJ/second | calculated |
| power in kW | 2.57 | KW | calculated |

| 1. Energy Output Of Biogas stove | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| hours of operation/yr | 1500 | Hours | 3 hours daytime / 1.1. Hours evening time |
| output/yr | 13890.46 | MJ/yr | calculated |

| 2. Energy Consumed In Absence Of Project Activity | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| n.c.v of kerosene | 44.75 | TJ/$10^3$ tonnes | IPCC 1996, 1.6., Table 1.3 |
| Density | 817.15 | kg/m3 | http://www.simetric.co.uk/si_liquids.htm |
| | 36.57 | MJ/litre | calculated |
| side tank single burner stove - | 35% | efficiency of stove | manufacturer |
| | 39687.03 | MJ/yr required input | calculated |
| litres kerosene replaced | 1085.23 | Litres | calculated |

| 3. Emission in baseline | | | |
|---|---|---|---|
| **Item** | **Value** | **Unit** | **Source** |
| Emission Factor Kerosene | 19.6 | TC/TJ | IPCC 1996, 1.6., Table 1.2 |
| Net Calorific Value Kerosene | 44.75 | TJ/$10^3$ tonnes | IPCC 1996, 1.6., Table 1.3 |
| Density Kerosene | 817.15 | kg/$m^3$ | http://www.simetric.co.uk/si_liquids.htm |
| | 44/12 | kg $CO_2$/kgC | |
| | 2.63 | kg$CO_2$/litre | Calculation |
| | 12000 | Number of units | |
| t$CO_2$ emission in baseline case | 34250 | t $CO_2$/year | Calculation |

## Annex 4

## MONITORING INFORMATION

CERI will

(i) record annually the number of systems operating by monitoring every single participating household and making sure the stove is working and being used exclusively for cooking and water heating;

(ii) estimate the annual hours of operation of an average system, by surveying 10% of users by visiting them randomly and regularly and observing one day's stove use. The annual hours of operation will be calculated by multiplying the observed average minutes of daily use by 365 days.

Templates for Data collection sheets to be archived electronically and on paper for the duration of the project plus two years.

| (i) Number of systems operating | | | | | | | |
|---|---|---|---|---|---|---|---|
| Name | Election card ID | Ration card ID | Stove installation date | Other stoves being used if any | User comment | Maintenance carried out | Whether working fine or not: Sign |
| | | | | | | | |
| | | | | | | | |

| (iia) Annual hours of operation of the average system – Daily sheet : Date: | | | | | | | |
|---|---|---|---|---|---|---|---|
| Name | Election card ID | Ration card ID | Stove installation date | Start Time | Finish Time | Total Minutes | Total Minutes this day |
| | | | | | | | |
| | | | | | | | |

| (iib) Annual hours of operation of the average system – Monthly sheet :Month: | | | | | | |
|---|---|---|---|---|---|---|
| Name | Election card ID | Ration card ID | Stove installation date | Date | Minutes used | Total Minutes this month |
| | | | | | | |
| | | | | | | |

| (iic) Annual hours of operation of the average system – Annual sheet :Year: | | | | | | |
|---|---|---|---|---|---|---|
| Name | Election card ID | Ration card ID | Stove installation date | Month | Minutes used | Total Minutes this year : Divide by 60 to get hours. |
| | | | | | | |
| | | | | | | |

- - - - -