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# VALIDATION REPORT

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## “BAGEPALLI CDM BIOGAS PROGRAMME” PROJECT IN KOLAR, INDIA

REPORT No. 2005-9058

REVISION No. 01

DET NORSKE VERITAS



## VALIDATION REPORT

Date of first issue: 2005-08-08	Project No.: 45259058
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Client: Women for Sustainable Development	Client ref.: Anandi Sharan Meili

## Summary:

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the “Bagepalli CDM Biogas Programme” project (hereafter called “the project”) in Kolar, India, on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board. This validation report summarizes the findings of the validation.

The validation consisted of the following three phases: i) a desk review of the project design, baseline and monitoring plan, ii) follow-up interviews with project stakeholders and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

In summary, it is DNV’s opinion that the project, as described in the project design document of 28 October 2005, meets all relevant UNFCCC requirements for the CDM, is eligible as category I.C small-scale CDM project activity and correctly applies the approved simplified baseline and monitoring methodology AMS-I.C. Hence, DNV requests the registration of the “Bagepalli CDM Biogas Programme” project as small-scale CDM project activity.

Report No.: 2005-9058	Subject Group: Environment	<b>Indexing terms</b>	
Report title: „Bagepalli CDM Biogas Programme“ Project in Kolar, India		Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area Verification
			Market Sector Process Industry
Work carried out by: Chandrashekara Kumaraswamy, Santosh Jayaram		<input checked="" type="checkbox"/> No distribution without permission from the client or responsible organisational unit <input type="checkbox"/> free distribution within DNV after 3 years <input type="checkbox"/> Strictly confidential <input type="checkbox"/> Unrestricted distribution	
Work verified by: Michael Lehmann			
Date of this revision: 2005-10-30	Rev. No.: 01	Number of pages: 12	

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**Appendix A Validation Protocol**

***Abbreviations***

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH <sub>4</sub>	Methane
CL	Clarification request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MoEF	Ministry of Environment & Forests
MNES	Ministry of Non-Conventional Energy Sources
N <sub>2</sub> O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
SKGS	Suma Khadi Gramodyoga Sangha
UNFCCC	United Nations Framework Convention on Climate Change
WSD	Women for Sustainable Development



## 1 INTRODUCTION

Women for Sustainable Development (WSD) has commissioned Det Norske Veritas Certification Ltd. (DNV) to validate the “Bagepalli CDM Biogas Programme” project (hereafter called “the project”) in Kolar, India. This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for small-scale CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation team consists of the following personnel:

Mr Kumaraswamy Chandrashekar	DNV Bangalore	GHG auditor and project manager
Mr Santosh Jayaram	DNV Hyderabad	GHG auditor
Mr Michael Lehmann	DNV Oslo	Technical reviewer, Energy sector expert

### 1.1 Validation Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

### 1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AMS-I.C. The validation team has, based on the recommendations in the Validation and Verification Manual /7/ employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

### 1.3 Description of Proposed CDM Project

The project, proposed by Women for Sustainable Development for registration as small-scale CDM project activity, involves the installation and operation of 5500 biogas plants (digesters) of 2 m<sup>3</sup> capacities each at single households in villages located in the Kolar district of Karnataka, India. The villages covered fall under the following Talukas of Kolar district: Sidlaghatta, Srinivasapura, Chintamani, Malur, Kolar, Chikkaballapura, Gowribidanur, Bangarpet, Mulbagal and Bagepalli.

The objective of the project is to replace the commonly used inefficient wood fired mud stoves technology with clean, sustainable and efficient biogas plants (digesters) using cow dung,



thereby replacing partly non-renewable biomass (fuel wood) and kerosene with renewable biogas.

Operation and maintenance of these digesters are the responsibility of Suma Khadi Gramodyoga Sangha (SKGS). The technology used in the project activity is indigenously available in India and is based on the Deenbandhu model that has been approved by the Ministry of Non-Conventional Energy Sources (MNES).

Given an anticipated annual baseline emission rate of 3.56 tonnes of CO<sub>2</sub>e per household, the project is expected to reduce 136 874 tCO<sub>2</sub>e during the first seven year crediting period of the project (average annual emission reductions equal to 19 553 tCO<sub>2</sub>e).

## 2 METHODOLOGY

The validation consists of the following three phases:

- I a desk review of the project design, baseline and monitoring plan
- II follow-up interviews with project stakeholders
- III the resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customised for the project, according to the Validation and Verification Manual /7/. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in Figure 1.

The completed validation protocol for the “Bagepalli CDM Biogas Programme” project is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective Action Requests (CAR) are issued, where:

- i) mistakes have been made with a direct influence on project results;
- ii) validation protocol requirements have not been met; or
- iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification may be used where additional information is needed to fully clarify an issue.



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<b>Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities</b>			
<b>Requirement</b>	<b>Reference</b>	<b>Conclusion</b>	<b>Cross reference</b>
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (OK), a <b>Corrective Action Request (CAR)</b> of risk or non-compliance with stated requirements or a request for <b>Clarification (CL)</b> where further clarifications are needed.</i>	<i>Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.</i>

  

<b>Validation Protocol Table 2: Requirement Checklist</b>				
<b>Checklist Question</b>	<b>Reference</b>	<b>Means of verification (MoV)</b>	<b>Comment</b>	<b>Draft and/or Final Conclusion</b>
<i>The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.</i>	<i>This is either acceptable based on evidence provided (OK), or a <b>Corrective Action Request (CAR)</b> due to non-compliance with the checklist question (See below). A request for <b>Clarification (CL)</b> is used when the validation team has identified a need for further clarification.</i>

  

<b>Validation Protocol Table 3: Resolution of Corrective Action Requests and Requests for Clarification</b>			
<b>Draft report corrective action requests and requests for clarifications</b>	<b>Ref. to Table 2</b>	<b>Summary of project participants' response</b>	<b>Final conclusion</b>
<i>If the conclusions from the draft Validation are either a <b>Corrective Action Request</b> or a <b>Clarification Request</b>, these should be listed in this section.</i>	<i>Reference to the checklist question number in Table 2 where the <b>Corrective Action Request</b> or <b>Clarification Request</b> is explained.</i>	<i>The responses given by the project participants during the communications with the validation team should be summarised in this section.</i>	<i>This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".</i>

Figure 1 Validation protocol tables



## 2.1 Review of Documents

The initial PDD /1/ of 23 May 2005, and the revised PDD of 28 October 2005, submitted by Women for Sustainable Development, and additional background documents related to the project design and baseline were assessed /2/-/8/.

## 2.2 Follow-up Interviews

On 4 August 2005, DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of Women for Sustainable Development and SKGS were interviewed /9//10/. The main topics of the interviews are summarised in Table 1.

**Table 1 Interview topics**

Interviewed organisation	Interview topics
Women for Sustainable Development - Anandi Sharan Meili – Chief Functionary	<ul style="list-style-type: none"> <li>• Site visit</li> <li>• Environmental issues</li> <li>• Resources, training, procedures</li> <li>• Interaction with stakeholders</li> </ul>
SKGS - Vidya Sagar	

## 2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve any outstanding issues which needed to be clarified for DNV's positive conclusion on the project design. The Corrective Action Requests and requests for Clarification raised by DNV, presented to the project participants in DNV's draft validation report of 8 August 2005 (rev. 0), were resolved during communications between Women for Sustainable Development and DNV. To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.

Since modifications to the Project design were necessary to resolve DNV's concerns, Women for Sustainable Development decided to revise the PDD and resubmitted the PDD on 28 October 2005. After reviewing the revised PDD, DNV issued this final validation report and opinion.



### 3 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the project design as documented and described in the revised and resubmitted project design documentation of 28 October 2005.

#### 3.1 Participation Requirements

The project participants are Women for Sustainable Development, Bangalore, and the Agricultural Development and Training Society, Bangalore. The host Party India meets all participation requirements. The DNA of India has approved the project on 3 March 2005 /2/. No participating Annex I Party has yet been identified.

The project contributes to sustainable development of the region through avoidance of uncontrolled burning of partly unsustainable (non-renewable) fuel wood and kerosene by switching to biogas. This will cause improvement in women and children's overall health situation by reduced smoke in kitchens and protecting the local environment by reduction of uncontrolled deforestation in the project area and help women save cooking time. The DNA of India has provided confirmation that the project assists in achieving sustainable development /2/.

#### 3.2 Project Design

The technology used in the project activity is indigenously available in India and is based on the Deenbandhu digester model approved by the MNES.

The biogas digester equipment consists of a digester (2 m<sup>3</sup> capacity) with a fixed, non-movable gas space. Gas is produced through anaerobic digestion of cow dung and stored in the upper part of the digester before being piped to the biogas stove in the kitchen. The gas pressure displaces the digested slurry into the compensating tank, which then can be used as manure. 5500 digesters, each of 2 m<sup>3</sup> capacity per household, have been envisaged in the proposed project.

The operation and maintenance of the plants have been outsourced to SKGS, who are also the manufacturers of the biogas plants. SKGS maintains a network of trained masons and supervisors who will train individual household members and also assist in maintaining close contact with the households to attend to problems, if any.

The expected operational lifetime of the project activity is 20 years. A renewable crediting period of seven years has been chosen with the starting date of the first crediting period as 18 December 2005.

#### 3.3 Project Baseline

The project is a *thermal energy for the user* project activity (Category I.C) as per appendix B of the simplified modalities and procedures for small scale CDM project activities. The total generation capacity is estimated based on the methane production potential from cow dung according to IPCC guidelines, and the sum of individual digester capacities works is around 6

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MW. As this is less than the stipulated 15 MW defining the capacity limit under category I.C – the project qualifies as a small scale CDM project activity.

The application of the simplified baseline methodology for category I.C small-scale CDM project activities (AMS-I.C) is justified as the project is displacing kerosene and non-renewable wood. For non-renewable fuel wood, the baseline is the non-renewable biomass consumption per household that would have been used in the absence of the project activity times an emission coefficient for the non-renewable sources of biomass displaced. For kerosene, the baseline is the fuel consumption per household that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced.

In absence of clear guidance by the CDM Executive Board on how to define non-renewable biomass, non-renewable fuel wood has been defined as the fuel wood which is not being re-grown. The area specific Kolar District study /6/ done by Ramachandra and Rao has been used in order to establish the share of fuel wood currently used that can be considered non-renewable. The study comprised the use of fuel wood and fuel wood availability of 10 Taluks in the Kolar district. The study determines a ratio of available fuel wood resources vs. fuel wood demand for each Taluk in the Kolar district. It concludes that on average this ratio is 0.244, thus indicating that fuel wood demand significantly exceeds available fuel wood resources in Kolar district. This average ration of available fuel wood resources vs. fuel wood demand is used by the project to conclude that only 24.4% of the fuel wood is renewable, while the remaining 75.6% of the fuel wood used in the Kolar district is considered non-renewable. The use of the study by Ramachandra et al for defining the share of non-renewable fuel wood is considered appropriate, in particular since the target households considered for application of the biogas digesters in the project activity are located in the same 10 Taluks as the study is based on.

The quantities of fuel wood and kerosene consumption per household have been determined by the project based on a survey of firewood and kerosene consumption in the Kolar District /3/. The fuel wood consumption per household determined in this survey has been corroborated and compared with established studies carried out for the region /4//5//6/. The studies have showed an estimated average consumption of fuel wood for a medium size family of 5 people of 5.24 tonnes per year /4/; a range from 3.2 to 4.6 tonnes per family per year with an average of 2.38 tonnes per family per year for Kolar District /5/ and a range from 1.3 to 2.5 kg/person/day (2.4 tonnes to 3.3 tonnes per family per year), with an average of 2.85 tonnes/year /6/. T

Five separate surveys with focus on 5 villages in Kolar District and the specific project region were carried out by WSD and the survey determined that for a single household of five persons, the average consumption worked out to 3.37 tonnes of fuel wood per year and 31.2 litres of kerosene per year /3/. However, to ensure consistency with by Ramachandra and Rao's findings /6/ for fuel wood availability, which have been determined based on surveyed fuel wood consumption figures, the project activity has adopted an average fuel wood consumption of 2.85 tonnes per year per household as established by Ramachandra and Rao /6/. This value is also more conservative than the fuel wood consumption established in the WSD survey.

The selected values for the fuel wood and kerosene consumption in the baseline scenario are thus 2.85 tonnes of fuel wood per year per family, whereof 75.6% is considered non-renewable, and 31.2 litre of kerosene per year per family, respectively. These values are considered appropriate and conservative and are correctly applied in the presented emission reduction calculations. Complimentary information provided by the project participants demonstrated that the capacity of the proposed 2 m<sup>3</sup> biogas digester suffices the requirements of individual families.



### 3.4 Additionality

The project's additionality has been demonstrated by presenting and arguing on the following main barriers:

**Investment barriers:** The project and the three alternatives to the project, i.e. the use of conventional stoves, kerosene and LPG, have been considered from an investment perspective of the village households. It has been demonstrated that, while the capital cost of a 2 m<sup>3</sup> biogas digester is significant, the cost of a conventional stove or oven is around five Euros and the basic three rock stove commonly used in the village households cost practically nothing. The cost of kerosene in the fair price shops and in the open market are prohibitive and beyond the means of the target population. While the use of LPG as an alternative has also been considered, it has been argued that LPG availability is limited mainly to the cities and penetration in the remote target villages is yet to take place. While there is a slow shift towards LPG use in villages, the costs of installing and operating a LPG facility is beyond the reach of this project's target population in the Kolar region of Karnataka. The presented analysis thus demonstrates that the project (installation of 2 m<sup>3</sup> biogas digesters) faces investment barriers and that, compared to other baseline alternatives, the continued use of conventional stoves is the cheapest option.

**Technological barriers:** While the conventional three rock stoves does not need any skill for building, the biogas digesters, on the other hand, requires careful designing and skill for assembly. These are also not freely available in the market in the target villages as compared to the baseline technology three rock stove.

**Prevailing practice:** Prevailing practice for the target village households continues to be reliance on firewood that is non-renewable and available in plenty.

The above barriers therefore make it unlikely that biogas plants in Kolar are build today in the absence of the CDM, and the project is thus not a likely baseline scenario. Moreover, the analysis of investment, technological and prevailing practise barriers demonstrates that the continued use of conventional three rock stove and the continued use of fuel wood and kerosene is the most likely baseline scenario.

### 3.5 Monitoring Plan

The selected monitoring methodology is in line with the monitoring methodology AMS-I.C.

A baseline emission factor of 3.56 tCO<sub>2</sub>/year/household for each household that will be attached to a single system (2m<sup>3</sup> capacity) has been estimated *ex-ante*. Since this is less than the stipulated limit of 5 tCO<sub>2</sub>/year in AMS-I.C (sub clause 9.c), the chosen monitoring methodology of monitoring the number of installed and operating systems twice a year is applicable. As the cost of installing gas metres to measure production of gas is prohibitive, and not really essential for measurement of GHG reductions, and as the reductions are assumed to occur against the baseline of unsustainable fuel wood consumption, monitoring meters have not been envisaged.

The monitoring indicators chosen are restricted to number of systems installed and operating and the average daily operating time of the systems, and will be monitored twice a year.

While the project owner is Women for Sustainable Development, project implementation, operation and maintenance is the responsibility of SKGS. The monitoring will be through the families using the bio gas and SKGS. The organisation has nearly 300 masons and supervisors who will be responsible for plant supervision, maintenance, and monitoring. Users are also part



of the local management of this project and trained by SKGS personnel. All complaints and maintenance needs shall also be dealt with by SKGS staff. Procedures for performance reviews, internal auditing, corrective actions, etc. have also been addressed and rest with Women for Sustainable Development and SKGS.

### **3.6 Calculation of GHG Emissions**

There are no direct offsite and indirect emissions involved in this project. Since the proposed 2 m<sup>3</sup> biogas digester suffices the requirements of individual families, no fuel wood or other fuels will have to be used in the project scenario. The PDD also addresses CH<sub>4</sub> leakages from day to day handling, defective digesters, during digester clean up and also indirect leakages resulting from use of this biomass as manure. In order to account for this uncertainty, CH<sub>4</sub> and N<sub>2</sub>O emission reductions from the combustion of non-renewable biomass in the baseline case, estimated to be around 7.4% of the CO<sub>2</sub> emissions from the combustion of non-renewable biomass fuel, have not been considered. Since CH<sub>4</sub> and N<sub>2</sub>O emissions in the baseline, which are not accounted for reasons of conservativeness, are likely to be larger than any potential unintended CH<sub>4</sub> emissions from the project, the adopted approach is deemed conservative and appropriate.

The project is displacing non renewable fuel wood and kerosene. In line with the methodologies approved as per category I.C, and upon consideration that 75.6% of fuel wood used for cooking and water heating is non-renewable, baseline emissions are estimated at 3.56 tCO<sub>2</sub>/year/household for each household that will be attached to one system (2 m<sup>3</sup> capacity). In the first seven year crediting period the project is expected to reduce emissions to the extent of 136 874 t CO<sub>2</sub>e.

### **3.7 Environmental Impacts**

As per the MoEF, there is no legislation requirement to be adhered-to by the proposed project activity. The project is also not expected to create any adverse environmental or social effects.

### **3.8 Comments by Local Stakeholders**

Key stakeholders involved in this project are the households in the villages and the gram panchayats (local government bodies). As part of the survey conducted for firewood and kerosene consumptions, interactions with about 1000 households were undertaken by Women for Sustainable Development and SKGS. All households and village gram panchayats have welcomed the project and no adverse comments have been received.



#### **4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS**

According to the modalities for the validation of CDM projects, the DOE shall make publicly available the PDD and receive, within 30 days, comments on the validation requirements from Parties, stakeholders and UNFCCC accredited Non-governmental Organisations (NGOs) and make them publicly available.

The PDD of 23 May 2005 was made publicly available on DNV's climate change website ([www.dnv.com/certification/climatechange](http://www.dnv.com/certification/climatechange)) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 18 June 2005 to 17 July 2005. No comments were received.



## 5 VALIDATION OPINION

*Det Norske Veritas Certification Ltd. (DNV) has in the period July 2005 to October 2005 performed a validation of the “Bagepalli CDM Biogas Programme” project in Kolar district of Karnataka, India, proposed for registration as small-scale CDM project activity. The validation is performed on the basis of UNFCCC criteria for small-scale CDM project activities, as well as criteria given to provide for consistent project operations, monitoring and reporting. This validation report summarises the findings of the validation of the project design and the project’s baseline and monitoring plan.*

*The project involves the installation and operation 5500 biogas plants (digesters) of 2 m<sup>3</sup> capacity each for single households in villages located in the Kolar district of Karnataka, India. The villages covered fall under the following talukas of Kolar district: Sidlaghatta, Srinivaspura, Chintamani, Malur, Kolar, Chikkaballapura, Gowribidanur, Bangarpet, Mulbagal and Bagepalli.*

*The project participants are Women for Sustainable Development, Bangalore, and Agricultural Development and Training Society, Bangalore. The host Party India meets all participation requirements, and the DNA of India has approved its voluntary participation in the project. No participating Annex I Party has yet been identified.*

*The project will contribute to sustainable development by replacing the commonly used inefficient wood fired mud stoves technology, with clean, sustainable and efficient biogas plants using cow dung, thereby replacing the non-renewable source of biomass (wood) and kerosene with renewable based biogas. The DNA of India has confirmed that the project assists in achieving sustainable development.*

*The validation did not reveal any information indicating that the project can be seen as a diversion of ODA funding towards India.*

*An analysis of the presented barriers demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity. The determination of the baseline is transparent. The project applies one of the options given by the simplified baseline methodology proposed for category I.C project activities, i.e. for non-renewable wood the baseline is the non-renewable biomass consumption that would have been used in the absence of the project activity times an emission coefficient for the non-renewable sources of biomass displaced. For kerosene, the baseline is the fuel consumption that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced.*

*A baseline emission factor of 3.56 tCO<sub>2</sub>e/year/household for each household that will be attached to a single system (2 m<sup>3</sup> capacity) has been estimated ex-ante. The monitoring plan provides for the monitoring of number of systems installed and operating and the average daily operating time of the systems in the project. Detailed responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures have also been addressed*

*By displacing unsustainable firewood and kerosene, the project results in reductions of CO<sub>2</sub> emissions that are real, measurable and give long-term benefits to the mitigation of climate*



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*change. Project emissions are zero and the baseline emissions are forecasted using reasonable assumptions.*

*A local stakeholder consultation process has been carried out by the project participant. DNV published the PDD on the DNV Climate Change website and comments by Parties, stakeholders and UNFCCC accredited NGOs were invited through the CDM website. No comments were received.*

*In summary, it is DNV's opinion that the "Bagepalli CDM Biogas Programme" project in Kolar, India, as described in the PDD of 28 October 2005, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology for category I.C small-scale CDM project activities (AMS-I.C). DNV thus requests the registration of the "Bagepalli CDM Biogas Programme" project in Kolar, India, as a small-scale CDM project activity.*



## REFERENCES

*Documents provided by the project proponent that relate directly to the project:*

- /1/ Women for Sustainable Development: *Clean Development Mechanism Project Design Document – “Bagepalli CDM Biogas Programme” in Kolar, India*. Version 01 of 23 May 2005, version 02 of 28 October 2005
- /2/ Indian DNA: *Letter of Approval*. 23 March 2005.

*Background documents related to the design and/or methodologies employed in the design or other reference documents:*

- /3/ Women for Sustainable Development: *Fuel wood data survey*
- /4/ Ramachandra T.V. et al.: *Bioresource status in Karnataka; Renewable and Sustainable Energy Reviews*. Volume 8, Issue 1, February 2004, Pages 1-47
- /5/ Ramachandra T.V et al.: *Mapping of Fuel Wood Trees in Kolar District Using Remote Sensing Data and GIS*.  
<http://wgbis.ces.iisc.ernet.in/energy/paper/fuelwood/fuelwood.html>
- /6/ T.V. Ramachandra and G.R.Rao: *Inventorying, Mapping and Monitoring of Bio-Resources Using GIS and Remote Sensing (Kolar District)*.  
[http://wgbis.ces.iisc.ernet.in/energy/paper/Biores\\_using\\_RS\\_GIS/index.htm](http://wgbis.ces.iisc.ernet.in/energy/paper/Biores_using_RS_GIS/index.htm)
- /7/ International Emission Trading Association (IETA) & the World Bank’s Prototype Carbon Fund (PCF): *Validation and Verification Manual*. <http://www.vvmanual.info>
- /8/ Appendix B of the simplified modalities and procedures for small-scale CDM project activities: *Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*. Version 05: 25 February 2005.

*Persons interviewed during the validation, or persons who contributed with other information that are not included in the documents listed above:*

- /9/ Women for Sustainable Development: Anandi Sharan Meili – Chief Functionary
- /10/ SKGS: Mr.Vidya Sagar – In Charge

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## **APPENDIX A**

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### **VALIDATION PROTOCOL FOR SMALL-SCALE CDM PROJECT ACTIVITIES**

**Table 1 Mandatory Requirements for Small Scale Clean Development Mechanism (CDM) Project Activities**

Requirement	Reference	Conclusion	Cross Reference/Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art. 12.2	OK	Table 2, Section E.4.1
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, Simplified Modalities and Procedures for Small Scale CDM Project Activities §23a	OK	Table 2, Section A.3
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art. 12.2.	OK	Table 2, Section E.4.1
4. The project shall have the written approval of voluntary participation from the designated national authority of each party involved	Kyoto Protocol Art. 12.5a, Simplified Modalities and Procedures for Small Scale CDM Project Activities §23a	OK	This project has been presented as a unilateral project. The Indian DNA has provided the approval of voluntary participation.
5. The emission reductions should be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	OK	Table 2, Section E.1 to E.4
6. Reduction in GHG emissions must be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5.c, Simplified Modalities and Procedures for Small Scale CDM Project Activities §26	OK	Table 2, Section B.2.1
7. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance	Decision 17/CP.7	OK	The project is being proposed as a unilateral project

Requirement	Reference	Conclusion	Cross Reference/Comment
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures § 29	OK	DNA of India: National Clean Development Mechanism Authority, Ministry of Environment and Forests
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities and Procedures § 30, 31b	OK	India ratified Kyoto Protocol on 26 August 2002.
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	Not applicable	Annex I Party has not been identified yet.
11. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	Not applicable	Annex I Party has not been identified yet.
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakesh Accords and shall not be a debundled component of a larger project activity	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK	Table 2, Section A.1
13. The project design document shall conform with the Small Scale CDM Project Design Document format	Simplified Modalities and Procedures for Small Scale CDM Project Activities, Appendix A	OK	
14. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and uses the simplified baseline and monitoring methodology for that project category	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK	Table 2, Section A.1.3, B and D
15. Comments by local stakeholders are invited, and a summary of these provided	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22b	OK	Table 2, Section G

Requirement	Reference	Conclusion	Cross Reference/Comment
16. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK	Table 2, Section F
17. Parties, stakeholders and UNFCCC accredited NGOs have been invited to comment on the validation requirements and comments have been made publicly available	Simplified Modalities and Procedures for Small Scale CDM Project Activities §23b,c,d	OK	The PDD has been published on DNV Certification's Climate Change website. Parties, stakeholders and NGOs were through the UNFCCC CDM website invited to provide comments on the validation requirement during a period of 30 days from 18 June to 17 July 2005. No comments were received

**Table 2 Requirements Checklist**

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
<b>A. Project Description</b> The project design is assessed.					
<b>A.1. Small scale project activity</b> It is assess whether the project qualifies as small scale CDM project activity.					
A.1.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/1/	DR	The project falls under category I.C – Thermal energy for the user. The generation capacity is not specified but and estimation is done with methane production potential from cow dung according to IPCC guidelines, and the sum of these capacities works out to around 6 MW. As this is less than the stipulated 15 MW as suggested under type I.C – the project does qualify as a small scale CDM project activity.		OK
A.1.2. The small scale project activity is not a debundled component of a larger project activity?	/1/	DR	No the project is not a debundled component of a larger project activity, since there is no registered small scale CDM project or an application to register another small scale CDM project – with the same project participants, in the same project category or technology.		OK
A.1.3. Does proposed project activity confirm to one of the project categories defined for small scale CDM project activities?	/1/	DR	The project confirms to Type I, Category I.C of the small scale CDM project activities as the thermal energy generated would be used up by the users (i.e., the village households).		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
<b>A.2. Project Design</b> Validation of project design focuses on the choice of technology and the design documentation of the project.					
A.2.1. Are the project's spatial (geographical) boundaries clearly defined?	/1/	DR	The project is located in Kolar District, in the state of Karnataka, India. The villages covered fall under the following talukas of Kolar district: Sidlaghatta, Srinivaspura, Chintamani, Malur, Kolar, Chikkaballapura, Gowribidanur, Bangarpet, Mulbagal and Bagepalli.		OK
A.2.2. Are the project's system (components and facilities used to mitigate GHG's) boundaries clearly defined?	/1/	DR	Yes, The project comprises of biogas digesters and stoves for burning the gas generated. 5500 digesters each of 2 m <sup>3</sup> capacity has been envisaged per household in the proposed project.		OK
A.2.3. Does the project design engineering reflect current good practices?	/1/	DR	The project biogas technology to be used is based on the Deenbandhu model, a model that is one of the approved models by MNES.		OK
A.2.4. Will the project result in technology transfer to the host country?	/1/	DR	No transfer of technology is envisaged as the same is already available in India.		OK
A.2.5. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period? Does the project make provisions for meeting training and maintenance needs?	/1/	DR	Yes, the project requires initial training and maintenance efforts. However, the PDD does not elaborate on the same, particularly with respect to how complaints and maintenance needs would be addressed	CL-1	OK

\* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
<b>A.3. Contribution to Sustainable Development</b> The project's contribution to sustainable development is assessed					
A.3.1. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	Yes, the project will have additional environmental aspects in terms of reducing the pollution in the kitchen and also in terms of reducing felling for want of firewood. On the social front, the project will provide limited employment during the project stage and also save on the cooking time required.		OK
A.3.2. Will the project create any adverse environmental or social effects?	/1/	DR	The project is unlikely to create any adverse environmental or social effects.		OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/	DR	The DNA of India has accorded its approval to the proposed project activity		OK
A.3.4. Is the project in line with relevant legislation and plans in the host country?	/1/	DR	There is no relevant legislation in India pertaining to installation and operation of biogas plants.		OK
<b>B. Project Baseline</b> The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.					
<b>B.1. Baseline Methodology</b> It is assessed whether the project applies an appropriate baseline methodology.					
B.1.1. Is the selected baseline methodology in line with the baseline methodologies provided for the relevant project category?	/1/	DR	Yes, The selected baseline methodology Type I.C (Renewable energy projects – Thermal energy for user) is relevant for the project.		OK
B.1.2. Is the baseline methodology applicable to	/1/	DR	The baseline methodology (Type I.C) as given in		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
the project being considered?			para 5 and 6 is applied. Application of methodology is justified as the project is displacing kerosene and non-renewable wood. For non-renewable wood baseline is <u>the non-renewable source of biomass consumption of the technologies times an emission coefficient for the non-renewable sources of biomass displaced</u> . And for kerosene baseline is <u>the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced</u>		
<b>B.2. Baseline Determination</b> It is assessed whether the project activity itself is not a likely baseline scenario and whether the selected baseline represents a likely baseline scenario.					
B.2.1. Is it demonstrated that the project activity itself is not a likely baseline scenario due to the existence of one or more of the following barriers: investment barriers, technology barriers, barriers due to prevailing practice or other barriers?	B.3	DR	<p>The project faces barriers such as investment barriers, technological barriers and barriers due to the prevailing practice. Prevailing practice in villages in India today is to use non-renewable wood or opt for kerosene as a fuel that is distributed through the Public Distribution system. This is, however, limited to 3 litres per family per month and therefore insufficient for an average household. LPG as a fuel, is also considered as an alternative, but is mostly restricted to families located in the cities and not the villages.</p> <p>Capital cost of the biogas plant is six times the cost of LPG and beyond the means of average households.</p>	GL-2	OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			However, further clarity is called for: The PDD also claims "The project activity...is financed almost completely through the revenues from the CER sales, and cannot be realized without the revenues from the carbon credits" – This needs to be verified since there is not documentary proof as regards to project funding.		
B.2.2. Is the application of the baseline methodology and the discussion and determination of the chosen baseline transparent and conservative?	/1/	DR	While it is apparent that the project is displacing kerosene, the argument that that firewood is non-renewable biomass is not sufficiently supported. The published papers by the Indian Institute of Science, Bangalore on "mapping of fuel wood trees in Kolar district using remote sensing data and GIS" and "Bio resource status in Karnataka" does not allow the conclusion that all firewood currently used can be considered non-renewable biomass.	<del>CAR-1</del>	OK
B.2.3. Are relevant national and/or sectoral policies and circumstances taken into account?	/1/	DR	Yes, There is a clear thrust under the Ministry of Non-Conventional Energy Sources (MNES) in India to promote bio gas plants.		OK
B.2.4. Is the baseline selection compatible with the available data?	B.5	DR	It has been argued that studies reveal an estimated average consumption of fuel wood for a medium size family to be between 1300 kg / year and 1700 kg / year in Kolar region. However, to be conservative, WSD and SKGS have carried out separate surveys with focus on Kolar District and the specific project region and determined that for single household of five persons average consumption of firewood to be 3.56 tonnes and 31.2 litres of kerosene per year. Area specific Kolar District study /6/ done by Ramachandra and Roa, has been used in order to establish the share of		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			fuel wood currently used that can be considered non-renewable is 75.6%. The results from this study were used to establish a baseline emission factor of 2.85 tCO <sub>2</sub> e/household/year.		
B.2.5. Does the selected baseline represent the most likely scenario describing what would have occurred in absence of the project activity?	/1/	DR	Yes, it is likely that the villages will continue to depend on partly non-renewable wood and kerosene for all household activities, in the absence of the project activity		OK
<b>C. Duration of the Project / Crediting Period</b> It is assessed whether the temporary boundaries of the project are clearly defined.					
C.1.1. Are the project's starting date and operational lifetime clearly defined?	/1/	DR	Yes, They are defined. The project starting date is 18.12.2005 and the operational life time is considered as 20 years.		OK
C.1.2. Is the assumed crediting time clearly defined (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/1/	DR	Yes, a renewable crediting period of seven years has been chosen with the starting date of the first crediting period as 18.12.2005.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
<b>D. Monitoring Plan</b> The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed.					
<b>D.1. Monitoring Methodology</b> It is assessed whether the project applies an appropriate monitoring methodology.					
D.1.1. Is the selected monitoring methodology in line with the monitoring methodologies provided for the relevant project category?	/1/	DR	Yes, The emission reduction is estimated at 4.2 tCO <sub>2</sub> /year/family and each family will be attached to one system (2m <sup>3</sup> capacity) and is less than 5 tCO <sub>2</sub> /year as stipulated in AMS-I.C (sub clause 9.C). The chosen monitoring methodology of monitoring the number of installed and operating systems twice a year is thus applicable.		OK
D.1.2. Is the monitoring methodology applicable to the project being considered?	/1/	DR	Yes, appropriate justification has been given in Section D.2.		OK
D.1.3. Is the application of the monitoring methodology transparent?	/1/	DR	The installed and operating systems will be monitored twice a year and is in line with the requirements stipulated in AMS-I.C.		OK
D.1.4. Will the monitoring methodology give opportunity for real measurements of achieved emission reductions?	/1/	DR	Yes.		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
<b>D.2. Monitoring of Project Emissions</b> It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
D.2.1. Are the choices of project emission indicators reasonable?	/1/	DR	The indicators are restricted to number of systems installed and operating and the average daily operating time of the systems		OK
D.2.2. Will it be possible to monitor / measure the specified project emission indicators?	/1/	DR	Yes.		OK
D.2.3. Do the measuring technique and frequency comply with good monitoring practices?	/1/	DR	Yes.		OK
D.2.4. Are the provisions made for archiving project emission data sufficient to enable later verification?	/1/	DR	Yes.		OK
<b>D.3. Monitoring of Leakage</b> It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.					
D.3.1. If applicable, are the choices of leakage indicators reasonable?	/1/	DR	The PDD has addressed direct leakages from day to day handling, defective digesters, digester clean up and also indirect leakages resulting from use of this biomass as manure. Clarifications required as to the justification on the capacity generation sufficing the requirement of individual families and in case capacity is not adequate, usage of the conventional fuels resulting in leakage.  There is an omission of 7.4% of the CO <sub>2</sub> emissions	GL-3	OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			from the baseline, Some estimates to justify this 7.4% need to be looked into. Another issue is in case if the family owns less than 4 cows, will they be in a position to meet the biogas requirements or will there be an addition to no: of cows for meeting the requirement?		
D.3.2. If applicable, will it be possible to monitor / measure the specified leakage indicators?	/1/	DR	It is indicated in the PDD that it will be difficult to monitor the specified leakage indicators. To monitor that the omission of 7.4% of the emissions from baseline suffices for leakage effect, it will be required to monitor the no: of defective digesters and time taken for correcting it. The other leakages in terms of handling and clean up once in 5 years will be small compared to emissions from defects.	GL4	OK
D.3.3. If applicable, do the measuring technique and frequency comply with good monitoring practices?	/1/	DR	Yes		OK
D.3.4. If applicable, are the provisions made for archiving leakage data sufficient to enable later verification?	/1/	DR	Yes.		OK
<b>D.4. Monitoring of Baseline Emissions</b> It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
D.4.1. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR	Yes, the baseline indicators have been chosen in line with AMS-I.C..		OK
D.4.2. Will it be possible to monitor / measure the specified baseline emission indicators?	/1/	DR	Baseline emissions from a household with a 2 m <sup>3</sup> biogas system have been determined. This is calculated as the average yearly wood		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			consumption of household times the emission coefficient for (non-renewable) wood, plus the average yearly kerosene consumption of a household times the emission coefficient for kerosene.		
D.4.3. Do the measuring technique and frequency comply with good monitoring practices?	/1/	DR	Yes.		OK
D.4.4. Are the provisions made for archiving baseline emission data sufficient to enable later verification?	/1/	DR	Yes.		OK
<b>D.5. Project Management Planning</b> It is checked that project implementation is properly prepared for and that critical arrangements are addressed.					
D.5.1. Is the authority and responsibility of project management clearly described?	/1/	DR	The project owner is WSD (Women for Sustainable Development). Operation and maintenance will be the responsibility of SKGS. The monitoring will be through the families using the bio gas and SKGS. The project implementation will be by SKGS		OK
D.5.2. Is the authority and responsibility for registration monitoring measurement and reporting clearly described?	/1/	DR	This has not been clearly addressed in the PDD	<del>CAR-2</del>	OK
D.5.3. Are procedures identified for training of monitoring personnel?	/1/	DR	Refer comments as given in A.2.5	<del>CL-1</del>	OK
D.5.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR	No adverse emergencies are foreseen. Emergencies can be related to problems in the reactor. These are addressed in PDD that any such problems will be responded within 24 hours and will		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			be rectified within one week.		
D.5.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR	Not applicable – as no monitoring equipments are in use.		OK
D.5.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR	As in D.5.5		OK
D.5.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR	As in D.5.5		OK
D.5.8. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	Yes. Responsibility rests with SKGS		OK
D.5.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR	No, But the necessity for data adjustments and uncertainties are minimal as data being monitored is only no: of units operating and operational hours		OK
D.5.10. Are procedures identified for internal audits of GHG project compliance with operational requirements as applicable?	/1/	DR	No procedures for internal audits have been addressed.	<del>CAR-2</del>	OK
D.5.11. Are procedures identified for project performance reviews?	/1/	DR	No procedures for project performance reviews have been addressed	<del>CAR-2</del>	OK
D.5.12. Are procedures identified for corrective actions?	/1/	DR	No.	<del>CAR-2</del>	OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
<b>E. Calculation of GHG emission</b> It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.					
<b>E.1. Project GHG Emissions</b> The validation of predicted project GHG emissions focuses on transparency and completeness of calculations.					
E.1.1. Are all aspects related to direct and indirect project emissions captured in the project design?	/1/	DR	The PDD has addressed direct emissions from day to day handling, defective digesters, digester clean up and also indirect leakages resulting from use of this biomass as manure. There are no direct offsite and indirect emissions involved in this project. Please refer comment in D.3.2	CL-2	OK
E.1.2. Have all relevant greenhouse gases and sources been evaluated?	/1/	DR	Yes, These are CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O.		OK
<b>E.2. Leakage</b> It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed.					
E.2.1. Are leakage calculation required for the selected project category and if yes, are the relevant leakage effects assessed?	/1/	DR	As in D.3.1 and D.3.2	CL-2	OK

\* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
E.2.2. Are potential leakage effects properly accounted for in the calculations (if applicable)?	/1/	DR	As in D.3.1 and D.3.2	CL2	OK
E.2.3. Do the methodologies for calculating leakage comply with existing good practice (if applicable)?	/1/	DR	As in D.3.1 and D.3.2	CL2	OK
E.2.4. Are the calculations documented in a complete and transparent manner and (if applicable)?	/1/	DR	As in D.3.1 and D.3.2	CL2	OK
E.2.5. Have conservative assumptions been used (if applicable)?	/1/	DR	As in D.3.1 and D.3.2	CL2	OK
E.2.6. Are uncertainties in the leakage estimates properly addressed (if applicable)?	/1/	DR	As in D.3.1 and D.3.2	CL2	OK
<b>E.3. Baseline GHG Emissions</b> The validation of predicted baseline GHG emissions focuses on transparency and completeness of calculations.					
E.3.1. Are the baseline emission boundaries clearly defined and do they sufficiently cover sources for baseline emissions?	/1/	DR	The baseline emissions are defined in accordance with AMS-I.C		OK
E.3.2. Are all aspects related to direct and indirect baseline emissions captured in the project design?	/1/	DR	All the emission sources have been captured in the project design.		OK
E.3.3. Have all relevant greenhouse gases and sources been evaluated?	/1/	DR	Yes, These are CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O. However, only CO <sub>2</sub> emissions will be accounted.		OK
E.3.4. Do the methodologies for calculating baseline emissions comply with existing good practice?	/1/	DR	The methodology complies with one of the approaches proposed for category I.C project activities.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
E.3.5. Are the calculations documented in a complete and transparent manner?	/1/	DR	<p>Following clarifications are called-for:</p> <ul style="list-style-type: none"> <li>- Calorific value of wood, in Annex 4 considered as 15.1 and source given as IPCC 1.45. But in IPCC 1.45 (Table 1-13), the value given for fuel wood is 15.00 (assumption air dry wood and a note below table "typical values to be considered as rough approximations). There are specific values given for wood in the same table, but the value considered i.e. 15.1 is not specified.</li> <li>- The values given in annex 4 with source as Smith[1,2], document not available for verification.</li> <li>- CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O – wood IPCC standard values, the source given as IPCC 1.45, IPCC/smith, IPCC/smith respectively. But unable to verify this data. IPCC 1.45 nothing regarding CO<sub>2</sub> – wood standard, IPCC/smith – source need to be more specific.</li> <li>- CO<sub>2</sub> emissions from kerosene per year the unit has to be kg CO<sub>2</sub> per year, instead of tCO<sub>2</sub>/year.</li> <li>- As part of IPCC calculation methodology, while calculating the CO<sub>2</sub> emissions, we need to take into account carbon not getting oxidized, Not clear from calculation sheet, whether this is considered or not.</li> <li>- The combustion efficiency of stove considered to be 0.2 (source Smith[1]), Are the stoves in use identical to that considered in the source document?</li> <li>- Table 4 gives a comparison of figures arrived from IPCC and average CO<sub>2</sub> emissions from</li> </ul>	CL5	OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
			reference document Smith. The IPCC figures are higher (1661 vs 1379.8). The document does not justify as to why IPCC values will be considered as against the values arrived from Smith from a conservative point of view.		
E.3.6. Have conservative assumptions been used?	/1/	DR	As in E.3.5	CL-5	OK
E.3.7. Are uncertainties in the baseline emissions estimates properly addressed?	/1/	DR	As in E.3.5	CL-5	OK
<b>E.4. Emission Reductions</b> Validation of baseline GHG emissions will focus on methodology transparency and completeness in emission estimations.					
E.4.1. Will the project result in fewer GHG emissions than the baseline case?	/1/	DR	Based on the 99% success rate of SKGS, Emission reductions per household with installed 2 m <sup>3</sup> system, is expected to be 3.56 t CO <sub>2</sub> e and in the first seven year crediting period it is expected to amount to 136 874 tCO <sub>2</sub> e reductions.		OK
<b>F. Environmental Impacts</b> It is assessed whether environmental impacts of the project are sufficiently addressed.					
F.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	/1/	DR	No, according to the MoEF, no EIA is required for such kind of projects.		OK
F.1.2. Does the project comply with environmental legislation in the host country?	/1/	DR	There is no legislation and hence not applicable.		OK
F.1.3. Will the project create any adverse	/1/	DR	No, The project does not create any adverse		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl.	Final Concl.
environmental effects?			environmental or social effects		
F.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/	DR	Not applicable, see comments in F.1.3		OK
<b>G. Comments by Local Stakeholder</b>					
Validation of the local stakeholder consultation process.					
G.1.1. Have relevant stakeholders been consulted?	/1/	DR	Key Stakeholders have been the families involved, apart from Gram panchayats of the villages concerned. A survey of 1000 families has been conducted as part of the survey for kerosene and firewood consumptions. Considering the natures of the project, this is deemed adequate.		OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	Direct one to one consultations with the families have been undertaken		OK
G.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR	No, It is not required by regulation/law.		OK
G.1.4. Is a summary of the comments received provided?	/1/	DR	No adverse comments have been received.		OK
G.1.5. Has due account been taken of any comments received?	/1/	DR	No adverse comments have been received.		OK

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**Table 3 Resolution of Corrective Action and Clarification Requests**

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
<p><b>CAR 1:</b> The argument that that firewood is non-renewable biomass is not sufficiently supported. The published papers by the Indian Institute of Science, Bangalore on “mapping of fuel wood trees in Kolar district using remote sensing data and GIS” and “Bio resource status in Karnataka” does not allow the conclusion that all firewood currently used can be considered non-renewable biomass.</p>	B.2.2	<p>In order to establish the non-renewable component of the biomass combusted, the Kolar District study /6/ done by Ramachandra et al, has been used which estimates that 32.2% of the firewood for cooking and water heating in Kolar District comes from Prosopis Juliflora and is renewable. Thus in the Bagepalli CDM Biogas Programme it has been concluded that 67.8% of biomass (excluding agro-residues) used for cooking and water heating is non-renewable.</p>	<p>This needs further elaboration. The fact that 32.2% is from Prosopis Juliflora does not obviously lead to the conclusion that the remaining 67.8% are non-renewable. What are the other 67.8% and why can they be considered non-renewable? Further clarification is requested.</p>
<p><b>CAR 1 (continued)</b> The fact that 32.2% is from Prosopis Juliflora does not obviously lead to the conclusion that the remaining 67.8% are non-renewable. Further clarification is requested.</p>	B.2.2	<p>A more comprehensive study by Ramachandra et al looking at 10 taluks in Kolar District (not only Gauribidanur taluk) is also part of the study we have been referring to, and this one is the one we now use for drawing the conclusion that 24.4% of biomass in Kolar District is non-renewable. We have included the summary of that paper in section A.4.3. and have revised all the references both in the figures and the written text as well as the calculation sheet Annex 4 accordingly. This document [Ref 3a now in the SSCPDD References) should be used as the regionally specific evidence for the non-renewable % of biomass in Kolar District.</p>	<p>OK. In absence of clear guidance by the CDM Executive Board on how to define non-renewable biomass, non-renewable fuel wood has been defined as the fuel wood which is not being re-grown. The area specific Kolar District study /6/ done by Ramachandra and Rao has been used in order to establish the share of fuel wood currently used that can be considered non-renewable. The study has considered use of fuel wood and fuel wood availability of 10 Taluks of Kolar district. The study determines a ratio of available fuel wood resources vs. fuel wood demand for each Taluk of Kolar district. The study concludes that on average this ratio is 0.244, thus indicating that fuel wood</p>

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			demand significantly exceeds available fuel wood resources in Kolar district. This average ration of available fuel wood resources vs. fuel wood demand is used by the project to conclude that only 24.4% of the fuel wood used in Kolar is renewable, while the remaining 75.6% of the fuel wood used in Kolar district can be considered non-renewable. The use of the study by Ramachandra et al for defining the share of non-renewable fuel wood is considered appropriate. The target households considered for the biogas plants in the project activity are located in the same 10 Taluks as the study is based on.
<p><b>CAR 2:</b> Procedures for monitoring, measurements, internal audits, performance reviews and corrective actions have not been addressed</p>	D.5.2, 5.10, 5.11, 5.12	<p>Village supervisors carry out monitoring. Spot checks through internal quality control by SKGS (Kolar office); review by ASM. See new monitoring plan.</p> <p>Internal audit for GHG compliance: This refers mainly to service and maintenance norms: it will be WSD's task to ensure that every plant owner is fully aware of their rights and obligations under this project activity in terms of ensuring 100% functioning of their plant. Intensive user education is the first step, followed by education and training of supervisors, and rigorous checking of follow-up action at the Kolar SKGS office level to ensure immediate rectification of faults. A system of rewards for efficiency will be</p>	OK. Complimentary information provided is accepted

Draft report corrective action requests and requests for clarification	Ref. to Table 2	Summary of project participants' response	Final conclusion
		<p>introduced, and owners, supervisors, and office staff will be given incentives to meet the 100% success target. Random checking of operating plants will be a key internal quality assurance measure to ensuring the veracity of the monitoring data, and to ensure that there are no surprises during verification. The CERs will be computed from this value. All monitoring and control functions will be thus be done as per the internal standards and norms of WSD. There are no instruments that need calibrating.</p> <p>The quantity of emission reductions claimed by the project will only be a fraction of the potential from biogas in Kolar District. Hence authentic data related to measurement, recording, monitoring and control of the plants installed under this project activity is essential (though not many other biogas projects are currently running with the exception of the MNES scheme covering 500 new users in this year).</p> <p><b>Project performance review:</b> to be carried out by WSD and SKGS on a monthly basis on the basis of the review of the performance standard tests and the monthly aggregated logbooks from all the plants.</p>	

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<p><b>CL 1:</b> The PDD does not elaborate on the same, particularly with respect to how complaints and maintenance needs would be addressed</p>	A.2.5	Training and maintenance needs have been addressed in the Monitoring plan of the PDD	OK. The operation and maintenance of the plants have been outsourced to SKGS, who are also the manufacturers of the biogas plants. The network of trained masons and supervisors of SKGS will not only train individual household members but also maintain close rapport with the households to attend to problems, if any. Complimentary information provided is accepted.
<p><b>CL 2:</b> The PDD claims "The project activity...is financed almost completely through the revenues from the CER sales, and cannot be realized without the revenues from the carbon credits" – This needs to be verified since there is not documentary proof as regards to project funding.</p>	B.3	<p>The reason why LPG is more expensive is that LPG only costs Rs 2500.00 for a cylinder, regulator and stove, and another Rs 306.00 per month for refilling the cylinder. On the other hand a biogas plant costs upwards of Rs 13'000 to install, plus an annual service contract of Rs 1000.00 and monitoring and other costs of Rs 1000 per year. So overall, even though running the Biogas is cheaper, (excluding cows), the capital cost is much more.</p> <p><b><u>CER's:</u></b> The cost of a biogas plant is Rs 13'000.00, A forward contract of CERs at 13 Euro per tonne, with a baseline of 5 tonnes CO<sub>2</sub>, will realise 65 Euro or 3250 Rs per year. Thus a simple 4 year advance will realise the entire cost of the plants. After supplying the first 4 years CERs, the rest of the income of Rs 3250 per year may contribute to upkeep of</p>	OK. Complimentary information provided is accepted

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		plant, cows, and for doing monitoring and verification. Two contract which WSD will be signing provide this financing for all the plants.	
<p><b>CL 3:</b> Clarifications required as to the justification on the capacity generation sufficing the requirement of individual families and in case capacity is not adequate, usage of the conventional fuels resulting in leakage.</p>	D.3.1	<p>In all cases the household size will be chosen in such a way as to ensure that 100% replacement of fuel wood occurs. As regards to justification of 7.4% : This cannot be done without a huge amount of effort and cost. In principle one would have to put methane measuring domes over all possible sources of methane. This would include around a) the plant itself, b) displacement chamber and the slurry pits, c) the stoves and piping, and d) the dung inlet. In practice it is highly unlikely that any leakage occurs because a) perfect construction b) all methane already removed from dung before slurry reaches displacement chamber or is evacuated onto the land c) stoves and pipes are checked regularly by supervisors d) the level of the end of the inlet pipe is always below the level of the slurry in the plant, So methane cannot escape there. 7.4% is a very conservative assumption. It is simply taken for convenience to match the CH<sub>4</sub> and N<sub>2</sub>O from wood burning. Project promoters would be very comfortable to remove this provision, and stand by the assertion that there is no</p>	<p>OK. Complimentary information provided is accepted and is sufficiently justified that the capacity suffices the requirements of individual families. Moreover, CH<sub>4</sub> and N<sub>2</sub>O emissions in the baseline, which are not accounted for conservativeness, are likely to be larger than any potential unintended CH<sub>4</sub> emissions from the project.</p>

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		physical leakage of methane from the plant. But too many reviewers have questioned this.	
<p><b>CL 4</b> To monitor that the omission of 7.4% of the emissions from baseline suffices for leakage effect, it will be required to monitor the no: of defective digesters and time taken for correcting it.</p>	D.3.2, E.1.1	This will actually be maximum 0.1 % (1 week for 99 plants out of 100 every year). Therefore this is ignored. The whole monitoring and service and maintenance plan is centered on this issue.	OK. Complimentary information provided is accepted.
<p><b>CL 5:</b></p> <ul style="list-style-type: none"> <li>- Calorific value of wood, in Annex 4 considered as 15.1 and source given as IPCC 1.45. But in IPCC 1.45 (Table 1-13), the value given for fuel wood is 15.00 (assumption air dry wood and a note below table "typical values to be considered as rough approximations). There are specific values given for wood in the same table, but the value considered i.e. 15.1 is not specified.</li> <li>- The values given in annex 4 with source as Smith[1,2], document not available for verification.</li> <li>- CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O – wood IPCC standard values, the source given as IPCC 1.45, IPCC/Smith, IPCC/Smith respectively. But unable to verify this data. IPCC 1.45 nothing regarding CO<sub>2</sub> – wood standard, IPCC/Smith – source need to be more specific.</li> <li>- CO<sub>2</sub> emissions from kerosene per year the unit has to be kg CO<sub>2</sub> per year,</li> </ul>	E.3.5	<p>Excel sheet attached with revisions: Calorific value of wood: changed to correct default value IPCC 1.45 Smith docs re [1] and [2] provided 7. Intergov. Panel Clim. Change. 1997 <i>Guidelines for National Greenhouse Gas Inventories: Reference Manual</i>, vol. 3. XX, Oxford UK: Blackwell. This is referred to in Smith document <b>TABLE 3</b> Comparison with Intergovernmental Panel on Climate Change (IPCC) default (uncontrolled) emission factors for residential fuel combustion (g/kg)a – page 751 CO<sub>2</sub> emissions from kerosene per year, the unit have been revised to kg CO<sub>2</sub> per year, instead of tCO<sub>2</sub>/year. Carbon not getting oxidized is not taken into account as this is considered negligible. No real need to consider stove efficiency in the present methodology except for leakages. In the new monitoring pan we</p>	OK. Complimentary information provided has been accepted.

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<p>instead of tCO<sub>2</sub>/year.</p> <ul style="list-style-type: none"> <li>- As part of IPCC calculation methodology, while calculating the CO<sub>2</sub> emissions, we need to take into account carbon not getting oxidized, Not clear from calculation sheet, whether this is considered or not.</li> <li>- The combustion efficiency of stove considered to be 0.2 (source Smith[1]), Are the stoves in use identical to that considered in the source document?</li> <li>- Table 4 gives a comparison of figures arrived from IPCC and average CO<sub>2</sub> emissions from reference document Smith. The IPCC figures are higher (1661 vs 1379.8). The document does not justify as to why IPCC values will be considered as against the values arrived from Smith from a conservative point of view.</li> </ul>		<p>provide a “standard performance” calculation to show that the 2 cu metre plants are large enough to cover all the cooking needs. The biogas stoves have a 55% percent efficiency, the traditional stoves have 10%. Ref [7]. Ref [7] provided</p> <p>There are too many assumptions including 20-year GWPs in Smith which make it difficult to apply the methodology in a transparent manner. If all GHGs are taken actually Smith et al figures come out higher, as they also include the warming from Particles of Incomplete Combustion, for example, and other non-Kyoto gases. Thus even though Smith is very thorough, in the interest of transparency only 3 Gases are considered for our Bagepalli CDM Biogas Programme, using IPCC default values.</p>	

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