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SUSTAINABILITY VERIFICATION REPORT

(the Verification for 1ST Monitoring Period in the 1st Crediting Period)

For the GS –VER Project Activity

Biogas Program for Animal Husbandry Sector of Vietnam
(GS Ref. No. GS1083)

In

Vietnam

Report No. 01 996 9105066812-GS 1st Veri

Version No. 01.4, 2013-02-21

Designated Operational Entity (DOE)
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I. Project data:

Project title:	Biogas Program for Animal Husbandry Sector of Vietnam		**Report No.:** 01 996 9105066812-GS 1st Veri	
Registration No. / Date:	GS1083 / 28-06-2012		**Current revision No.:** 01.4	
Monitoring period:	28-06-2010 — 31-12-2011		**Date of current revision:** 21/02/2013	
Methodology:	Technologies and practices to displace decentralized thermal energy consumption, Version 1.0		**Date of first issue:** 01/08/2012 (Protocol)	
Publication of MR:	Not published. The monitoring report (version 2.3, 21/02/2013)			
Average emission reductions:	Estimated:	*736,760tCO$_2$e [1] from 28/06/2010 to 31/12/2011 including both days (552 days) based on the phased emission reductions as indicated in the registered PDD (Version 3.1, dated 24/09/2012)*	Verified:	*510,952tCO$_2$e from 28/06/2010 to 31/12/2011 including both days (552 days)*
GHG reducing measure/technology:	*1. Methane recovery by using enclosed manure management system* *2. Reduce the fossil-fuel consumption by using the recovered biogas for cooking*			

Party	Project participants	Party considered a project participant
Vietnam (Host)	Biogas Program for the Animal Husbandry Sector of Vietnam	No
	SNV Vietnam	No

II. Verification Team:

Verification Team			Role					
Full name	**Affiliation TÜV Rheinland**	**Appointed for Sectoral Scopes (Technical Areas)**	Team leader	Local Expert	Team Member (Auditor)	Technical Expert	Technical Reviewer	Expert to TR
Mr. Tommy Lo	Hong Kong	1.2, 5, 13.1, 13.2	X	X		X		
Mr. Timothy Chan		1.2, .2.2, 13.1			X			
Mr. Walter Tang	China	1.1, 1.2, 2.1, 2.2, 3.1, 4.3, 4.5, 13.1					X	

III. Verification Report:

Verification Phases and Verification Status:

☒ Desk Review ☒ Follow up interviews ☒ Resolution of outstanding issues
☐ Corrective Actions / Clarifications Requested ☒ Full Approval and Submission for Issuance ☐ Rejected

III. Verification Report:

Final approval	Released	Distribution
☒	**By: Mr. Praveen N. Urs**	☐ No distribution without permission from the Client or responsible organizational unit
Date: 2013-02-22		☒ Unrestricted distribution

[1] The total ER for the Period (01/05/2010 – 31/12/2011, total 610 days) is estimated as 814,174tCO$_2$e. For the indicative monitoring period, the ER is hence estimated as (814,174tCO$_2$e/ 610 days) x (552days) = 736,760tCO$_2$e.

Abbreviations

AWMS	Animal Waste Management System
BE_y	Baseline Emissions
BP	Biogas Program for the Animal Husbandry Sector of Vietnam
BPD	Livestock Production Department the Biogas Project Division
BUS	Biogas User Survey
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification Request
CMS	Carbon Monitoring Survey
CO_2	Carbon Dioxide
DNA	Designated National Authority
DOE	Designated Operational Entity
DR	Document Review
EB	Executive Board
EIAR	Environmental Impact Assessment Report
ER	Emission Reductions
GBM	Gold Standard Biodigester Methodology
GHG	Greenhouse Gas
GS	Gold Standard
GSF	Gold Standard Foundation
GWh	Giga Watt Hours
I	Interview
IPCC	Intergovernmental Panel on Climate Change
hh	Household
kW	Kilo Watt
kWh	Kilo Watt Hours
LSC	Local Stakeholder Consultation
L_y	Leakage
MARD	Ministry of Agriculture and Rural Development
MCF	Methane Conversion factor
MDGs	Millennium Development Goals
MoV	Means of Verification
MP I	1st Monitoring Period
MS	Manure System
MW	Mega Watt
MWh	Mega Watt Hours
NGO	Non-Government Organisation
NRB	Non-Renewable Biomass
N_2O	Nitrogen Oxide
O&M	Operation and Maintenance
OSV	On Site Visit
PBPD	Provincial Biogas Project Division
PDD	Project Design Document
PE_y	Project Emissions
SD	Sustainable Development
SNV	The Netherlands Development Organization
SO_2	Sulphur Dioxide
T	Tonne
TPDDTEC	Technologies and Practices to Displace Decentralized Thermal Energy Consumption
UNFCCC	United Nations Framework Convention on Climate Change
US	Usage Survey
VGS	Voluntary Gold Standard
VVM	Validation and Verification Manual

Verification opinion — summary

The verification team assigned by the DOE (TÜV Rheinland (China) Ltd.) concludes that the CDM Project Activity "Biogas Program for the Animal Husbandry Sector of Vietnam" in Vietnam, as described in the registered PDD (Version 3.1, 24/09/2012) and monitoring report (Version 2.3, 21/02/2013), meets all relevant requirements of the UNFCCC and Gold Standard Foundation. The project reduces GHG emissions by the utilization of biogas, which is recovered from domestic biogas digester, for the replacement of fossil fuel consumption for daily cooking and for livestock manure treatment. This verification covers the 1st monitoring period from 28/06/2010 to 31/12/2011 (including both days) in the first crediting period.

GS VER Verification methodology and process

The verification has been performed based on the UNFCCC VVM version 01.2 and constitutes the following steps:

- Desk review on the following documents from project proponent:
  - Pre-registered PDD (Version 2.6, 26/04/2012)
  - Pre-registered GS Passport (Version 2.4, 25/04/2012)
  - Pre-registered GS Local Stakeholder Consultation (LSC) Report (Version 2.4, 06/04/2012)
- Desk review on the document from the validation DOE:
  - Pre-registered GS Validation Report (Version 1.2, 26/04/2012)
- Desk review of the pre-registered MR (Version 1, 27/05/2012) and the relevant documents
- On-site assessment (25/06/2012 – 28/06/2012)
- Issuance of verification protocol (Table 1) with corrective action requests (CARs) and clarification requests (CLs) (Table 2)
- Desk review on the following revised documents and other relevant documents:
  - GS comments on the registration request of the project
  - registered PDD (Version 3.1, 24/09/2012)
  - registered GS Passport (Version 3.1, 25/09/2012)
  - registered GS LSC Report (Version 3.1, 25/09/2012)
  - registered GS Validation Report (Version 2.2, 25/10/2012)
  - revised MR (Version 2.3, 21/02/2013)
- Review of the proposed corrections and clarifications
- Issuance of the final Verification Report and Protocol

The project activity was correctly implemented according to applied monitoring methodology "Technologies and practices to displace decentralized thermal energy consumption" and monitoring plan in the pre-registered GS Passport. The related monitoring equipment (i.e. weighting scale) was calibrated and applied during the monitoring survey. The monitoring survey was carried out in accordance with the pre-registered PDD in order to collect the monitoring data. The verification team is able to verify the amount of achieved GHG emission reductions. The DOE is therefore pleased to issue a positive verification opinion indicated in the attached Certification statement.

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1. Introduction

The Contracting Client Organization has commissioned the DOE TÜV Rheinland (China) Ltd. to perform a verification of the CDM Project Activity "Biogas Program for the Animal Husbandry Sector of Vietnam" in Vietnam (hereafter "the project activity"). This report summarises the findings of the verification of the project, performed on the basis of paragraph 62 of the CDM modalities and procedures, as well as guidance of Gold Standard. Verification is required for all registered GS project activities intending to confirm their achieved emission reductions and process with request for issuance of voluntary emission reductions (VERs). This report contains the findings from the verification and a certification statement for the certified VERs.

1.1 Objective

Verification is the periodic independent review and *ex post* determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered GS project activity during a defined monitoring period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the "Biogas Program for the Animal Husbandry Sector of Vietnam" in Vietnam for the period 28/06/2010 to 31/12/2011.

The purpose of verification is to review the monitoring results and verify that monitoring methodology was implemented according to monitoring plan and monitoring data, used to confirm the reductions in anthropogenic emissions by sources is sufficient, definitive and presented in a concise and transparent manner.

In particular, monitoring plan, monitoring report and the project's compliance with relevant UNFCCC and host Party criteria are verified in order to confirm that the project has been implemented in accordance with previously registered design and conservative assumptions, as documented. And also if the monitoring plan is in compliance with the registered PDD, GS Passport and approved monitoring methodology.

1.2 Scope

The scope of the verification is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.
- Where sampling in involved, sampling guidelines are applied to ensure the adequate sampling and survey method is followed in reaching professional judgments.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified. The verification comprises a review of the monitoring report over the monitoring period from 28/06/2010 to 31/12/2011. Based on registered PDD in part of the monitoring parameters and monitoring plan, emission reduction calculation spreadsheet, monitoring methodology and all related evidence provided by project participants.

On-site visit and stakeholders interviews are also performed as part of the verification process.

2. Methodology

The verification consists of the following five phases:

1. Completeness check of the preliminary monitoring report submitted by the PP;
2. Desk review of the monitoring plan, monitoring report, project design document and other relevant documents;
3. On-site visit (including follow-up interviews with project stakeholders, when deemed necessary);
4. Desk review of the registered PDD, GS Passport and the revised MR.
5. Resolution of outstanding issues and the issuance of the final Verification report and Certification statement.

The following sections outline each step in more detail.

2.1 Desk review

Table 1. The following table outlines the documentation reviewed during the verification.

/1/	Gold Standard (GS) Requirements and Toolkit (with the Annexes), Version 2.1, 01/07/2009	
/2/	UNFCCC, CDM Validation and Verification Manual (VVM), Version 01.2, EB 55 Annex 1	
/3/	GS, Technologies and practices to displace decentralized thermal energy consumption, Version 01.0, 11/04/2011	
/4/	/4.1/	PDD Version 2.6(pre-registration version), 26/04/2012
	/4.2/	PDD Version 3.1(registered version), 24/09/2012
/5/	/5.1/	GS Passport, version 2.4 (pre-registered version), 25/04/2012
	/5.2/	GS Passport, version 3.1 (registered version), 25/09/2012
/6/	/6.1/	GS Local stakeholder Consultation Report, Version 2.4 (pre-registered version), 25/04/2012
	/6.2/	GS Local stakeholder Consultation Report, Version 3.1 (registered version), 25/09/2012
/7/	/7.1/	TÜV Rheinland (China) Ltd., GS Validation Report Version 01.2, 26/04/2012)
	/7.2/	TÜV Rheinland (China) Ltd., GS Validation Report Version 02.2, 25/10/2012)
/8/	/8.1/	Preliminary GS Monitoring Report for the 1st monitoring period, Version 1, 27/05/2012 (received by the DOE on 13/06/2012)
	/8.2/	GS Monitoring Report for the 1st monitoring period, Version 2.3 (revised version), 21/02/2013
/9/	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories	
/10/	Monitoring database for the 1st monitoring period, BPD,21/02/2013	
/11/	Usage Survey results,21/02/2013	
/12/	Carbon monitoring survey results, 21/02/2013	
/13/	Sampled Form 02 of the project activity, Minutes of annual check on in-performance biogas plant, 02/01/2012 to 13/02/2012	
/14/	Sampled Form 03 of the project activity for the visited households (total 8 sets), Letter of interest on biogas plant construction	
/15/	Sampled Form 04 of the project activity for the visited households (total 8 sets), Contract on technical and financial support for household to build biogas plant	
/16/	Sampled Form 07 of the project activity for the visited households (total 8 sets), Certificates of acceptance	
/17/	Sampled Form 09 of the project activity for the visited households (total 8 sets), Minutes of assessment QC-UC, BPD	
/18/	Sampled Carbon Monitoring Survey form for the monitoring period I of the project, 20/04/2012 – 08/05/2012	

/19/	/19.1/	Quality control trip records by BPD, 04/01/2012
	/19.2/	Quality control on quality control records by BPD, 04/01/2012
	/19.3/	Quality control on quality control record by PBPD, 14/02/2012
/20/	Quality control manual 2011, Livestock Production Department the Biogas Project Division (BPD), Ministry of Agriculture and Rural Development (MARD)	
/21/	Guideline for programme activities at provinces - 2012, BPD	
/22/	/22.1/	Calibration report of the applied scales, Asian Management and Development Institute (AMDI), 11/06/2012
	/22.2/	Certificate of Verification for the applied weight stone, QUATEST1, No. 12/234/DL1, 29/03/2012
/23/	Teodorita Al Seadi, et al. *biogas Handbook*. University of Southern Denmark Esbjerg, October 2008	
/24/	/24.1/	Can Tho Province mason database, BPD
	/24.2/	Hung Yen Province mason database, BPD
/25/	/25.1/	Can Tho household group training record, BPD
	/25.2/	Hung Yen household group training record, BPD
/26/	/26.1/	Mason & technician training report 2011(Bac Ninh), BPD
	/26.2/	Mason & technician training report 2010 (Lam Dong), BPD
	/26.3/	Mason & technician training report 2010 (Quang Ninh), BPD
/27/	/27.1/	List of trained people 2010, BPD
	/27.2/	List of trained people 2011, BPD
/28/	Digestate management system survey database, BPD, 09/04/2012 – 15/07/2012	
/29/	Electronic database system, BPD	
/30/	ER calculation spreadsheet	
/31/	Biogas user handbooks (visited households)	
/32/	UNEP Risoe, CDM pipeline, 01/11/2012	
/33/	Email confirmation from Gold Standard Foundation for the approval of the PDD (Version 3.1) for registration.	
/34/	Review Comments during the 8-week registration review period, Gold Standard Foundation, 03/07/2012	
/35/	Photo of biodigester serial no. marking, taken during OSV, 25-27/06/2012	
/36/	Bio-slurry use survey results, AMDI, 09/04/2012 – 07/05/2012	
/37/	Organization chart, Biogas Project Division	
/38/	United States Environmental Protection Agency (USEPA) research report “Greenhouse Gases From Small-Scale Combustion Device in Development Countries: Charcoal-Making Kilns in Thailand”, (ref. no. EPA-600/R-99-109), December 1999.	
/39/	GS Issuance Review GS1083, 21/01/2013	

2.2 On-site visit and follow-up interviews with project stakeholders

TÜV Rheinland verification team carried out an on-site visit dated (25/06/2012 to 27/06/2012) and performed interviews with the project representatives and stakeholders. The site visit was conducted to verify the accuracy and completeness of the project description as well as monitoring plan specified in the pre-registered PDD. Prior to the interview salient points to be discussed were planned. Date of interview, interviewee and points discussed are given in the following Table 2.

If there is any change in between on the pre-registered PDD and registered PDD after the OSV, the changes will be reviewed by the verification team based on document review and interviews conducted during the OSV. In case of further document evidence(s) or OSV is needed, the verification team will request for further document evidence(s) from the PP or conduct another OSV.

Table 2. Interviewed person who provide additional information to the presented documentation

	Date	Name	Position / Organization	Topic
/i/	25/06/2012	Nguyen Duc Thu	Director, Provincial Biogas Project Division (PBPD) of Hung Yen Province	➢ Project design and development ➢ Baseline determination ➢ Sustainable development issues ➢ Monitoring issues ➢ Technician, mason and households trainings ➢ Document management ➢ Digester application and construction procedures ➢ Environmental impacts
/ii/		Nguyen Dinh Tuong	Vice director, PBPD of Hung Yen Province	
/iii/		Do Trong Thao	Provincial Biogas Technician, PBPD of Hung Yen Province	
/iv/		Le Quang On	Biogas household in Phu Cu District, Hung Yen Province	➢ Digester installation ➢ Livestock raising ➢ Sources of fuel for cooking before and after building the digester ➢ Manure management before and after building the digester ➢ Biogas and bio-slurry utilization ➢ Monitoring issues ➢ Training ➢ Benefits of running the digester
/v/		Nguyen Van Thuan	Biogas household in Phu Cu District, Hung Yen Province	
/vi/		Pham Van Lanh	Biogas household in Phu Cu District, Hung Yen Province	
/vii/		Nguyen Van Huan	Biogas household in Phu Cu District, Hung Yen Province	
/viii/	26/06/2012	Ngo Cong Chinh	Director / Survey Team Leader, AMDI	➢ Design of the Usage Survey (US) and Carbon Monitoring Survey (CMS) ➢ Sampling method ➢ Calibration of scale ➢ Training of the surveyor ➢ Survey results ➢ QA/QC issues
/ix/		Nguyen Hung Manh	Quantitative Researcher, AMDI	
/x/		Dam Thanh Hang	Research Assistant, AMDI	
/xi/		Le Anh Duc	QC officer, PBPD of Can Tho Province	➢ Data and documentation management system ➢ QA/QC issues ➢ QC on QC
/xii/		Nguyen Thi Minh Nguyet	Biogas Program Coordinator, BPD (As management representative)	➢ Project design and development ➢ Baseline determination ➢ Sustainable development issues ➢ Monitoring issue ➢ Technician, mason and households trainings ➢ Document management ➢ Digester application and
/xiii/		Dagmar Zwebe	Technical Advisor, SNV	
/xiv/		Vo Thi Thuy Duong	Vice Director, PBPD of Can Tho Province	
/xv/		Nguyen Dai Nha	Provincial Biogas Technician, PBPD of Can	

			Tho Province	construction procedures ➢ Environmental impacts
/xvi/		Eric Buysman	Consultant, Nexus - Carbon for Development	➢ US and CMS design ➢ Baseline determination ➢ Monitoring data management ➢ ER calculations
/xvii/	27/06/2012	Lam Quang Van	Biogas household in Binh Thuy District, Can Tho Province	➢ Digester installation ➢ Livestock raising ➢ Sources of fuel for cooking before and after building the digester ➢ Manure management before and after building the digester ➢ Biogas and bio-slurry utilization ➢ Monitoring issue ➢ Training ➢ Benefits of running the digester
/xviii/		Dang Thi Dung	Biogas household in Binh Thuy District, Can Tho Province	
/xix/		Duong Thi Kim Han	Biogas household in Binh Thuy District, Can Tho Province	
/xx/		Thi Van Kien	Biogas household in Binh Thuy District, Can Tho Province	

Verification Team along with onsite observation, objective evidence collections, data generation and recording analysis also considered the views obtained in these interviews while arriving at Verification Opinion. The registered PDD is approved by GS on 12/11/2012[2] and the verification team conducted review on the registered PDD. It is concluded that the changes in the registered PDD have been covered by the verification protocol and related assessments had been done in the OSV. It was determined that another on-site assessment was not necessary to assess the project activity with regards to the changes. The verification team has conducted detailed assessment of the project activity on the compliance with all related GS requirements (refer to Section 3 of this report for details). It is the opinion that the monitoring implementation of the project activity has substantially demonstrated to be in compliance with the revised MR approved by the GS and all related GS requirements.

2.3 Resolution of outstanding issues

The objective of this phase of the verification is to resolve any outstanding issues which have to be clarified prior to final DOE's conclusions on the project implementation, monitoring practices and achieved emission reductions. In order to ensure transparency a verification protocol is completed for the project activity. The protocol shows in transparent manner criteria (requirements), means of verification and resulting statements on verification actual project activity against identified criteria.

The verification protocol serves the following purposes:

- It organises in a table form, details and clarifies the requirements, which GS project is expected to meet;
- It ensures a transparent verification process where the DOE will document how a particular requirement has been verified and the result of the verification.

The verification protocol consists of three tables. Table 1 reflects the verification requirements and reference to the materials used to verify the project activity against those requirements, as well as means of verification, reference to Table 2 and preliminary and final opinion of the DOE on every particular requirement. Table 3 reflects the carry forward actions initiated by the verification team. The completed verification protocol for this project is enclosed in Appendix A to this report.

Findings during the verification can be interpreted as a non-compliance with CDM criteria or a risk to the compliance. Corrective action requests (CARs) are raised, in case:

(a) Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;

(b) Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;

[2] Based on the email confirmation from GS to the PP /33/.

(c) Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

Requests for clarification (CLs) are raised, if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

2.4 Internal quality control

The final verification report underwent a technical review by a qualified independent reviewer before requesting issuance of the project activity. The technical review was performed by a technical reviewer qualified in accordance with TÜV Rheinland's qualification scheme for CDM/GS validation and verification.

2.5 Verification Team

Before the assessment begins, members of the verification team are ensured to cover the technical area(s), sectoral scope(s) and relevant host country experience including local language ability for evaluating the GS verification activity. The qualification of the team is in line with the criteria defined by the EB/GSF guidelines for qualification.

Verification Team			Type of Involvement						
Full name	**Affiliation TÜV Rheinland**	**Appointed for Sectoral Scopes (Technical Areas)**	Supervising the work	Desk review	Site Visit + Interview	Report and protocol Writing	Technical Expert Input	Reporting Support	Technical Reviewer
Tommy Lo	Hong Kong	1.1, 5.1, 13.1, 13.2	X	X	X		X	X	
Timothy Chan		1.2, 2.2, 13.1		X	X	X			
Walter Tang	China	1.1, 1.2, 2.1, 2.2, 3.1, 4.3, 4.5, 13.1							X

3. Verification findings

The findings of the verification are described in the following sections. The verification criteria (requirements), the means of verification and the results of verification are documented in detail in the verification protocol in Appendix A.

3.1 Project implementation

3.1.1 The implementation of the project activity

Project Participants:	1. Biogas Program for the Animal Husbandry Sector of Vietnam 2. SNV Vietnam
Host country:	Vietnam
Title of project activity:	Biogas Program for the Animal Husbandry Sector of Vietnam
GS registration No:	GS1083
Baseline and monitoring methodology:	Technologies and practices to displace decentralized thermal energy consumption, Version 01.0
Location of the project activity:	47 provinces of Vietnam as of the end day of the 1st monitoring period
Project's crediting period:	28/06/2010 to 27/06/2017
Period verified in this verification:	28/06/2010 to 31/12/2011

As part of the site visit the verification team was able to confirm that the project implementation is in accordance with the project description contained in registered PDD/ Version 3.1 dated 24/09/2012.

Through document review (e.g. the pre-registered PDD /4.1/ and the preliminary monitoring report /8.1/), on-site inspection and interviews with representatives from Biogas Project Division (hereafter named as "BPD") /xii/, SNV Vietnam (Netherlands Development Organization Vietnam, hereafter named as "SNV") /xiii/, and Provincial Biogas Project Division (hereafter named as "PBPD") /i/ /xi/ /xiv/, the verification team can summarize the implementation of the project in this Section.

The project "Biogas Program for the Animal Husbandry Sector of Vietnam" (hereafter named the "project activity") is a small-scale biodigester project. The project participants from the host country (i.e. Vietnam) are Biogas Program for the Animal Husbandry Sector of Vietnam (hereafter named "BP") and SNV (hereafter named "SNV").

The project has been retroactively registered as a GS project by the Gold Standard Foundation on 28/06/2012 with the project ID of GS1083[3]. This report aims at reporting of the verification result for the 1st monitoring period between 28/06/2010 to 31/12/2011 (hereafter named as "the indicated monitoring period"). It is noted that the indicated monitoring period is within the 1st crediting period of the project activity, which was started retroactively from 28/06/2010 as approved by GS. The verification of both the emission reductions and sustainability monitoring report for the Gold Standard VER is conducted at the same time.

According to the PDD and the reviewing of BP monitoring database /10/, the project has been implemented in 47 provinces of Vietnam. The list of provinces being covered by this project activity as stated in the MR is confirmed to be consistent with the monitoring database. An on-site visit was carried out by the verification team from 25 – 27/06/2012 in order to check the physical features of the project activity. The verification team randomly selected two provinces with the Usage survey (US) conducted for the monitoring of the indicated monitoring period, i.e. Hung Yen Province and Can Tho Province. Totally 8 households with biogas digesters from BP and had conducted US were visited and interviewed in order to verify the survey results in the indicated monitoring period.

The BPD electronic database system /29/ in the computer system of BPD was checked by the verification team during on-site visit (OSV). Digester information (i.e. plant code, capacity, mason code, etc.) of the visited households gathered during OSV were selected to cross-check with the electronic database system, the hard copies of Minutes of assessment QC-UC (Form 09) /17/ and Certificates of acceptance (Form 07) /16/ as well as the provided BPD monitoring database /10/. The information is found consistent between all the references. Thus the data input to the BPD database is deemed to be reliable and traceable.

For the visited biogas users, the installed volumes of the visited biodigester are ranging from 6.6 m^3 to 18.1 m^3. According to the monitoring report (MR) /8.2/, in the period of 01/01/2007 to 31/12/2011, the average installed capacity of the digester for all the participated households is 11.3 m^3, while 94.21% of participated households installed biodigesters with a capacity $\leq 20m^3$. It can be confirmed from the BPD monitoring database /10/. Thus the verification team considers that the visit to biodigester with capacity ranging from 6.6 m^3 to 18.1 m^3 was a representative approach in order to check the operation status of the biodigesters since this represents the majority of biodigester volume design.

According to the MR, the number of biodigesters installed from the project starting date (validated as 01/01/2007) to 31/12/2011 was 89,176 units. The digester size built has an average volume of 11.3 m^3 among all the biodigesters. This cumulative installation of biodigesters is checked against the BPD monitoring database /10/, in which they are consistent with the input data in the electronic database system /29/. Thus verification team considers that the cumulative installations of biodigesters in the monitoring report are deemed to be reliable and traceable.

The verification team has checked the certificate of acceptance /16/ of the visited households for the mason who built the biodigester. It is found that all the masons can be cross-checked with the record in Province mason database of Can Tho /24.1/ and Hung Yen /24.2/ by the mason code. Furthermore, the verification team has checked the list of trained people 2010 /27.1/ and 2011 /27.2/, which has recorded the masons and provincial biogas technicians trained in these two years. The trained masons and provincial biogas technician in the lists

[3] https://gs1.apx.com/myModule/rpt/myrpt.asp?r=111

can be cross-checked with the Mason & technician training report 2010 & 2011 /26.1/ /26.2/ /26.3/, and they are found consistent. Based on the above findings, the training system for the mason and the provincial biogas technician is considered to be well organized and recorded. The masons are confirmed to be certified by the BPD. Moreover, by reviewing the Quality control manual 2011 /20/, it has clearly indicated the required technical specification of the biodigester and the QC procedures in details. Thus the standards and the quality can be ensured for the construction and operation of biodigesters.

Through OSV & interviews, and document checking, the verification team considers that the implementation of project activity including project location and biodigester installation is in line with the registered PDD and BP's internal requirements /20/ /21/ and no diversion from the original plan has been found.

3.1.2 The actual operation of the CDM project activity

As confirmed during OSV, the project activity includes installation of biodigesters according to the BP's requirement. Different sizes of biodigesters were installed as indicated in the registered PDD.

The indicated monitoring period for 1st monitoring period

The indicated monitoring period in the monitoring report is for the 1st monitoring period is 28/06/2010 to 31/12/2011. It is also confirmed by the BP that during this period, no other scheme of carbon credit was claimed, apart from GS VER.

According to the on-site observation and interview with biodigester users /iv/ /v/ /vi/ /vii/ /xvii/ /xviii/ /xix/ /xx/, all the biodigesters were operated under normal status. Adequate biogas supply could be demonstrated for the operation of biogas stoves and biogas lamps. Moreover the households also applied bioslurry from the biodigesters as their agricultural fertilizer.

The verification team can also check the biogas user handbooks /31/ from each of the visited participated households. According to the biogas handbooks, it includes the operation and maintenance manual of the biodigester. The unique serial number (plant code) of the biodigesters can be checked from the completion certificates of acceptance of each visited biodigesters /16/, which is consistent with the mark on the biodigesters seen on-site. In addition, the regular inspection records were checked by the verification team to confirm that the inspection of biodigester operation was conducted by the provincial biogas technician /iii//xv/. According to the BP quality control requirements /20/, all the biodigesters will be inspected by the district technician and fill out Certificate of acceptance (Form 07). The provincial technician will then conduct a 10% random check on the certificate of acceptance (i.e. QC on QC). The 1.5% of the biodigesters will be checked by the BPD officer randomly. The verification team confirmed from the Quality control records by PBPD /19.3/ and BPD /19.2/ that the rate of inspection done by PBPD and BPD were 13% and 2% respectively which is in compliance with the registered PDD which requires 5% and 1% respectively (i.e.P.53 of the PDD). Thus the verification team considers that the biodigesters can be operated under the requirements from BP, and ensure the proper operation of the biodigesters.

In conclusion, the project implementation is consistent with the project design illustrated in the registered PDD /4.2/ and registered GS Passport /5.2/.

The timeline of the project's implementation is as follow:

Milestone of the project activity	Timeline	Assessment by the verification team
Starting date of operation:	01/01/2007 (installation of the first biodigester)	BPD monitoring database /10/, registered PDD /4.2/
Registration of the project activity	28/06/2012	GSF website[4]
Crediting period	28/06/2010 – 27/07/2017 (retroactive crediting period)	GSF website[5]
1st monitoring period	28/06/2010 – 31/12/2011	MR /8.2/

[4] https://gs2.apx.com/myModule/rpt/myrpt.asp?r=111
[5] https://gs2.apx.com/myModule/rpt/myrpt.asp?r=111

Milestone of the project activity	Timeline	Assessment by the verification team
	(include both days)	

In summary, the monitoring period is reasonable and the actual implementation of the project activity is appropriate to its GS development. The verification team took cognizance of clause 198 (a), (b) of VVM.

3.2 Compliance of the monitoring plan with the monitoring methodology

The DOE verification team is able to confirm that the monitoring plan contained in the registered PDD /4.2/ dated 24/09/2012 is in accordance with the approved methodology applied by the project activity, i.e. Technologies and practices to displace decentralized thermal energy consumption (hereafter named as "TPDDTEC")/ Version 01.0 /3/.

The verification team also checked the applicability of the applied GS methodology for the 1st monitoring period. The project activity is confirmed in compliance with all the applicability criteria conditions listed in the applied monitoring methodology.

Applicability criteria conditions of TPDDTEC/ Version 01.0	Observations & Verification opinion
1. The project boundary can be clearly identified, and the technologies counted in the project are not included in another voluntary market or CDM project activity (i.e. no double counting takes place). Project proponents must have a survey mechanism in place together with appropriate mitigation measures so as to prevent double-counting in case of another similar activity with some of the target area in common.	The project activity disseminates a total of 89,176 units of biodigester system to households within the 47 provinces of Vietnam since the start date of the project activity i.e. 01/01/2007 and until the end of the indicated monitoring period (i.e. 31/12/2011). It is noted that there is a **FAR01** in the Validation Report /7.2/ of the project activity that requires toconfirm if any double counting of the biogas digester households between the VGS and potential subsequent CPA in the CDM PoA under the UNFCCC. The interviewed management representative of BP advised that the project activity has not applied any other voluntary market but in parallel with the application as a CDM PoA (i.e. Vietnam National Biogas Programme [6]). The verification team has checked through the CDM pipeline /32/, UNFCCC PoA official website [7] and VCS official website [8] by filtering with the project name and PP's names, it has found no similar project (except the PoA/CPA application) applying these emission reduction certification schemes. Furthermore, it is confirmed that the CDM PoA is not yet registered. Hence the verification team confirms this GS VER project activity does not involve in double-counting of other carbon scheme at the time of this request for issuance. The digesters were given with a unique serial no. and they were recorded in the electronic database system. Related QC and QC on QC procedures were implemented to ensure no double-counting had occurred. Therefore, it is confirmed that there is no double counting occurred with regards to **FAR01**. Therefore, the project activity was implemented in line

[6] http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/FYHTWZ3QLWM91NKR9DB47YIHGQ5KSU/view.html
[7] http://cdm.unfccc.int/ProgrammeOfActivities/registered.html
[8] https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?tc=1&Tab=Projects&a=1

	with this criteria condition.
2. The technologies each have continuous useful energy outputs of less than 150kW per unit (defined as total energy delivered usefully from start to end of operation of a unit divided by time of operation). For technologies or practices that do not deliver thermal energy in the project scenario but only displace thermal energy supplied in the baseline scenario, the 150kW threshold applies to the displaced baseline technology.	It is confirmed from P.18 of the registered Validation report /7.2/ that the calculated unit thermal output rate per cubic meter of recovered biogas is 0.0997kW/m^3. And it is confirmed from the BPD monitoring database that that the maximum capacity of the installed biodigester during the indicated monitoring period was 49.2m^3. Therefore, the max unit thermal rate output is calculated as 0.0997kW/m^3 × 49.2m^3 = 4.9kW. It is lower than the threshold. Therefore, the project activity was implemented in line with this criteria condition.
3. The use of the baseline technology as a backup or auxiliary technology in parallel with the improved technology introduced by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology (e.g. discounted price for the improved technology) and the definitive discontinuity of its use. The project documentation must provide a clear description of the approach chosen and the monitoring plan must allow for a good understanding of the extent to which the baseline technology is still in use after the introduction of the improved technology, whether the existing baseline technology is not surrendered at the time of the introduction of the improved technology, or whether a new baseline technology is acquired and put to use by targeted end users during the project crediting period – see section III. The success of the mechanism put into place must therefore be monitored, and the approach must be adjusted if proven unsuccessful. If an old technology remains in use in parallel with the improved technology, corresponding emissions must of course be accounted for as part of the project emissions – see section II.5.	The project activity has encouraged the elimination of the old technologies (i.e. firewood and other fossil fuel for cooking, etc., and old AWMS) by providing subsidy to the households for the construction of the digester system. It is confirmed by the Contract on technical and financial support for household to build biogas plant (Form 04) /15/, that subsidy was given to the households. The PP has implemented Usage Survey (US) /11/ and Carbon monitoring survey (CMS) /12/ during the indicated monitoring period in order to monitor the utilization of the old technologies in parallel with the new technologies in the project scenarios. By reviewing the ER calculation spreadsheet /30/, it is found that the emissions from the continuous utilization of old technologies in parallel had been taken into account for the calculations of the ER of the project activity. Therefore, the project activity was implemented in line with this criteria condition.
4. The project proponent must clearly communicate to all project participants the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity. This must be communicated to the technology producers and the retailers of the improved technology or the renewable fuel in use in the project situation by contract or clear written assertions in the transaction paperwork, If the claimants are not the project technology end users, the end users should be notified that they cannot claim for emission reductions from the project.	The verification team has confirmed that all the visited households had signed the agreement of transferring the right of selling emissions reductions resulting from their participations in this project activity, it is confirmed from the signed Form 04 of the visited households /15/. It is also advised from the management representative /vii/ of BPD that all the households who participated in the project activity had signed the agreement. The verification team considers it is reliable as BPD is a governmental organization under the Ministry of Agriculture and Rural Development of Vietnam. Therefore, the project activity was implemented in line with this criteria condition.
5. Project activities making use of a new biomass feedstock in the project situation (e.g. shift from	The project activity does not involve biomass feedstock, and the project activity is defined as

non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rules. If the biomass feedstock is sourced from a dedicated plantation, these criteria must apply to both plantations established for the project activity AND existing plantations that were established in the context of other activities but will supply biomass feedstock. Furthermore, the following conditions apply: A. Adequate evidence is supplied to demonstrate that indoor air pollution (IAP) levels are not worsened compared to the baseline, and greenhouse gases (as listed in section II.1) emitted by the project fuel/stove combination are estimated with adequate precision. The project fuel/stove combination may include instances in which the project stove is a baseline stove. B. Records of renewable fuel sales may not be used as sole parameters for emission reduction calculation, but may be used as data informing the equations in section II of this methodology if correlated to data on distribution9 and results of field tests and surveys confirming (a) actual use of the renewable fuel and usage patterns such as average fraction of non-renewable fuels used in mixed combustion or seasonal variation of fuel types, (b) GHG emissions, (c) evidence of CO levels not deteriorating (d) any further factors effecting emission reductions significantly.	improved distributed heating and cooking devices as per GS Toolkit Annex C. Therefore, this criteria condition is not applicable to the project activity.

The project activity also applied in compliance with Annex 6 of the applied methodology.

Applicability criteria condition in Annex 6 of TPDDTEC / Version 01.0	Verification team's opinion
If more than one climate zone is included in the project activity, a distinction per climate zone must be considered. The distinct geographical boundary of each project area *i* must be clearly documented in the project documentation, using representative GPS data.	As per the monitoring report /8.2/, two distinctive climate zones are identified in accordance with the guidance of 2006 IPCC Guidelines for National Greenhouse Gas Inventories /9/. The 47 provinces covered by the project activity were divided in to 1. Temperate Zone; 2. Warm Zone. The ER calculations spreadsheet /30/ has clearly provided the respective annual average temperature of the provinces. GPS data is not used in either the PDD or the MR, instead, a map is inserted in the MR to indicate the location and boundary of the provinces. The verification considers it is acceptable and confirms the criteria condition is fulfilled.

Relevant monitoring records, i.e. US survey form /13/, CMS survey form /18/ have been checked by the verification team and confirmed to be valid and traceable (*please refer to Section 3.3.1 for details*). The

measuring frequency of the monitoring survey or device is also described in the monitoring report according to the actual arrangement. The verification team considers that it is not necessary to submit revision to the monitoring plan or deviation prior to request for issuance to Gold Standard.

3.3 Compliance of the Actual monitoring with monitoring plan in the PDD

The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD /4.2/ of 24/09/2012.

The verification team reviewed the monitoring plan stated in the monitoring report (MR) /8.1/ and conducted an on-site visit so as to (i) verify the compliance of the monitoring with the monitoring plan contained in the pre-registered PDD /4.1/ and also the pre-registered GS Passport /5.1/, and (ii) confirm the emission reductions and contributions to sustainable development during the indicated monitoring period. The revised monitoring report /8.2/ is reviewed afterwards. The monitoring plan in the revised MR is confirmed to be in compliance with that stated in the registered PDD /4.2/.

The monitoring plan in the registered PDD applies the monitoring requirements of the Section III of applied GS Technologies and practices to displace decentralized thermal energy consumption/ Version 01.0 /3/. During the OSV, it was observed that BP conducted a Usage survey (US) and Carbon monitoring survey (CMS) in order to collect the data required in the applied GS methodology. According to the registered PDD /4.2/, the baseline emission for thermal energy needs is determined through baseline option 1 in the applied GS methodology. The data and parameters monitored are also consistent with the monitoring plan in the registered PDD.

According to the Section B.7.2 of the registered PDD, the verification team summarizes the findings of the monitoring approach applied.

1. Unique serial number of biodigester

As mentioned in the previous section, the Provincial Biogas Project Division (PBPD) supervisor would check each biodigester upon construction completion. A Minute of QC-UC (Form 09) /17/ would be filled by the PBPD supervisor for the quality control of the biodigester under construction. In addition, Certificate of Acceptance (Form 07) /16/ with unique serial number would be issued to the biodigester end-user. Form 09 and Form 07 of the visited households (total 8 households in Hung Yen Province & Can Tho Province) were checked by the verification team /16/ /17/, and confirmed to be valid. Then the Form 07 would be given to the BPD office for inputting data into the electronic database system. As mentioned in the previous Section 3.1.1, the verification team also checked BPD monitoring database /10/, and considers that the data input is reliable and traceable. Therefore the number of biodigester can be tracked from the BPD monitoring database. In addition, by reviewing of the unique serial number of each biodigester, this can avoid the double counting of the biodigesters input in the BPD database.

2. Monitoring Survey

Usage Survey

A Usage Survey (US) /11/ was conducted by BPD officer as described in the registered PDD /4.2/. According to the monitoring report, the survey was conducted by stratified random sampling, and the sample size was 35 per each age group of biodigesters (total sample size: 175 households). It is in compliance with a confidence level of 90% and a level of precision of 10%, which requires minimum total sample size as100 with at least 30 samples for each age group. The actual sample size was higher than the requirement stipulated in the registered PDD and the applied GS methodology as well as the referenced UNFCCC “Standard for Sampling and Survey for CDM Project Activities and Programme of Activities/ Version 2.0”.

The data obtained from the US survey forms was used to obtain the statistical data for the 1st monitoring period as checked in the ER calculation worksheet /30/. The calculated sample population is 100 households, and the BP also over-sampled the survey households in order to account for missing values and non-responsiveness. The sample size was increased to 175 households, and the verification team considers that this is conservative for over-sampling. During On-site visit, the verification team has checked all the survey forms and confirmed

that 175 samples were surveyed. Detailed data of the survey forms was checked, it is confirmed that data input in the excel worksheet is consistent with the data in the survey form.

Carbon Monitoring Survey (CMS)
According to the monitoring report /8.2/, cluster random sampling was applied for each climate zone. This is the same approach as the monitoring strategy stipulated in the registered PDD /4.2/, in which the sampling approach was accepted by GS. The sampling method is in compliance with the referenced UNFCCC "Standard for Sampling and Survey for CDM Project Activities and Programme of Activities/ Version 2.0". As per the design of the sampling which prescribes 90% confidence interval and 10% precision, the calculated sampling size for each climate zone are 100 and 99 respectively for Temperate and Warm zone respectively. The survey was contracted to a third party survey consultant (i.e. AMDI) to implement the survey.

There are totally 20 clusters (10 clusters in each climate zone) randomly selected in the survey. For each clusters, a 10% add-up of the sampling size is adopted in accordance with the sampling standard to guarantee over sampling. It results in 17 samples per clusters (total: 340 samples for two zones). The sampled clusters are clearly indicated in the CMS survey result /12/. The verification has interviewed the survey team who carried out the CMS survey from AMDI. The whole sampling approach was verified by the verification team from the interview and confirmed to be consistent with the PDD and in a random basis. The verification team considers that sampling approach is reasonable and transparent.

The CMS has incorporated Biogas User Survey (BUS) which is designated to evaluate the users' satisfaction on the biodigesters. BUS and CMS was conducted by the same surveyor (i.e. AMDI) in the same survey trip. The verification team can confirm the BUS part from the survey forms /18/ as well as from the interview with the surveyor /viii/ during OSV. It is confirmed in compliance with the monitoring plan.

3. Gold Standard Sustainable Indicator
The monitoring of the Gold Standard sustainable indicator stated in the GS Passport /5.2/ is done by conducting survey which was included in the CMS /12/ /18/. The CMS was conducted by an independent consultant (i.e. AMDI) as described in the registered PDD /4.2/. Please refer to following Section 3.5 for the verification of GS sustainable indicators.

Baseline Field Test (BFT) & Project Field Test (PFT)
It is found that the BFT and PFT were not carried out in the 1st monitoring period for updating the related baseline parameters as well as the parameters in the project scenario. However, according to the GS Issuance Review /39/, it is confirmed that such deviation is accepted by the GS. Hence these FTs are approved to be not included in this monitoring period as well as not in the scope of verification. According to Table 9 of the MR, the BFT will be conducted once for each crediting period while the PFT will be conducted bi-annual for the remaining monitoring periods (Refer to Section 3.7 for the FAR raised with this regards). This arrangement was accepted by the GS according to the GS Issuance Review.

Data and Parameters not be monitored
The verification team checked the monitoring report /10.2/, in which the following parameters are not monitored as the *ex-ante* values would be applied in the ER calculation. Except for CO_2 emission factor of charcoal production, the *ex-ante* values are consistent with the values indicated in the registered PDD and the applied GS methodology.

1. Data and parameters relevant for baseline 1: fuel switch (monitoring report p.51)

Parameters		
$EF_{b,CO2}$	Description	CO_2 emission factor arising from use of fuels in the baseline scenario ($kgCO_2/TJ$ fuel)

	Value	**Fuel *b*** / **EF_{CO2}, (kg/TJ)** LPG: 63,100 Charcoal: 112,000 Coal: 94,600 Firewood: 112,000 Agriculture residues: 100,000 Kerosene: 71,900 Charcoal production: 1,285 gCO_2/kg charcoal
	Source	2006 IPCC Guidelines defaults, see chapter 2 Stationary Combustion: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines For charcoal production, since there is no relevant national survey in Vietnam, the PP applies the United States of America EPA research report "Greenhouse Gases From Small-Scale Combustion Device in Development Countries: Charcoal-Making Kilns in Thailand" page 2 and the EF of charcoal production is sourced as between 970-1600gCO2/kg charcoal produced /38/. An average value is then applied by the PP as 1,285 gCO2/kg charcoal produced in the project activity. In addition, the PP further assumes that the Thailand charcoal production industry should be more developed, comparing with the situation in Vietnam. Thus a lower EF in Thailand is expected. The verification team also considers that it is a reliable research from USEPA, and it is also conservative to apply an expectedly lower EF value from Thailand for the project activity.
$EF_{i,CH4}$	Description	CH_4 emission factor arising from use of fuels in the baseline scenario ($kgCH_4$/TJ fuel)
	Value	**Fuel *i*** / **EF_{CH4}, (kg/TJ)** LPG: 11.95 Charcoal: 330.5 Coal: 1458.5 Firewood: 1224 Agriculture residues: 2210 Kerosene: 12.6 Charcoal production: 1000
	Source	2006 IPCC Guidelines defaults see chapter 2 Stationary Combustion: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html, Table 2.9 Charcoal production from Good Practice Guidance and Uncertainty Management in National GHG inventories: http://www.ipcc-nggip.iges.or.jp/public/gp/bgp/2_2_Non-CO2_Stationary_Combustion.pdf
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines
$EF_{i,N2O}$	Description	N_2O emission factor arising from use of fuels in the baseline scenario (kgN_2O/TJ fuel)
	Value	**Fuel *i*** / **EF_{N20}, (kg/TJ)** LPG: 2.1 Charcoal: 5.45 Coal: NA Firewood: 11.25 Agriculture residues: 9.7

		Kerosene: 1.55 Charcoal production: NA
	Source	2006 IPCC Guidelines defaults, see chapter 2 Stationary Combustion, table 2.9 http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines
NCV_i	Description	Net calorific value of the fuel i used in the baseline (TJ/Gg)
	Value	**Fuel *i*** / **NCV_i (TJ/Gg)** LPG: 47.3 Charcoal: 29.5 Coal: 25.8 Firewood: 15.6 Agriculture residues: 11.6 Kerosene: 43.8
	Source	2006 IPCC Guidelines defaults, see chapter 1 Energy table 1.2 http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines
GWP_{CH4}	Description	Global Warming Potential (GWP) of methane (tCO_2e per tCH_4)
	Value	21
	Source	SAR IPCC
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC reference Fixed for the first crediting period and shall be revised to further COP/MOP decision
GWP_{N2O}	Description	Global Warming Potential (GWP) of nitrous oxide (tCO_2e per tN_2O)
	Value	310
	Source	SAR IPCC
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC reference Fixed for the first crediting period and shall be revised to further COP/MOP decision

2. Data and parameters relevant for baseline 2: Methane avoidance from Animal Manure Management System (monitoring report p.53)

$VS_{(T)}$	Description	Daily volatile solid excreted for livestock category T (kg dry matter per animal per day)
	Value	**Animal T** / **$VS_{(T)}$ kg/day** Pig: 0.3 Buffalo: 3.9 Dairy Cow: 2.8 Cattle: 2.3
	Source	Volume 4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10 (online: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines
$Bo_{(T)}$	Description	Maximum methane production capacity for manure produced by livestock category T (m^3 CH_4 per kg of VS excreted)
	Value	**Animal T** / **$Bo_{(T)}$ $m^3CH_4/kgVS$**

		Pig: 0.29 Buffalo: 0.1 Dairy Cow: 0.13 Cattle: 0.1
	Source	Volume 4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10 (online: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines
$MCF_{(k)}$	Description	Methane conversion factor for each manure management system by climate region k
	Value	10% for biodigester systems
	Source	Volume 4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10 (online: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines
$EF_{(T)}$	Description	Animal waste methane emission factor by average temperatures ($kgCH_4$ per animal per year for livestock type T)
	Value	**Animal T** / **$EF_{(T)}$ (Temperate) ($kgCH_4$/head/year)** / **$EF_{(T)}$ (Warm) ($kgCH_4$/head/year)** Dairy cow: 21.0 / 28.0 Pig: 5.0 / 6.0 Cattle: 1.0 / 1.0 Buffalo: 2.0 / 2.0
	Source	IPCC default values for the region Asia from volume 4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10 (online:http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the IPCC guidelines
$\eta_{biogasstove}$	Description	Combustion efficiency of the biogas stove (%)
	Value	98%
	Source	The default value from the GS methodology: Indicative Programme, baseline, and monitoring methodology for Small Scale Biodigester
	Remark	*Ex-ante* values in registered PDD section B.6.2. Consistent with the GS methodology

3.3.1 Monitored parameters

For Emission Reductions

The verification team has assessed the monitoring techniques and each monitoring value in the monitoring report, and provides a short summary on the verification of every parameter listed in the monitoring plan and used for calculation of emission reductions. Please note that there is no monitoring frequency specified in the applied GS methodology, and also calibration is not required since the source of data is from survey questionnaire or literature review. This is also required from the applied GS methodology by using the survey or literature review to collect the data during monitoring. Regarding the determination of fuel consumption, the survey team used newton scales to measure the weight of the fuel. The scales are calibrated by the survey team every day before starting the surveying works.

1. Data and parameters relevant for baseline 1: fuel switch (monitoring report p.55)

Parameter		
$f_{NRB,y}$	Description	Non-renewability status of woody biomass fuel in scenario I during year y (Fraction of non-renewability)
	Value	67%

<table>
<tr><td></td><td>Source</td><td>Literature review, surveys</td></tr>
<tr><td></td><td>QA/QC procedure</td><td>N/A</td></tr>
<tr><td></td><td>Verification opinion</td><td>By reviewing the validation report /7.2/ and the registered PDD /4.2/, the value has been validated and approved by the GS. Therefore, the value is considered as appropriate.</td></tr>
<tr><td>$P_{b,y}$</td><td>Description</td><td>The baseline is continuously updated with new households that install a biogas plant. (Quantity of fuel that is consumed in the baseline scenario in year y)</td></tr>
<tr><td></td><td>Value</td><td>
<table>
<tr><th rowspan="2">Fuel i</th><th>Average per household in zone temperate</th><th>Average per household in zone warm</th></tr>
<tr><th>(kg/year)</th><th>(kg/year)</th></tr>
<tr><td>LPG</td><td>14.0</td><td>36.1</td></tr>
<tr><td>Charcoal</td><td>83.8</td><td>101.3</td></tr>
<tr><td>Coal</td><td>444.7</td><td>29.3</td></tr>
<tr><td>Firewood</td><td>1840.4</td><td>1798.3</td></tr>
<tr><td>Agriculture residues</td><td>653.8</td><td>156.9</td></tr>
<tr><td>Kerosene</td><td>0.8</td><td>0.8</td></tr>
</table>
</td></tr>
<tr><td></td><td>Source</td><td>BPD database</td></tr>
<tr><td></td><td>QA/QC procedure</td><td>Fuel data is collected by the district technician before the biogas plant is installed and inspected by the provincial biogas technician before the data is entered into the database</td></tr>
<tr><td></td><td>Verification opinion</td><td>The data is consistent with the BPD monitoring database /10/ which is checked and confirmed that the baseline fuel consumption data of every participated household (total: 89,176 households since 01/01/2007 – 31/12/2011) was recorded in a detailed manner. By checking the ER calculation spreadsheet /30/, the fuel consumption is calculated by taking average of all the data for each type of fuel collected from each household of each zone. The BPD database is considered to be reliable and the calculated values are confirmed to be traceable.</td></tr>
<tr><td>$P_{h,y}$</td><td>Description</td><td>Quantity of fuel that is consumed in the project scenario in year y (kg/household)</td></tr>
<tr><td></td><td>Value</td><td>
<table>
<tr><th rowspan="2">Fuel i</th><th>Average per household in zone temperate</th><th>Average per household in zone warm</th></tr>
<tr><th>(kg/year)</th><th>(kg/year)</th></tr>
<tr><td>LPG</td><td>8.7</td><td>4.1</td></tr>
<tr><td>Charcoal</td><td>10.0</td><td>3.4</td></tr>
<tr><td>Coal</td><td>56.5</td><td>1.0</td></tr>
<tr><td>Firewood</td><td>971.7</td><td>527.6</td></tr>
<tr><td>Agriculture residues</td><td>33.1</td><td>109.7</td></tr>
<tr><td>Kerosene</td><td>0.0</td><td>0.0</td></tr>
</table>
</td></tr>
<tr><td></td><td>Source</td><td>Monitoring survey</td></tr>
<tr><td></td><td>QA/QC procedure</td><td>Refer to chapter 4 of MR</td></tr>
<tr><td></td><td>Verification opinion</td><td>The CMS results /12/ is checked and confirmed that the applied data is consistent with the results. The CMS was conducted by AMDI which is a third party survey consultant. The CMS survey forms /18/ were cross-checked with the data entered in the CMS results /12/, it is found consistent. The survey was done in compliance with 90/10 sampling</td></tr>
</table>

		approach and with additional 10% sample size over the requirement. It is considered as conservative. By checking the CMS results, it is confirmed that the values of each type of fuel are calculated by taking average of the collected data from each sampled households in each zone. In summary, the survey data is considered as reliable, conservative, and traceable.
$U_{p,y}$	Description	Percentage of bio-digesters in use in monitoring period y (%)
	Value	96.574%
	Source	Usage survey
	QA/QC procedure	Conservative sample of 35 household per year for each programme year was taken instead of 30. All data was collected by provincial or district technicians (expert persons) and checked at national level by BP before entering into the database.
	Verification opinion	By reviewing the US results /11/, it is confirmed that 35 samples were surveyed for each age group of biodigesters built since 2007 to 2011. The verification team has cross-checked the US results /11/ with the survey forms /13/, the data input to the US results is found consistent with the sampled survey forms. It is confirmed that the applied data is calculated by taking average of the collected data from the two climate zone. The verification team considers the data is reliable, conservative and traceable.

2. Data and parameters relevant for baseline 2: Methane avoidance from Animal Manure Management System (monitoring report p.56)

<table>
<tr><td rowspan="5">$N_{p,y}$</td><td>Description</td><td>Number of biogas plants commissioned (units)</td></tr>
<tr><td>Value</td><td>89,176</td></tr>
<tr><td>Source</td><td>BPD database</td></tr>
<tr><td>QA/QC procedure</td><td>100% of all plants are checked after completion of the construction by the district technician on compliance with the MARD biogas standard. 5% of the plants will be visited by the provincial technician for the same check (QC on QC on random sampling basis.</td></tr>
<tr><td>Verification opinion</td><td>By checking the BPD monitoring database /10/, it is confirmed that there were 89,176 units of biodigesters recorded in the database since 01/01/2007 to 31/12/2007. The verification has inspected the whole documentation management system of the project activity and considered the document management and quality control were implemented as per the description in Section B.7.2 of PDD /4.2/. As discussed in Section 3.3 of this report i.e. “1. Unique serial of number of biodigester”, it is confirmed that unique serial no. was given to the biodigesters of this project which can be confirmed for the visited households during OSV. The verification team is able to cross-check consistently for the serial no. of the visited biodigesters with 1. the mark on the biodigesters /35/, 2. BPD monitoring database /10/, 3. signed Form 03 /14/, Form 04 /15/, Form 07 /16/ and Form 09 /17/. Double-counting is hence assured. As discussed in Section 3.2, it is confirmed that all the biodigesters included in this project activity has not applied for other ER certification scheme. In summary, it is confirmed that the applied data is reliable and traceable.</td></tr>
<tr><td rowspan="3">$MS_{(T,S,k)}$</td><td>Description</td><td>Fraction of livestock category T’s manure fed into the biodigester S, in climate zone k (%)</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Climate zone</th><th>Pig</th><th>Buffalo</th><th>Dairy cow</th><th>Cattle</th></tr>
<tr><td>temperate</td><td>93%</td><td>36%</td><td>N/A</td><td>26%</td></tr>
<tr><td>warm</td><td>92%</td><td>34%</td><td>28%</td><td>29%</td></tr>
</table>
</td></tr>
<tr><td>Source</td><td>CMS monitoring survey</td></tr>
</table>

<table>
<tr><td></td><td>QA/QC procedure</td><td>Refer to chapter 4 and 2.2</td></tr>
<tr><td></td><td>Verification opinion</td><td>The CMS results /12/ is checked and confirmed that the applied data is consistent with the results. The CMS was conducted by AMDI which is a third party survey consultant. The survey was done in compliance with 90/10 sampling approach and with additional 10% sample size over the requirement. It is considered as conservative. By checking the CMS results, it is confirmed that the values of each type of manure being fed into the biodigester are calculated by taking average of the collected data from each sampled households in each zone. It is confirmed from the CMS results that no sampled household had raised dairy cow in Zone Temperate, therefore it is “N/A” for this value. The verification team has cross-checked the sampled CMS survey form for the data input of the fraction of manure being fed into biodigester in the CMS results, it is confirmed that the data is consistent with that recorded in the CMS results. In summary, the applied data is considered as reliable, conservative, and traceable.</td></tr>
<tr><td rowspan="5">MS_(P,S,k)</td><td>Description</td><td>Fraction of livestock category T’s manure not fed into the biodigester S, in climate zone k (%)</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Climate zone</th><th>Pig</th><th>Buffalo</th><th>Dairy cow</th><th>Cattle</th></tr>
<tr><td>temperate</td><td>7%</td><td>64%</td><td>N/A</td><td>74%</td></tr>
<tr><td>warm</td><td>8%</td><td>66%</td><td>72%</td><td>71%</td></tr>
</table>
</td></tr>
<tr><td>Source</td><td>CMS monitoring survey</td></tr>
<tr><td>QA/QC procedure</td><td>Refer to chapter 4 and 2.2</td></tr>
<tr><td>Verification opinion</td><td>The CMS results /12/ is checked and confirmed that the applied data is consistent with the results. The CMS was conducted by AMDI which is a third party survey consultant. The survey was done in compliance with 90/10 sampling approach and with additional 10% sample size over the requirement. It is considered as conservative. By checking the CMS results, it is confirmed that the values of each type of manure being not fed into the biodigester are calculated by taking average of the collected data from each sampled households in each zone. It is confirmed from the CMS results that no sampled household had raised dairy cow in Zone Temperate, therefore it is “N/A” for this value. The verification team has cross-checked the sampled CMS survey form /18/ for the data input of the fraction of manure being not fed into biodigester in the CMS results, it is confirmed that the data is consistent with that recorded in the CMS results. In summary, the applied data is considered as reliable, conservative, and traceable.</td></tr>
<tr><td rowspan="5">N_(T)</td><td>Description</td><td>Number of animals of livestock category T (number)</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Animal</th><th>N(T),h climate zone temperate</th><th>N(T),h climate zone warm</th></tr>
<tr><td>T</td><td>#</td><td>#</td></tr>
<tr><td>Pig</td><td>14.03</td><td>15.95</td></tr>
<tr><td>Buffalo</td><td>0.17</td><td>0.01</td></tr>
<tr><td>Dairy cow</td><td>0.00</td><td>0.40</td></tr>
<tr><td>Cattle</td><td>0.15</td><td>0.69</td></tr>
</table>
</td></tr>
<tr><td>Source</td><td>CMS monitoring survey</td></tr>
<tr><td>QA/QC procedure</td><td>Refer to chapter 4 and 2.2</td></tr>
<tr><td>Verification opinion</td><td>The CMS results /12/ is checked and confirmed that the applied data is consistent with the results. The CMS was conducted by AMDI which is</td></tr>
</table>

<table>
<tr><td></td><td></td><td>a third party survey consultant. The survey was done in compliance with 90/10 sampling approach and with additional 10% sample size over the requirement. It is considered as conservative. By checking the CMS results, it is confirmed that the values of number of animal for each type of livestock raised by the households are calculated by taking average of the collected data from each sampled households in each zone. The average no. of animals is considered as more appropriate than the in-situ no. of animal observed at the time of the survey, on the ground that it can reflect the situations of animal raising through-out the whole year.
It is confirmed from the CMS results that no sampled household had raised dairy cow in Zone Temperate, therefore it is “N/A” for this value.
The verification team has cross-checked the sampled CMS survey form /18/ for the data input of number of animal for each type of livestock raised by the sampled households in the CMS results, it is confirmed that the data is consistent with that recorded in the CMS results. In summary, the applied data is considered as reliable, conservative, and traceable.</td></tr>
<tr><td rowspan="4">PL</td><td>Description</td><td>Physical leakage of the biodigester (%)</td></tr>
<tr><td>Value</td><td>10%</td></tr>
<tr><td>Source</td><td>IPCC 2006 guidelines</td></tr>
<tr><td>QA/QC procedure</td><td>N/A</td></tr>
<tr><td>Verification opinion</td><td>The verification team has checked applied GS methodology TPDDTEC/ Version 01.0 Section A6.3, the PP has applied the default value of 10% from IPCC for the physical leakage of the biogas digester. It is considered reasonable and traceable.</td></tr>
<tr><td rowspan="5">$EF_{awms,T}$</td><td>Description</td><td>Animal waste methane emission factor by average temperatures (kgCH_4 per animal per year for livestock type T in the project)</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Animal</th><th>$EF_{awms,T}$ climate zone temperate</th><th>$EF_{awms,T}$ climate zone warm</th></tr>
<tr><td>T</td><td>Kg CH_4/head/year</td><td>Kg CH_4/head/year</td></tr>
<tr><td>Pig</td><td>2.142</td><td>2.259</td></tr>
<tr><td>Buffalo</td><td>4.445</td><td>4.907</td></tr>
<tr><td>Dairy cow</td><td>N/A</td><td>5.065</td></tr>
<tr><td>Cattle</td><td>2.251</td><td>2.489</td></tr>
</table>
</td></tr>
<tr><td>Source</td><td>IPCC default values for the region Asia from volume 4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 10 (online: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)</td></tr>
<tr><td>QA/QC procedure</td><td>N/A</td></tr>
<tr><td>Verification opinion</td><td>As per the ER calculations spreadsheet /30/, $EF_{awms,T}$ are calculated by the weighted The verification team has checked Table 10.14 of Volume 4 Chapter 10 of IPCC for the methane emission factor by temperature of animal waste of livestock T. It is found consistent with respect to the corresponding temperature. The applied $EF_{awms,T}$ is considered reasonable and traceable.</td></tr>
<tr><td rowspan="4">PE_{dig}</td><td>Description</td><td>Methane emissions from digestate (tCO_2e/year from digestate storage)</td></tr>
<tr><td>Value</td><td>0.0861</td></tr>
<tr><td>Source</td><td>CMS monitoring survey.</td></tr>
<tr><td>QA/QC procedure</td><td>N/A</td></tr>
<tr><td>Verification opinion</td><td>The verification team considers that the calculation steps stated in the MR Section 3.224 are in compliance with the registered PDD. As per the PDD, the potential project emission from bio-slurry storage shall be</td></tr>
</table>

		estimated by using the IPCC tier 2 approach. By document reviews on relevant references i.e. biogas Handbook /23/, digestate management system survey database /28/, and ER calculations spreadsheet /30/, it is confirmed that all the applied values for the PE_{dig} are traceable with respect to the relevant references. The applied VS, B0, MCF values in the calculations are confirmed sourced from IPCC guidelines. The calculated PE from methane emissions from digestate per year per households is 0.0861tCO_2e/year/hh for the indicated monitoring period. The calculations are based on the weighting of the installed biodigester units in the zones respectively.

For Contributions To Sustainable Development

The sustainability monitoring is required by the GS and assessed according to the GS Toolkit Annex I. According to GS Toolkit 2.4.3, all non-neutral indicators must be monitored, and any indicators that were neutralized (i.e. originally scored negative, but later score neutral due to a suitable mitigation measure) must also be included. Moreover, any sensitive issue brought up during the stakeholder consultation must also be included. According to the BP, they have different platforms such as PBPD, technicians & masons, Biogas construction companies and BP website and training workshops, etc. for the biogas users to give their comments. It is advised by the PP /xii/ that there is no adverse comment or complaint received during the indicated monitoring period. The verification team interviewed the biodigester users during OSV, all the users /iv/ - /vii/ /xvii/ - /xx/ expressed that they were satisfied with performance of the biodigester and no negative comment was raised.

According to the sustainability monitoring plan in the registered GS Passport, 7 sustainability monitoring parameters are included. The verification team conducted the verification according to the requirements and parameters indicated in the monitoring plan.

<table>
<tr><td>Indicator</td><td colspan="2"></td></tr>
<tr><td rowspan="4">ID 1
Air Quality</td><td>Chosen Parameter</td><td colspan="2">Reduction in fuel (wood, agricultural residues, kerosene and coal) consumption (kg of fuel reduced/year)</td></tr>
<tr><td>Value</td><td colspan="2"><table>
<tr><th>Fuel</th><th>Baseline (kg/year/hh)</th><th>MPI (kg/year/hh)</th><th>Reduction (kg/year/hh)</th></tr>
<tr><td>Charcoal</td><td>73.9</td><td>8.6</td><td>65.3</td></tr>
<tr><td>Coal</td><td>112.9</td><td>45.0</td><td>67.9</td></tr>
<tr><td>Firewood</td><td>1846.5</td><td>879.9</td><td>966.6</td></tr>
<tr><td>Agricultural Residues</td><td>371.8</td><td>49.0</td><td>322.8</td></tr>
<tr><td>Kerosene</td><td>32.4</td><td>0.0</td><td>32.4</td></tr>
</table></td></tr>
<tr><td>Source</td><td colspan="2">Monitoring survey</td></tr>
<tr><td>Verification opinion</td><td colspan="2">By reviewing the CMS results /12/, the fuel consumptions for each type of fuel during the indicated monitoring period are confirmed. The verification team has cross-checked the selected sampled CMS survey form /18/ and confirmed that the data recorded in the forms is consistent with the CMS results. The average annual fuel consumption for both of the climate zone is calculated for each type of fuel. Hence the average annual fuel consumption per household per year during the indicated monitoring period is confirmed to be based on the CMS results. On the other hand the baseline fuel consumption is confirmed to be based on the data collected by BPD officer in the BPD monitoring database /10/. Furthermore, as discussed before, the CMS was conducted by a third party survey consultant by adopting oversampling approach. Therefore, the reduction in fuels consumption is confirmed to be traceable and reliable.

By considering that the air pollutants emitted from the combustion of the fuels could be decreased as reducing the amount of fuel remaining in use. The score</td></tr>
</table>

<table>
<tr><td></td><td></td><td>of ID 1 Air Quality should be positive.</td></tr>
<tr><td></td><td>Verified Score</td><td>+</td></tr>
<tr><td rowspan="5">ID 2
Soil condition</td><td>Chosen Parameter</td><td>Usage of bio-slurry</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Zone</th><th>Fertilizer</th><th>Don't use</th><th>Fish feed</th><th>Other</th></tr>
<tr><td>Temperate</td><td>75.2%</td><td>19.2%</td><td>5.6%</td><td>0.0%</td></tr>
<tr><td>Warm</td><td>54.5%</td><td>19.0%</td><td>24.8%</td><td>1.7%</td></tr>
</table>
</td></tr>
<tr><td>Source</td><td>Monitoring survey</td></tr>
<tr><td>Verification opinion</td><td>The verification team has checked the bio-slurry use survey results /36/, it is found that the values shown in the MR are consistent with the survey data. The bio-slurry use survey was conducted by AMDI and it is incorporated in the CMS survey form (i.e. as a sub-section of CMS). The selected sampled CMS survey forms /18/ are cross-checked, it is found that the data input for the bio-slurry use is consistent with that recorded in the survey forms. Furthermore, as discussed before, the CMS was conducted by a third party survey consultant by adopting oversampling approach. The verification team considers the values are reliable and traceable.

By considering that the nutrients in the bio-slurry can be applied to the soil directly and hence improves the soil conditions. The score of ID 2 Soil condition should be positive.</td></tr>
<tr><td>Verified Score</td><td>+</td></tr>
<tr><td rowspan="5">ID 3
Biodiversity</td><td>Chosen Parameter</td><td>Cumulative savings of wood</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Zone</th><th>Baseline (kg/hh/yr)</th><th>Current (kg/hh/yr)</th><th>wood reductions (kg/hh/yr)</th><th>Total project (ton wood/year)</th></tr>
<tr><td>Temperate</td><td>1840.4</td><td>971.7</td><td>868.7</td><td>61451</td></tr>
<tr><td>Warm</td><td>1798.3</td><td>527.6</td><td>1270.8</td><td>23428</td></tr>
<tr><td colspan="4">Cumulative savings in the project area</td><td>84879</td></tr>
</table>
</td></tr>
<tr><td>Source</td><td>Monitoring survey</td></tr>
<tr><td>Verification opinion</td><td>By reviewing the CMS results /12/, the consumption of wood during the indicated monitoring period are confirmed. The verification team has cross-checked the selected sampled CMS survey form /18/ and confirmed that the data recorded in the forms is consistent with the CMS results. On the other hand the baseline wood consumption is confirmed to be based on the data collected by BPD officer in the BPD monitoring database /10/. Therefore, the saving of wood consumption is confirmed to be traceable and reliable.

By considering that the amount of timber being cut down for fuel can be replaced by biogas. The score of ID 3 Biodiversity should be positive.</td></tr>
<tr><td>Verified Score</td><td>+</td></tr>
<tr><td rowspan="3">ID 4
Quality of employment</td><td>Chosen Parameter</td><td>Number of masons and technicians participating in the trainings</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Date</th><th>Cumulative number of masons</th><th>Cumulative number of technicians</th></tr>
<tr><td>28 June 2010-31 December 2010</td><td>160</td><td>77</td></tr>
<tr><td>2011</td><td>85</td><td>89</td></tr>
<tr><td>Total MPI</td><td>245</td><td>166</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td rowspan="3"></td><td>Source</td><td>Training reports of the trainings</td></tr>
<tr><td>Verification opinion</td><td>According to the List of trained people 2010 and 2011 /27.1/ /27.2/, it is confirmed that the cumulative number of trained masons and technician during the indicated monitoring period were 245 and 166 respectively. The verification team confirmed to be reliable and traceable.

By considering that the trainings can improve the skills of the mason and technicians. The score of ID 4 Quality of employment should be positive.</td></tr>
<tr><td>Verified Score</td><td>+</td></tr>
<tr><td rowspan="4">ID 5 Livelihood of the poor</td><td>Chosen Parameter</td><td>Number of people having access to an improved waste management system</td></tr>
<tr><td>Value</td><td>436,962 persons</td></tr>
<tr><td>Source</td><td>Monitoring survey</td></tr>
<tr><td>Verification opinion</td><td>As assessed in Section 3.3 for $N_{p,y}$, the no. of biodigester built since 01/01/2007 to 31/12/2011 due to the project activity is confirmed as 89,176 units. According to the BPD monitoring database /10/, the average household size is 4.9 persons. Therefore, the total no. of people having accessed to an improved waste management system is calculated as 89,176 × 4.9 = 436,962 persons. It is confirmed as traceable and reliable.

By considering that the household with biodigester can enjoyed various benefits namely improved air quality, nourished soil conditions, sustainable fuel source, etc. The score of ID 5 Livelihood of the poor should be positive.</td></tr>
<tr><td>Verified Score</td><td>+</td></tr>
<tr><td rowspan="4">ID 6 Access to affordable and clean energy services</td><td>Chosen Parameter</td><td>Total amount of energy replaced by biogas</td></tr>
<tr><td>Value</td><td>
<table>
<tr><th>Fuel</th><th>Baseline (MJ/year/hh)</th><th>MPI (MJ/year/hh)</th><th>MJ displaced by biogas (MJ/year/hh)</th></tr>
<tr><td>LPG</td><td>664</td><td>413</td><td>251</td></tr>
<tr><td>Charcoal</td><td>2471</td><td>295</td><td>2176</td></tr>
<tr><td>Coal</td><td>11474</td><td>1458</td><td>10016</td></tr>
<tr><td>Firewood</td><td>28711</td><td>15159</td><td>13552</td></tr>
<tr><td>Agriculture residues</td><td>7584</td><td>384</td><td>7200</td></tr>
<tr><td>Kerosene</td><td>363</td><td>0</td><td>36</td></tr>
<tr><td>Total</td><td>50941</td><td>17709</td><td>33232</td></tr>
</table>
</td></tr>
<tr><td>Source</td><td>Data on fuel use is collected during the application for a biogas unit using Form 03 and subsequently multiplied with the NCV that is used in the PDD of the respective fuels. The remaining fuel use is obtained using the carbon monitoring survey and multiplied with the NCV that is used in the PDD for the respective fuels.</td></tr>
<tr><td>Verification opinion</td><td>As discussed in ID1, the fuel consumptions for each type of fuel (including LPG) during the indicated monitoring period are confirmed from CMS survey results /12/. Also the baseline fuel consumption is confirmed to be based on the data collected by BPD officer in the BPD monitoring database /10/.
As discussed in the above Section 3.3, the applied NCV values of the fuels are confirmed to be consistent with the default value of IPCC guidelines. It is confirmed that the amount of energy replaced by biogas is calculated by multiplying the fuel replaced by the biogas with the respective NCV of the fuel. Total amount of energy replaced = 33,232 MJ/year /hh
Therefore, the amount of energy replaced by biogas is confirmed to be traceable and reliable.

By considering that the biogas as a clean and sustainable energy. The score of</td></tr>
</table>

		ID 6 Access to affordable and clean services should be positive.
	Verified Score	+
ID 7 Technology transfer and technological self-reliance	Chosen Parameter	Number of masons trained in the construction of KT1 or KT2 biodigesters
	Value	245
	Source	Training reports of the trainings
	Verification opinion	According to the List of trained people 2010 and 2011 /27.1/ /27.2/, it is confirmed that the cumulative number of trained masons during the indicated monitoring period were 245. The training reports 2010 /26.2/ /26.3/ and 2011 /26.1/ are checked and confirmed that the masons were trained for the construction of biodigester model KT and KT2. The verification team confirmed the no. of mason trained in the construction of KT1 and KT2 biodigester is reliable and traceable. By considering that the trained masons can acquire foreign biogas technology. The score of ID 7 Technology transfer and technological self-reliance should be positive.
	Verified Score	+

According to Gold Standard Toolkit Section 2.4.3, "*all mitigation measures put in place to prevent violation or the risk of violating a safeguarding principle of the 'Do No Harm' Assessment*" shall be monitored. The verification team checked 'Do No Harm' Assessment" of the registered GS Passport, and found no mitigation measures for the safeguarding principles are required. Thus monitoring is not necessary for the safeguarding principles.

3.3.2 Monitoring responsibility

The verification team checked the organization chart for the BP for the monitoring team of the project /37/. It includes the project coordinator, technical manager, technical supervisors and independent CDM consultant. Moreover, the monitoring was carried out in form of biogas user survey conducted by third party surveying consultant (i.e. AMDI).

The verification team checked the biogas user survey in form of questionnaires which was conducted in the period from April to May 2012. The verification team also interviewed with the PP /xii/ and the survey team leader /viii/ and the team members /ix/ /x/. The survey team was selected by the BP since they are the independent technical expert with experience in conducting surveys in Vietnam, agricultural knowledge and statistical survey. The selection of survey consultant was based on the tendering process, in order to ensure that the survey consultant is capable to conducting the survey questionnaires. According to Annex III of the monitoring report /8.2/, the survey coordinator also conducted the specified trainings for the surveyors on 26/03/2012 and 30/03/2012. The verification team can confirm the same training arrangements with the interviewed surveyor /viii/ /ix/ /x/ during OSV.

There were totally 10 surveyors forming of 2 teams, each team with 1 supervisor and 4 survey members. The training records for the surveyors were attached in the MR as Annex III. The content of the records are confirmed by interviewing with the survey team /xiii/ /ix/ /x/ during OSV. The training is considered to ensure that the trained personnel in the survey team have a clear understanding of the survey form design and the questions, also the knowledge about the regional customs, local farming practices, technical design of the biodigester system, amount and type of fuel used and the way for households to handle the animal waste. This is considered in compliance with the requirements in the applied GS methodology Section III.

It is confirmed that each team was responsible in different provinces according to the geographical locations of the selected biodigesters from the survey. It is stated by the team leader /viii/ that about 4-5 biodigesters were surveyed each day, and this is also consistent with the estimation in the GS methodology Section III. The verification team checked the CMS survey form /18/, it includes lots of issues for the practices and operation of

biodigesters for the participated households. The surveyors also checked if the biodigesters are still operating according to the BP standards.

Thus the verification team considers that the PP complies all the requirements in the applied GS methodology Section III for the Quality Assurance of Questionnaire distribution and collection.

3.3.3 Accuracy of equipment

During the survey questionnaire /18/, only the measurement of amount of fuel consumption is required. The survey teams calibrated the equipment, i.e. newton scale by a calibrated and certified weigh stone of 1 kg in daily basis. As per the interview with the survey team /viii/ /ix/ /x/, in order to ensure the measurement is reliable the weighing scales were calibrated every day before starting the survey. The verification team has checked the calibration report /22.1/ issued by AMDI, it clearly indicated the procedures to conduct the calibration procedures. It also states that every newton scale should be set zero after each survey with a household.

The calibration certificates /22.2/ of the weigh stones issued by a local independent testing entity i.e. QUATEST1, is checked by the verification team. The certificate is confirmed to be valid. The verification team also checked the technical specification of the newton scales from the official websites[9]. The max capacity of the scale is 5kg and the minimum is 0.5kg, the accuracy is ± 1%. The newton scales could indicate the reading of 1kg for the calibrated weigh stones. Thus it is reasonable to consider that the newton scales were accurate for conducting the measurement of fuel consumption by the surveyors.

Thus it is considered that accuracy of the equipment for the measurement of amount of fuel consumption can be ensured to be reliable.

3.3.4 Deviation from and Revision of the registered monitoring plan

The verification team confirms that there is no revision of the monitoring plan in the registered PDD /4.2/. The same monitoring approach as per the monitoring plan was implemented in the 1st monitoring period. The monitoring plan was approved by the Gold Standard. Thus the current estimation of emission reductions during the indicated monitoring from 28/06/2010 to 31/12/2011 is confirmed to be correctly applied.

3.4 Assessment of data and calculation of greenhouse gas emission reductions

During the OSV, the verification team checked the implementation process and monitoring plan via document reviews and interviews with project participants and survey consultant and team member. As the emission reductions are based on the BPD monitoring database and the usage survey results, the quality assurance were carried out by the related BPD officers and surveyors. The survey was conducted by independent experienced survey consultant team while the BPD monitoring database was maintained by comprehensive QA/QC procedures on the data management. Moreover, the verification team can also confirm the quality control of the monitoring process as indicated in the monitoring report. Thus it is considered that the emission reductions can be calculated in accordance with the steps in the registered PDD /4.2/ and the subsequent monitoring report /8.2/.

Quality Control of monitoring results

According to the applied GS methodology, "Technologies and Practices to Displace Decentralized Thermal Energy Consumption", Section III, the quality control shall be transparent and traceable which allow the third party auditor to check. The related references (in this case, the survey questionnaires/ records) shall be archived completely so that he auditor is able to cross-check the data of the survey results. As discussed in the previous section, several households were randomly selected from the project sample group by the verification team. The practices of animal waste treatment, project consumption of fossil fuel, application of bio-slurry and use of biodigester, biogas stove and lamps were confirmed by interviewing the biodigester users.

[9] http://nhonhoascale.com.vn/index.php?option=com_product&task=detail&cat=15&subcat=74&id=119

In order to confirm the data in the survey questionnaires were reliable, the sampled CMS survey questionnaires /18/ were inspected. The verification team cross-checks the figures provided in the CMS survey results /12/ with the data provide by the respondents in the questionnaires. It is found that the data in the questionnaires are consistent with the survey results /12/. The Biogas usage survey result /11/ was cross-checked with the Form 02 /13/ for the baseline information. It is found consistent between the results and the respective forms. Furthermore, the data recorded in the BPD monitoring database is also cross-checked with relevant records i.e. Form 03 /14/, Form 07 /16/, and Form 09 /17/ for the visited 8 households. It is also found consistent between the database and the records.

According to Section 3.3, the verification team considers that all parameters are used correctly in the calculations, all results are transparent, traceable and verifiable, all assumptions are described and based on verifiable evidence and calculations are done in accordance with the calculation approach in the registered PDD /4.2/.

Verification of Baseline emissions

Ex-post Baseline emissions from thermal energy demand

The NBP applies the data from the baseline study indicated in the registered PDD /4.2/. It is noted that once the biodigester is constructed for the households, the baseline fuel consumption can no longer be monitored. Thus only the data from baseline study can be applied for baseline emission from thermal energy demand. According to Annex III of the PDD, the PP has conducted a study on the baseline information on the fraction of use of non-renewable Biomass for the project activity. The f_{NRB} is determined as 67% in accordance with which has been approved by GS.

In accordance with the applied GS methodology and the registered PDD, the verification team checked the calculation steps and the input values in the formulae in the NBP excel worksheet "BE fuel" /30/ and confirmed the calculation is correctly indicated in the monitoring report /8.2/. The baseline emissions factors from thermal energy demand per household per year are confirmed to be 5.180 and 3.620 tCO_2e/household/year for temperate and warm zone respectively. The average baseline emission factor is confirmed to be 4.86 tCO_2e/household/year.

Ex-post Baseline emissions from Animal Waste Management System (AWMS)

According to the applied GS methodology, the PP can apply the emission factor of animal waste methane emission *ex-ante*. The verification team checked that emission factors of animal applied in the calculation are consistent with the values for all the animals (cow, pig and buffalo) indicated in the registered PDD /4.2/. The PP also applies the surveyed data of the numbers of animals in the calculation of *ex-post* baseline emissions from Animal Waste Management System (AWMS), in accordance with the applied GS methodology.

The verification has checked the CMS survey forms /18/ and considers they are consistent with the values in the CMS survey results /12/ for $N_{(T),h}$. The verification team also checked the calculation steps and the input values in the formulae in the BP excel worksheet "BE & PE AWMS" /30/ and confirmed the calculation is correctly indicated in the monitoring report. The values applied in the calculations are consistent with the CMS survey result. The baseline emissions from Animal Waste Management System per household per year are confirmed to be 1.48 and 2.26 tCO_2e/household/year for temperate and warm zone respectively.

Verification of Project emissions

Ex-post Project emissions from thermal energy demand

According to the applied GS methodology, the PP can apply the ex-ante values of NCV and emission factors of fuels in the registered PDD /4.2/. The verification team checked that NCV and emission factors applied in the calculation are consistent with the values for all fuels (firewood, coal, charcoal, LPG, agricultural residue and kerosene) indicated in the registered PDD (IPCC 2006 default values Volume 2 Chapter 1). The PP also applies the surveyed data of the fossil fuel consumption in the calculation of *ex-post* project emissions from thermal energy demand, in accordance to the applied GS methodology.

The verification has checked the CMS survey form /18/ and considers they are consistent with the values in the CSM survey result /12/. The verification team also checked the calculation steps and the input values in the formulae in the worksheet "PE fuel" of ER calculation spreadsheet /30/ and confirmed the calculation is in line with the registered PDD and the results are consistent with the summary table in the monitoring report. Thus the project emissions from thermal energy demand are confirmed to be 1.897 and 1.079 tCO_2e/household/year respectively for the temperate and warm zone. The average PE for the project activity is confirmed to be 1.73 tCO_2e/household/year.

Ex-post Project emissions from Animal Waste Management System (AWMS)

According to the applied GS methodology, the PP can apply the emission factor of animal waste methane emission ex-ante. In addition, the physical leakage of the biodigesters and the combustion efficiency of the biogas stove are also default in the applied GS methodology. The verification team checked the calculations for determining the emission factors of all the animals (pig, buffalo, dairy cow and cattle) are in compliance with that indicated in the registered PDD /4.2/ which uses IPCC Tier 2 approach. The MCF of the various AWMS are calculated based on the IPCC default values with the multiplication with the proportion of the AWMS. The proportion of AWMS is confirmed to be consistent with the CMS survey result /12/. The PP also applies the survey data of the numbers of animals, which can be confirmed form the CMS survey results /12/, in the calculation of *ex-post* project emissions from AWMS, it is in accordance with the applied GS methodology.

The verification has checked the survey questionnaires /18/ and considers they are consistent with the values in the CMS survey results /12/. The verification team also checked the calculation steps and the input values in the formulae in the worksheet "BE&PE AWMS" of ER calculation spreadsheet /30/ and confirmed the calculation is correctly indicated in the monitoring report. The project emissions from AWMS are confirmed to be 0.066and 0.084 tCO_2e/household/year for temperate and warm zone respectively. And the average project emission 0.0693 tCO_2e/household/year.

Ex-post Project emissions from the storage of bio-slurry

According to the registered PDD /4.2/, the project emission from the storage of bio-slurry should be determined by adopting IPCC Tier 2 approach. It is confirmed from the applied methodology and 2006 IPCC Guidelines for National Greenhouse Gas Inventories /9/, that there is no specific guidelines on the determination of the project emissions from bio-slurry storage. According to the monitoring report /8.2/, a 5-step calculation approach is proposed. The assessments are detailed as follows:

1. Estimation of the total amount of VS entering the biodigester

Animal T	VS excretion **kgVS/hd/day**	Head/average biodigester	Total amount of VS excreted **kgVS.day^{-1}**	Share fed into biodigester	Total VS entering the biodigester **kgVS.day^{-1}**
	A	**B**	AxB =C	D	CxD

From the above calculations, the total amount of VS of animal T entering the biodigester is calculated by (VS excretion of animal T (A) × average head of animal T per biodigester (B)) × proportion of manure from animal T being fed into biodigester (D). The source of reference for the value of (A) is IPCC default value, while (B) and (D) are sourced from the CMS survey results /12/. It is confirmed that the applied values are consistent with respect to the correlated sources of reference. The total amount of VS entering the average biodigester is 4.22 and 5.18 kgVS/day in the climate zone temperate and warm respectively. The verification team considers the estimations are reasonable.

2. Assessment of remaining VS content of digestate

Zone	(A) Total VS entering the	Digester efficiency	(B) Total VS destroyed in the	(A) - (B) Total VS

	biodigester kgVS.day^{-1}		biodigester kgVS.day^{-1}	remaining in bio-slurrykgVS.day^{-1}
Temperate	4.22	55%	2.32	1.90
Warm	5.18	55%	2.85	2.33

According to the monitoring report, with referenced with *biogas Handbook (2008)* /23/, the digestion efficiency of agricultural biogas plants is typically in the range 50-60%[10]. This means that digestate contains 40-50% of the initial organic dry matter, primarily as fibers. Therefore, it is assumed that the 55% of the initial VS content would be destroyed by the digester. The assumption is deemed reasonable.

3. Assessment of methane potential of bio-slurry

The MR applied the default value of fraction of the original methane potential as 20% according to EB65 Annex 32. The default value (i.e. $F_{ww,cH4,default}$) is used to calculate $B_{0,dig,T}$ by multiplying the with $B_{o,T.}$

$$B_{o,dig,T} = F_{ww,CH4,default} \times B_{0,T}$$

Where:

$B_{o,dig,T}$	=	Methane potential of digestate from animal type T manure
$F_{ww,CH4,}$	=	Default factor representing the remaining CH4 production capacity of liquid digestate
$B_{0,T}$	=	Methane potential of manure from animal type T

A weighted average methane potential of digestate is calculated by using the surveyed average no. of animal T per digesters for each zone. The results are 0.057 and 0.056 m^3CH_4/kgVS for temperate and warm zone respectively. The verification team considered the estimation is deemed to be reasonable.

4. MCF of the digestate management systems (DMS)

As per the monitoring report, it calculates the MCF of digestate management system by multiplying the default MCF of the DMS with respect to the temperature with the proportion of DMS collected from the CMS survey. The verification team confirms the applied DMS are consistent with the DMS survey results /28/, which is part of the CMS survey. Therefore, the weighted average MCF for the DMS for temperate and warm zone are 15.27% and 13.42% respectively. The verification team considers the calculation is deemed to be reasonable.

5. Calculation of PE_{dig} using the information obtained in the previous steps

The MR adopts IPCC Tier equation to calculate the emissions from the digestate. The applied parameters are replaced with that determined in the above 4 steps.

Zone	Total VS destroyed in the biodigester kgVS.day^{-1}	$B_{0,dig}$ (m^3CH4/kgVS)	∑DMSxMCF	D_{CH4} (kg/m^3CH_4)	Year (day)	Digester emissions (tCO_2/year/hh)
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Temperate	1.90	0.0571	0.153	0.67	365	0.085
Warm	2.331	0.056	0.134	0.67	365	0.090

[10] P55 http://www.lemvigbiogas.com/BiogasHandbook.pdf

(iv) = (i) × (ii) × (iii) × (iv) × (v)

Hence the average project emissions from the storage of the bioslurry is calculated as 0.0861tCO_2e/year/hh. The verification team considers that the determination of the project emissions from bio-slurry is in deemed to be reasonable in compliance with IPCC Tier 2 approach.

Verification of Emission Reductions (ER_y)

According to the above results, the total baseline emissions are 4.86 + 1.64 = 6.50 tCO_2e/household/year, while the total project emissions are 1.73 + 0.07 + 0.09 = 1.88 tCO_2e/household/year. Therefore the total emission reductions for both thermal energy demand and AWMS are verified as:

Total Baseline Emissions - Total Project Emissions
= 6.50 – 1.88

= 4.62 tCO_2e/household/year

Emission source	BE (tCO_{2e}/h/year)	PE (tCO_{2e}/h/year)	ER (tCO_{2e}/h/year)
Fuel use	4.86	1.73	3.13
AWMS	1.64	0.07[11]	1.57
Digestate	0	0.09	-0.11
Sum	**6.50**	**1.88**[12]	**4.62**

Effective usage rate

As confirmed in Section 3.3.1 above, the average biodigester (all age group) being used in operation during the indicated monitoring period is determined based on the result of US. It is confirmed that 96.574% of the installed biodigester are in operation. Among these operating biodigesters, some of them had been emptied for the purpose of cleaning the sediment. The stopping duration was not accounted for the ER calculation. An effective usage rate of 96.13% is calculated by multiplying "share of units being used" with "share of unit being used in operation". This effective usage rate is confirmed being applied for the ER calculations for the MPI. It is considered conservative, as the interviewed biogas users had expressed that they would clean the biodigester once per a few years, while some said they didn't clean it so far.

Conclusion

The verification team checked the calculation in the worksheet "ER database" of the ER calculations spreadsheet /30/, the emission reductions are correctly calculated as monthly basis, in which the emission reductions were only accounted starting from one month after the biodigester built. The verification team interviewed with the randomly selected households /iv/ /v/ /vi/ /vii/ /xvii/ /xviii/ /xix/ /xx/, they also stated that the biodigesters could be worked after 1-2 weeks after construction. Actually after the biodigesters were built, the households could feed the animal waste to the biodigesters immediately. It usually takes about 1-2 weeks for anaerobic digestion in the digesters, so as to supply adequate biogas for cooking and lighting purposes. Thus the emission reductions can be started to be accounted one month from the construction accomplishment. The

[11] It is round up from 0.069tCO2e/h/year to 0.07tCO2e/h/year.
[12] Due to the rounding up issue of the PE_{AWMS} and PE_{dig}, it is confirmed that the sum of PE should be 1.88tCO2e/h/year but not 1.89tCO2e/h/year which is calculated from the PE_{fuel}, PE_{AWMS} and $PE_{digestate}$. (i.e. 1.73 + 0.07 +0.09). The verification team confirms it as consistent with the ER spreadsheet.

verification team considers it as conservative for the emission reductions calculations. According to the number of biodigester cumulatively built for each month as indicated in the ER calculation spreadsheet /30/, the total number of biodigesters built up to 31/12/2011 is 89,716 units.

By checking the BP excel worksheet, the total emission reductions (ER_y) during the indicated monitoring period from 28/06/2010 to 31/12/2011 are verified to be 510,952 tCO_2e.

Assessment of the uncertainty level of the data for calculating the emission reductions

The data for the calculation of emission reductions was obtained from survey questionnaires /13/ /18/. The survey questionnaires were conducted by independent experienced consultant for statistics with related agricultural knowledge /vii/ /viii/ /ix/ and also by the BPD officers. The verification team has inspected the sampled survey forms /13/ /18/ and confirms the data is consistent with the respective survey result /11/ /12/. The survey results are consistently applied in the calculation of emission reductions /30/.

For the samples selected, the survey is designated to over-sample the sample sized. It can account for missing values and non-responsiveness. The sample size is based on a sample with a confidence level of 90% and a level of precision of 10%, which is in compliance with the requirement of the registered PDD, the applied GS methodology as well as the referenced Sampling Standard for both the Usage Survey (US) and Carbon monitoring survey (CMS). The sample size of US is increased to 175 households while that of CMS is 340 households. The verification team considers that this is conservative to have over-sampling. All the survey forms for US and CMS were inspected by the verification team during the on-site verification and subsequent document submission. All of the data recorded in the inspected survey forms are consistent with that of the survey results /11/ /12/. Thus the verification team considers the survey results were accurately recorded and hence reliable.

3.4.1 Assessment of actual emission reductions with the estimate emission reductions in PDD

According to the registered PDD /4/, the estimation of emission reductions is in annual basis. The emission reductions greatly depends on the number of biodigester built in the project activity. It is estimated in the registered PDD that up to 31/12/2011, totally 89,176 units would be installed, while actually 89,176 units of biodigesters were built. Moreover, it is expected that about 100% of households still using the biodigesters. According to the usage survey result /11/, only 96.186% of households were still using the biodigesters in the indicated monitoring period. Besides, the *ex-post* calculated average annual emission factors per biodigester is 4.60 tCO_2e per digester which is lower than 6.34 tCO_2e per digester estimated in the registered PDD.

Thus the actual emission reductions (i.e. 510,952tCO_2e) are lower than the estimated emission reductions in the registered PDD (i.e. 736,760tCO_2e, from 28/06/2010 to 31/12/2011 including both days (552 days) based on the phased emission reductions as indicated in the registered PDD (Version 3.1, dated 24/09/2012). The verification team considers that this is also acceptable and understandable as the survey results are confirmed to be reliable.

3.5 Assessment of contribution to sustainable development

In accordance with the requirement of the GS Toolkit (version 2.1, section 4.1), the monitored sustainability indicators are also scored in the monitoring report by comparing with the baseline sustainable indicator situations, which is also confirmed by the verification team in the discussion in section 3.3.1 above.

The project has applied the sustainable development assessment matrix as required by the Gold Standard. The total score obtained is +7 based on the verification results in the indicated monitoring period, while other indicators are neutral. The scoring in each section is summarized below:

- Environment scores a subtotal of +3 (from positive impacts of air quality, soil condition and biodiversity);
- Social development scores a subtotal of +3 (from positive impacts of quality of employment, livelihood of the poor and access to affordable and clean energy services);
- Economic and technological development scores a subtotal of +1 (from positive impact of technology transfer and technological self-reliance).

Thus the project is eligible under the Gold Standard as per GS Toolkit Section 2.4.2, in which the project activity contributes positively to all three categories (Environment, Social development and Economic and technological development).

3.6 Issues remaining from the previous verification period

A FAR01 is mentioned in the validation report that requires the DOE to confirm if any double counting of the biogas digester households between the VGS and potential subsequent CPA in the CDM PoA under the UNFCCC. The assessment is provided in Section 3.2 of this verification report. It is confirmed that the project does not involve double counting of the biogas digester households between the VGS and other related carbon scheme such as subsequent CPA in the CDM PoA under the UNFCCC at the time of issuance request for the indicated monitoring period.

3.7 Forward Action Request

During the verification, there are some deviations from the monitoring plan stipulated in the registered PDD. By reviewing the GS Issuance Review /39/ for the verification of the 1st monitoring period in the 1st crediting period, it is confirmed that all the deviations are accepted by the GS. GS has requested the PP to implement the modified monitoring plan in the forth-coming (the 2nd monitoring period and on-ward) verifications. Based on the GS approval on the modified monitoring plan, the DOE for conducting the follow-up verifications is requested to consider the changes in the monitoring plan as described in GS Issuance Review for the 1st Verification or related GS approved document (e.g. revised PDD (if any)). Four FARs are raised as follows:

FAR02
Please ensure the trained masons and technicians were chosen in line with the defined rules in the monitoring of SD parameter of **Quality of Employment** as requested by GS during the 1st verification.

FAR03
Please ensure the digestate management system implemented by the biogas users in project scenario is monitored and the project emissions is taken account for the methane emissions from digestate as requested by GS during the 1st verification.

FAR04
Please ensure the GS approved emission factor of charcoal production is applied as requested by GS during the 1st verification.

FAR05
Please ensure BFT is conducted once for each crediting period and PFT is carried out bi-annually for the project activity as approved by GS during the 1st verification referring to Annex 5 of the applied GS methodology.

Appendix A

Verification protocol

For Gold Standard VER Project

Biogas Program for Animal Husbandry Sector of Vietnam

in Vietnam

to Report No. 01 996 91050 66812-GS 1st Veri

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
1. Implementation					
1.1 Have all physical features proposed in the registered PDD been implemented at the project site?	/4/ /7/	DR OSV	The physical features for a particular biodigester plant proposed in the PDD are the construction of biogas digester and the associated appliances (including the gas pipe, main valves, stove/gas lamps). During on-site visit, the physical features of the project activity (i.e. biodigester and associated gas pipe and biogas stove(or with biogas lamp)) are checked for totally 8 no. of household participants (HP). According to the PDD, the technology used in this project activity is defined in to 2 plant types, namely KT.1 and KT.2. As per the commissioning reports (Form 9) of the 8 inspected HP. They clearly indicate that the pant types of the constructed biogas digester are either KT.1 or KT.2. And referring to the provided database of the program, it has recorded the technology used for the HP. However, it is found that some of the HP have installed plant types other than KT.1 and KT.2, for instance “KT 2A”, “KT 2B”. **CL01** is raised. **CL01** As per the database of the program, the plant types constructed for the HPs are of 2 types namely KT.1, KT.2A and KT.2B. Please clarify if there is any deviation from the PDD in the technology design for the constructed plant types KT.2A and KT.2B for the HPs.	~~CL01~~	OK. (Refer to Table 2 for details)

[13] MoV = Means of Verification, DR = Document Review, I = Interview, www = internet search.

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
1.2 Has the project activity been operated in accordance with the project scenario described in the registered PDD and relevant guidance? Reference: <http://cdm.unfccc.int/EB/033/eb33rep.pdf>, §75	/4/ /6/ /7/	DR OSV	The project scenario stated in the PDD is the installation of the biogas digesters for the HPs. All the visited HHs had installed the biogas digesters in accordance with the technologies stated in the PDD. It is reported in the monitoring report that the total no. of the plant installed up to the 31/12/2011 was 89,176 since the project start date (i.e. 13/06/2006). According to monitoring report, during the monitoring period (i.e. 28/06/2010 – 31/12/2011), the no. of the operating system is calculated as 79,747 based on the Usage Survey (US) results. For the detailed assessment of the US, please refer to **4.4** of this protocol below.	OK	OK
1.3 If the project activity is implemented on a number of different locations, has the Monitoring report provided the verifiable starting dates for each site?	/4/ /6/ /7/ /11/	DR	According the monitoring report (MR), for monitoring period 1 the project activity is a program which has built 89,176 unit of biogas digesters (plant) for households in 47 provinces of Vietnam since 13/06/2006. The project commissioning date of each plant is different. The project commissioning dates of the plants are recorded in the monitoring database, which is verified by means of cross-checking with Form 7 of the inspected HPs during OSV. One of the plants (i.e. HYE-PC-DD-045) is not consistent with the provided database for project commissioning date. Please clarify the inconsistency. **CL02** One of the plants (i.e. HYE-PC-DD-045) is not consistent with the provided database for project commissioning date. The date in Form 7 is 09/11/2008, but the date recorded in the database is 01/11/2008. Please clarify the inconsistency.	~~CL02~~	OK. (Refer to Table 2 for details)

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
1.4 Is the start date of monitoring period consistent?	/6/ /7/	DR	Yes. The start date of the monitoring period 1(i.e. 28/06/2010) is consistent in all the related documents namely MR and monitoring database.	OK	OK
1.5 Is the monitoring report consistently filled with respect to all sections as required by its guideline of filling the monitoring report?	/2/ /4/ /6/	DR	Since there is no template or guideline in writing the monitoring report, the monitoring report is written in PP's own format. The MR contains 4 main parts: 1. Introduction; 2. Methodology; 3. Results; 4. Data quality control and assurance. However, the MR does not include a complete list of monitored parameters. The PP is requested to clearly demonstrate that all the monitored parameters are implemented as per the registered PDD. **CAR01** is raised. Besides, some parts are considered not clear. **CL03** is raised: **CAR01** The *ex-post* monitored and *ex-ante* determined parameters are not completely and clearly shown in the MR. Please revise the MR to clearly show all the applied parameters and their correlated values for a comprehensive demonstration of the ER calculations. **CL03** Regarding to the information shown in the monitoring report, please response to the followings: 1. Please clearly describe the technical description (i.e. details of the applied technology) of the project activity with reference to the PDD. 2. Please clearly describe the monitoring system with respect to the sustainable indicators listed in the PDD.	~~CAR01~~ ~~CL03~~	OK. (Refer to Table 2 for details)

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
1.6 Does the CER's obtained for the monitoring period within the limit of estimate in the registered PDD? Is the claimed CER's justifiable?	/4/ /7/	DR	Yes. As per the sheet "ER_database" of ER spreadsheet applied for registration, the *ex-ante* estimated ER for the period of 28/06/2010 – 31/12/2011 is calculated as 685,973tCO_2e.The ER for the monitoring period is determined as 649,169tCO_2e, which is smaller than the estimated ER from the PDD for the same period stated in the PDD.	OK	OK
1.7 Is the monitoring system provided in line diagrams showing all relevant monitoring points?	/2/ /4/ /6/	DR	Not applicable.	N/A	N/A
2. Monitoring plan and methodology					
2.1 Is the monitoring plan established in accordance with the monitoring methodology?	/3/ /4/ /14/	DR	Yes. According to the PDD, the monitoring plan consists of A. Quality control monitoring; B. Carbon monitoring survey (CMS); and C. Usage Survey. It is confirmed that the monitoring plan is in line with the applied methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption/ version 1.0".	OK.	OK
2.2 In case the implemented monitoring plan defers from the monitoring methodology, has any requests for revision to or deviation from the monitoring methodology been officially communicated to the CDM EB? Reference: <http://cdm.unfccc.int/EB/033/eb33rep.pdf>, §84, §58	/3/ /4/ /14/	DR	Not applicable.	OK.	OK
2.2.1 Have the above changes to the monitoring plan been approved by the CDM EB?	/3/ /4/ /14/	DR	Not applicable.	OK.	OK

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
3. Monitoring and the monitoring plan					
3.1 Is monitoring established in full compliance with the monitoring plan, contained in the registered PDD (or new monitoring plan approved by the CDM EB)?	/3/ /4/ /14/	DR OSV	It is not yet confirmed. Since the MR does not contained a full description on the monitoring system (Refer to **CL03**). (Assessment is made based on the pre-registered PDD)	~~CL03~~	OK. (Refer to Table 2 for details)
3.2 Are all baseline emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	/3/ /4/ /6/	DR OSV	The MR has clearly list out the implementation details of the CMS conducted for the proposed project, as well as the Quality control monitoring. According to the PDD, monitored parameters are listed in Section 7.1. However, similar table cannot be found in the MR. Please revise the MR to include a table to list out all the monitored parameters and indicate their monitored values respectively. Therefore, the verification team cannot yet confirm whether all the monitored parameters are implemented in accordance with the monitoring plan in the PDD. Refer to **CL03**.	~~CL03~~	OK. (Refer to Table 2 for details)

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
3.2.1 Was the monitoring equipment for baseline emission parameters controlled and monitoring results recorded as per approved frequency?	/6/	DR OSV	As per the interview with the baseline monitoring survey team (i.e. AMDI), the CMS was conducted with the aid of newton balances for the measurement of the non-renewable biomass used for cooking. It is advised by the team leader of the survey team that the newton balances were calibrated every day before conducting the on-site interview. For the assessment of accuracy of the measurement equipment. Please provide the technical specification of the balances and clarify how the calibrations were carried out with relevant substantiation. **CL04** is raised. **CL04** Regarding the accuracy of the newton balances used during CMS, please clarify the technical specifications of the balances and describe how the calibrations were carried out with relevant substantiation.	~~CL04~~	OK. (Refer to Table 2 for details)
3.2.2 Was the monitoring equipment for baseline emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	/6/	DR OSV	The QA/QC procedures in the PDD have not included the measurement equipment used in CMS. Please refer to **CL04** for the assessment on the QA/QC procedure for the used equipment. The MR has described the QA/QC procedures for CMS reporting and data storage arrangement, which is consistent with that of the PDD.	~~CL04~~	OK. (Refer to Table 2 for details)
3.3 Are all project emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	/6/ /9/	DR OSV	Yes. According to the PDD, the project emissions include 1. Fuel use; 2. Emissions from bio-digester. The MR has been checked that it includes all the project emissions parameters monitored in accordance with monitoring plan as well as the monitoring methodology.	OK	OK

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
3.3.1 Was the monitoring equipment for project emission parameters controlled and monitoring results recorded as per approved frequency?	/4 / /6/ /9/	DR OSV	The parameters were monitored by the conducting CMS survey. According to the MR, the survey was conducted in Apr - May 2012, when was after the end of the monitoring period (i.e. 30/12/2011). By referring to the monitored parameters stated in the PDD (Section B.7.2), the monitoring frequency of the $MS_{(T,S,K)}$, $MS_{(P,S,K)}$, $N_{(T)}$ shall be once a year (i.e. annually). Since the monitoring period I started from 28/06/2010 – 30/12/2011 (i.e. 1.5years), the PP is requested to clarify whether the monitoring of the mentioned parameters are implemented in accordance with the monitoring plan. **CL05** is raised. **CL05** Please clarify whether the monitoring of parameters $MS_{(T,S,K)}$, $MS_{(P,S,K)}$, $N_{(T)}$ are implemented in accordance with the monitoring plan. Please also provide evidence for the confirmation of the CMS survey date.	~~CL05~~	OK. (Refer to Table 2 for details)

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
3.3.2 Was the monitoring equipment for project emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	/3/ /4/	DR OSV	They were monitored by conducting a survey (i.e. CMS) which was contracted out to a third party (i.e. AMDI). Newton balance is used for the determination of the fuel used in project scenario during the survey. Please refer to **CL04**. According to the PDD, the contracted party will develop an inception report, draft report and final report which are all inspected by BPD before the party can continue with the next stages. The final stage is the workshop, and final CMS report is produced. Please demonstrate, by providing related references at the each stage of the CMS survey, that the QA/QC procedures are followed. **CL06** is raised. **CL06** Please demonstrate, by providing related references at the each stage of the CMS survey, that the QA/QC procedures are followed.	~~CL04~~ ~~CL06~~	OK. (Refer to Table 2 for details)
3.4 Are all leakage emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	/3/ /4/	DR	As per the applied methodology, leakage emissions of CH4 from biodigester and the cook stove are considered. The MR has followed the steps as per the PDD for the calculations of the leakage emissions. No monitoring is required by the monitoring plan of the PDD as these two parameters are default values which are not monitored in the crediting period.	OK	OK
3.4.1 Was the monitoring equipment for leakage emission parameters controlled and monitoring results recorded as per approved frequency?	/3/ /4/	DR	Idem.	OK	OK

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
3.4.2 Was the monitoring equipment for leakage emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	/3/ /4/	DR	Idem.	OK	OK
3.5 Were all monitoring parameters available and verifiable through the whole monitoring period?	/3/ /4/ /7/ /8/ /9/	DR OSV	According to B.7.1 of the PDD, the monitored parameters includes: 1.$f_{NRB,y}$; 2. $P_{b,y}$; 3. $P_{h,y}$; 4. $U_{p,y}$; 5. $N_{p,y}$; 6. $MS_{(T,S,K)}$, 7. $MS_{(P,S,K)}$; 8. $N_{(T)}$, 9. PL; 10.$EF_{awms,T}$. The parameters are sourced from the reference stated as per the PDD, namely US, CMS, BP database and literature.	OK	OK
3.5.1 In case, only partial monitoring data is available and PP(s) provide estimations or assumptions for the rest of data, was it possible to verify those estimations and assumptions? Reference: <http://cdm.unfccc.int/EB/026/eb26rep.pdf>, §109(b)	/3/ /4/ /7/ /8/ /9/	DR	Not applicable as all the monitored parameters are available and are based on related monitoring methods in the PDD. No estimation is involved.	OK	OK

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
3.6 Was management and operation system established and operated in accordance with the monitoring plan?	/3/ /4/ /11/ /12/	DR	According to the PDD, program is managed by Biogas Project Division (BPD) of Livestock Production Department of Vietnam. By OSV interviews, the verification team confirms that the operation system was implemented as per the B.7.2 (A. Quality control monitoring) of the PDD. The verification team has also verified the project implementation by reviewing the whole documents flow (from signing purchase agreement to the biodigester commissioning report, (i.e. Form 3, Form 4, Form 7, Form 9) for the visited HP. It is confirmed that the management and operation system were established and operated in accordance with the monitoring plan. It is confirmed by interviewing the HP that all of them have received biodigester operational training from the provincial technician after the completion of the biodigester.	OK	OK
3.7 Was is it possible to verify that involved management and operation personal is fully aware of the responsibilities and perform all operations according to the registered monitoring plan and internally developed manuals?	/3/ /4/	DR OSV	Yes. By interviewing the related personal (includes: central BPD officer, provincial BPD officers, provincial BPD technicians, district BPD technicians, masons, and the users), it is confirmed that all of them know their responsibilities very well and they also performed their role accordingly.	OK	OK
3.8 Does the monitoring system provide organizational structure, role and responsibilities, emergency procedures?	/3/ /4/	DR	The MR has not described the organizational structure, role and responsibilities of the monitoring system. **CL07** is raised. **CL07** Please clarify the organizational structure, role and responsibilities of the monitoring system in the MR.	~~CL07~~	OK. (Refer to Table 2 for details)

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
3.9 Does any uncertainties identified and addressed?	/3/ /4/ /6/ /7/ /8/ /9/ /10/ /11/ /12/	DR OSV	Apart from the raised CARs/CLs, there is uncertainty arising from the review questions issued by GS in the course of request for registration of the PDD. Therefore the PDD and the monitoring plan are not yet confirmed at the moment. Refer to **CL08** and **CL09** mentioned in the next section..	~~CL08~~ ~~CL09~~	OK. (Refer to Table 2 for details)
4. Parameters					
4.1.1 **Monitored parameter** Title: **Fraction of non-renewablility** Indication: $\mathbf{f_{NRB,y}}$ Units: **%** Estimated value (*ex-ante*): **67%** Measured value (*ex-post*): **N/A (it is determined ex-ante)**	/3/ /4/	DR	Cross-check with independent source: validation report of the project activities */13/* DOE opinion on justification of the applied value: The verification team has confirmed from the validation report of the project activity that the NRB assessment is only required to be conducted once at the time of validation for one crediting period. Therefore, the ex-ante determined fraction of non-renewable biomass at the validation is applicable to the monitoring period.	OK	OK
4.1.2 **Monitored parameter** 1. Title: **Quantity of fuel that is consumed in the baseline scenario in year y** Indication: $\mathbf{P_{b,y}}$ Units: kg/year 2. Title: **Quantity of fuel that is consumed in the project scenario in year y** Indication: $\mathbf{P_{h,y}}$ Units: kg/year	/3/ /4/ /7/ /10.1/ /11.1/	DR	Cross-check with independent source: Form 3 of the visited HP /10.1/ /11.1/ DOE opinion on justification of the applied value: The monitoring database has been cross-checked with Form 3 of all the visited HP. The baseline fuel data in the monitoring database is found completely consistent with the HP records. The monitoring database is hence considered as reliable source.	OK	OK

Table 1. Verification Protocol						
Checklist question		**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
	Fuel / $P_{b,y}$ (ex-ante) / $P_{h,y}$ (ex-post) — Average per household (kg/year): LPG 17.8 / 36.1; Charcoal 93.2 / 101.3; Coal 362.7 / 29.3; Firewood 1855.4 / 1798.3; Agriculture residue 556.4 / 156.9; Kerosene 0.7 / 0.8					
4.1.3 **Monitored parameter** Title: **Percentage of bio-digesters in use in monitoring period y** Indication: **$U_{p,y}$** Units: **%** Estimated value (*ex-ante*): **99%** Measured value (*ex-post*): **95.44%**		/3/ /4/ /7/ /8/	DR	Cross-check with independent source: Usage Survey result spreadsheet /8/ DOE opinion on justification of the applied value: $U_{p,y}$ was determined by conducting Usage Survey by the provincial technicians. The verification team has been provided with the Usage Survey result spreadsheet, the results in the US result spreadsheet are found consistent with that stated in the monitoring database. The US was conducted by a third party and the survey design is in line with the monitoring plan. Therefore, the survey results are considered to be credible and hence accepted.	OK	OK
4.1.4 **Monitored parameter** Title: **Number of biogas plants commissioned** Indication: $N_{p,y}$ Units: **unit**		/3/ /4/ /7/	DR	Cross-check with independent source: Monitoring database /7/ DOE opinion on justification of the applied value: The verification team has confirmed from the monitoring database that the total no. of completed	OK	OK

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
Estimated value (*ex-ante*): 85,378 Measured value (*ex-post*): 89,176			biodigester as of 31/12/2011(i.e. the last day of the monitoring period) was 89,176 units. The database is considered as reliable as proven from the above discussion in the QA/QC procedures. Since BPD is a governmental authority under the Ministry of Agriculture and Rural Development, it is considered as a credible source of reference. According to the sheet "ER database" of the monitoring database, the ER was calculated from 28/06/2010 to 31/12/2011. The ER spreadsheet uses the cumulative no. of biodigester as of 30/11/2011 for the ER calculations. It is reasonable to assume that the ER generation will occur after the biodigesters operated for at least one month. So the total no. of biodiegester used for the ER calculations of the indicated monitoring period is 88,158 units, which is considered as conservative.		
4.1.5 **Monitored parameter** 1. Title: **Fraction of livestock category T's manure fed into the biodigester S, in climate zone k** Indication: $MS_{(T,S,K)}$ Units: **%** 2. Title: **Fraction of livestock category T's manure not fed into the biodigester S, in climate zone k** Indication: $MS_{(P,S,K)}$ Units: **%** *Ex-ante value*	/3/ /4/ /7/ /9/	DR	<u>Cross-check with independent source:</u> Monitoring database /7/, CMS survey result spreadsheet /9/ <u>DOE opinion on justification of the applied value:</u> The fraction of manure fed into the biodigester determined by conducting a survey, which was done together with the CMS survey by AMDI in Apr – May 2012. The data recorded in the monitoring database is cross-checked with the result from the survey spreadsheet. All the information is consistent except for the value of dairy cow in temperate zone(*ex-post*). **<u>CL08</u>** is raised for the difference in the monitoring database and the reference source of information.	~~CL08~~	OK. (Refer to Table 2 for details)

Table 1. Verification Protocol

Checklist question	Ref.	MoV[13]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
<table><tr><th rowspan="2">Category</th><th colspan="2">Temperate zone</th><th colspan="2">Warm zone</th></tr><tr><th>$MS_{(T,S,K)}$</th><th>$MS_{(P,S,K)}$</th><th>$MS_{(T,S,K)}$</th><th>$MS_{(P,S,K)}$</th></tr><tr><td>Pig</td><td>100%</td><td>0%</td><td>100%</td><td>0%</td></tr><tr><td>Buffalo</td><td>100%</td><td>0%</td><td>100%</td><td>0%</td></tr><tr><td>Dairy cow</td><td>100%</td><td>0%</td><td>100%</td><td>0%</td></tr><tr><td>Cattle</td><td>100%</td><td>0%</td><td>100%</td><td>0%</td></tr></table> *Ex-post value* <table><tr><th rowspan="2">Category</th><th colspan="2">Temperate zone</th><th colspan="2">Warm zone</th></tr><tr><th>$MS_{(T,S,K)}$</th><th>$MS_{(P,S,K)}$</th><th>$MS_{(T,S,K)}$</th><th>$MS_{(P,S,K)}$</th></tr><tr><td>Pig</td><td>94%</td><td>N/A</td><td>92%</td><td>N/A</td></tr><tr><td>Buffalo</td><td>31%</td><td>N/A</td><td>34%</td><td>N/A</td></tr><tr><td>Dairy cow</td><td>28%</td><td>N/A</td><td>28%</td><td>N/A</td></tr><tr><td>Cattle</td><td>16%</td><td>N/A</td><td>19%</td><td>N/A</td></tr></table>			**CL08[14]** It is found inconsistency of the information in the monitoring database and the reference sources, please clarify the differences for the followings: 1. The no. of dairy cow in temperate zone is zero according the CMS survey result, please clarify why the monitoring database spreadshhet state that there is 28% of manure from dairy cow being claimed for feed into the biodigester. 2. Referring to the calculation of the weighted average emission factor for each category of livestock in sheets "PR EF_temperate" and "PR EF_warm" of the monitoring database, however, it is found that the values are not consistent with the linked reference cells in the monitoring database. Please clarify the source of the applied average annual temperature for each province. 3. The MCF values for AWMS "Lagoon" and "Slurry" in the reference are temperature-dependent, but the monitoring database applies fixed values without showing how they are determined. Please how the value for these two AWMS is determined.		
4.1.6 **Monitored parameter** Title: **Number of animals of livestock category T**	/4/ /7/ /9/	DR	Cross-check with independent source: Monitoring database /7/, CMS survey result spreadsheet /9/	~~CAR01~~	OK. (Refer to Table 2 for details)

[14] CL08 is an intergrated clarification request for a few similar obervations.

Table 1. Verification Protocol

Checklist question	Ref.	MoV[13]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
Indication: $N_{(T)}$ Units: **N/A** Category / *Ex-ante*[15] / *Ex-post* Pig 17,625,266 N/A Buffalo 18,197 N/A Dairy Cow 2,403 N/A Cattle 30,891 N/A			DOE opinion on justification of the applied value: There is no information of $N_{(T)}$ recorded In the MR & the monitored spreadsheet, the assessment of this parameter is not yet confirmed. Please refer to **CAR01**. The verification team has checked the CMS spreadsheet for the confirmation of survey data with that recorded in the monitoring database, it is found no clear $N_{(T)}$ data is presented in the CMS result spreadsheet. Instead, the average no. of animal of livestock category T (i.e. $N_{(T),h}$) is shown. The results are compared with the *ex-ante* data as follows: Category / *Ex-ante*[16] $N_{(T),h}$ / *Ex-post*[17] $N_{(T),h}$ (Temperate zone / Warm zone) Pig 20.68 27.832 21.97 Buffalo 0.21 0.171 0 Dairy Cow 0.03 0 0.404 Cattle 0.36 0.151 1.344 The results are based on the CMS survey, which was conducted by a third party in line with monitoring plan. Therefore the results are considered as credible and hence acceptable.		
4.1.7 **Monitored parameter** 1. Title: **Physical leakage of the biodigester**	/3/ /4/ /7/ /15/	DR	Cross-checked with independent source: P.52 of applied methodology (i.e. TPDDTEC /version	OK	OK

[15] Sourced from the ER spreadsheet (Sheet: "Database") submitted for registration request
[16] Sourced from the ER spreadsheet (Sheet: "Database") submitted for registration request
[17] Sourced from the monitoring database spreadsheet (Sheet "Analysis")

Table 1. Verification Protocol

Checklist question	Ref.	MoV[13]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
Indication: PL Units: % Estimated value (*ex-ante*): 10% Measured value (*ex-post*): 10%			1.0)/3/ , 2006 IPCC Guidelines for National Greenhouse Gas Inventories /15/ DOE opinion on justification of the applied value: The verification team has confirmed that the applied value is in line with the latest IPCC guidelines[18]. According to monitoring plan in the PDD, leakage assessment shall be conducted every two year. Since the monitoring period stats from 28/06/2010, it is still in compliance with the requirement.		
4.1.8 **Monitored parameter** 1. Title: **kgCH4 per animal per year for livestock type T in the project** Indication: **$EF_{awms,T}$** Units: % Estimated value (*ex-ante*) & Measured value (*ex-post*): Livestock / *Ex-ante (baseline $EF_{awms,T}$)* / *Ex-post (project $EF_{awms,T}$)*: Temperate / Warm Pig 2.128 2.164 2.260 Buffalo 9.537 4.027 4.907 Dairy Cow 8.902 5.065 5.065 Cattle 5.625 1.700 2.208	/3/ /4/ /7/ /15/	DR	Cross-checked with independent source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories /15/ DOE opinion on justification of the applied value: The verification team has confirmed that the applied value of default manure EF of livestock T at certain temperatures are in line with the latest IPCC guidelines[19]. Referring to the calculation of the weighted average emission factor for each category of livestock in sheets "PR EF_temperate" and "PR EF_warm" of the monitoring database, however, the PP is requested to clarify the source of the applied average annual temperature for each province. Because it is found that the values are not consistent with the linked reference cells in the monitoring database spreadsheet. Please refer to **CL08**.	~~CL08~~	OK. (Refer to Table 2 for details)

[18] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#.UBdLvKPwVI0
[19] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#.UBdLvKPwVI0

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
4.1.9 **Default parameter** Title: **Please refer to B.6.2 of the PDD** Indication: **Please refer to B.6.2 of PDD** Units: **Please refer to B.6.2 of PDD** Default/Used value: **Please refer to B.6.2 of PDD**	/3/ /4/ /7/ /15/	DR	Cross-check with independent source: The verification team confirms from the stated references in B.6.2 of the PDD to cross-check with the values applied in the monitoring database DOE opinion on justification of the applied value. The default (ex-ante, fixed) parameters are not clearly shown in the MR, please refer to **CAR01**. Except values applied for parameters MCF, all other applied values for the *ex-ante* fixed parameters used in the monitoring data spreadsheet are confirmed to be consistent with that used in the PDD. The PP is requested to clarify how are the MCF for AWMS "Lagoon" and "Slurry" determined. With reference to 2006 IPCC Guidelines for National Greenhosue Gas Inventories, MCF values of these two AWMS are temperature-dependent. Please refer to **CL08**.	~~CAR01~~ ~~CL08~~	OK. (Refer to Table 2 for details)
4.1.10 **Monitored Sustainable Development Indicators** Indicator: **Please refer to Section F of the GS Passport for this project** Mitigation measure: **Please refer to Section F of the GS Passport for this project** Chosen parameter: **Please refer to Section F of the GS Passport for this project** Default/Used value: **Please refer to Section F of the GS Passport for this project**	/3/ /4/ /5/ /7/ /8/ /9/	DR OSV	The verification has confirmed from the related references to cross-check the data shown in SD indicate ID 1, ID2, ID4 and ID5. For the verification of SD indicator ID 3, ID6. Please provided related reference for the verification.**CL09** is raised. **CL09** For the verification of the following SD indicators, please provide the related substantiation: 1. Quality of employment (ID3) 2. Technology transfer and technological self-reliance (ID6).	~~CL09~~	OK. (Refer to Table 2 for details)

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
4.2.1 **Monitored safeguarding principles:** Principles: **The project respects the employees' freedom of association and their right to collective bargaining and is not complicit in restrictions of these freedoms and rights.** Project risks: **Low** Proposed mitigation measures: **The programme complies with the Vietnamese Labor Law**	/5/	OSV	Mitigation assessment: The freedom of association and their right to collective bargaining is confirmed by means of interviewing the mason and the biodigester construction company. Besides, the PP is a government authority which is considered to have monitoring on this issue in the course of operation of the project activity.	OK	OK
4.2.2 **Monitored safeguarding principles:** Principles: **The project does not involve and is not complicit in any form of forced or compulsory labour** Project risks: **Low** Proposed mitigation measures: **The programme complies with the Vietnamese Labor Law**	/5/	OSV	Mitigation assessment: The major labouring works are the construction of the biodigesters, which is built by the biodigester construction company. It is confirmed by means of interviewing the mason and the biodigester construction company that no indication of forced labor is involved in this project activity. Besides, the PP is a government authority which is considered to have monitoring on this issue in the course of operation of the project activity.	OK	OK
4.2.3 **Monitored safeguarding principles:** Principles: **The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis.** Project risks: **Low** Proposed mitigation measures: **The programme complies with the Vietnamese Labor Law. The programme further has an**	/5/	OSV	Mitigation assessment: By interviewing all the related stakeholder (including BPD staff, HP, potential HP, mason, mason company, etc.), there is no indication of any form of discrimination. It is also considered to promote female involvement in the project activity by providing training to the female HP. Besides, the PP is a government authority which is considered to have monitoring on this issue in the course of operation of the project activity.	OK	OK

Table 1. Verification Protocol					
Checklist question	**Ref.**	**MoV[13]**	**Findings, comments, references, data sources**	**Draft conclusion**	**Final conclusion**
expressed positive gender recruitment policy.					
4.2.4 **Monitored safeguarding principles:** Principles: **The project workers with a safe and healthy work environment and is not complicit in exposing workers to unsafe or unhealthy work environments.** Project risks: **Low** Proposed mitigation measures: **The programme complies with the Vietnamese Labor Law. In addition, construction and operation manuals explicitly mention safety precaution.**	/5/	OSV	Mitigation assessment: The safety precaution training manula in the GS Passport is considered to provide adequate safety information for the construction and operation of the biodigester. Besides, the PP is an government authority which is considered to have monitoring on this issue in the course of operation of the project activity.	OK	OK
5. Calculations					
5.1 Have all the calculations related to the baseline emissions been carried according to the formulae and methods described in the registered PDD and applied methodology?	/4/ /7/ /8/ /9/	DR	Yes, by reviewing the MR, ER calculations (incorporated in the monitoring database) spreadsheet, the baseline emissions calculations are in line with the calculations steps and equations stated in the PDD. However, please refer to **CL08**.	~~CL08~~	OK. (Refer to Table 2 for details)
5.2 Have all the calculations related to the project emissions been carried according to the formulae and methods described in the registered PDD and applied methodology?	/4/ /7/ /8/ /9/	DR	Yes. The calculations of project emissions are in line with the PDD. However, please refer to **CL08**.	~~CL08~~	OK. (Refer to Table 2 for details)
5.3 Have all the calculations related to the leakage emissions been carried according to the formulae and methods described in the registered PDD and applied methodology?	/4/ /7/ /8/ /9/	DR	Yes. The calculations of leakage emissions are in line with the PDD.	OK	OK

Table 2: List of Requests for Corrective Action (CAR) and Clarification (CL)					
No.	Type of request	Observation	Reference (Table 1)	Summary of project owner response	Verification team conclusion
1.	CAR01	The *ex-post* monitored and *ex-ante* determined parameters are not completely and clearly shown in the MR. Please revise the MR to clearly show all the applied parameters and their correlated values for a comprehensive demonstration of the ER calculations.	1.5, 4.1.6	The MR is updated by specifically stating which parameters are ex-post determined. See the revised MR in chapter 6.	Relevant fixed parameters and ex-post monitored parameters are added in line with the PDD. All the parameter are confirmed to be consistent with the ER calculations spreadsheet (i.e. "Monitoring Database"). **CAR01** is therefore closed.
2.	CL01	As per the database of the program, the plant types constructed for the HPs are of 2 types namely KT.1, KT.2A and KT.2B. Please clarify if there is any deviation from the PDD in the technology design for the constructed plant types KT.2A and KT.2B for the HPs.	1.1	There are no design deviations. The first KT2 model is denoted as KT2A and the modified version KT2B, which is the only model built since recent years and denoted as KT2 in the database, see the newly added chapter 1.3 for a technical description of the applied technologies. In a separate file the differences are explained in details and is attached to the reply package	The supplementary document on the design of the digester sub-model (i.e. KT2A and KT2B) is checked. It reveals that the two sub-models have applied the same type of technology. **CL01** is therefore closed.
3.	CL02	One of the plants (i.e. HYE-PC-DD-045) is not consistent with the provided database for project commissioning date. The date in Form 7 is 09/11/2008, but the date recorded in the database is 01/11/2008. Please clarify the inconsistency.	1.3	The inconsistency is caused by a mistake of the provincial technician who confused the date of completion with the date of commissioning. This mistake is rectified in the database and forms. The instruction of filling in the forms are dealt with during trainings and	It is understood that human error is inevitable. As per the response, the PP has suggested 2 preventive measures to address the problem: 1. Strengthen the refresh training; 2. QC on QC. The verification team considers the measures are feasible to minimize the error. As per the response, the procedures taken to control the quality of database can be 1. assured

				opening and closing workshops which takes place on an annual basis and during refreshment trainings which are organized for technicians on a biennial basis since 2010. BP therefore presumes that this mistake is incidental, which is also confirmed by the QC on QC procedures, where BP checks 10% of the forms filled in by the provincial technicians. Filling in the forms correctly continues to get full attention during training courses. This topic is also discussed during the technicians trainings. This check on the effectiveness is done by BP using a 10% random check. Mistakes hardly occur and if they do happen, the provincial technician is requested to refill the documents. Training material and manuals are included in the reply package including an excel QC sheet of the random quality check by both BP and PBPD. BP check at least 2% QC on QC and PBPD 10% QC on QC of all biogas plants built.	by the routine refresh trainings; 2. ensured by the 10% random quality check. These measures are considered as comprehensive, but please provide related training manual and random quality check records for substantiation. The "implementation guidelines for provincial office" and "QC manual" are checked, they detail the procedures, roles and responsibilities of the people participated in the QC works. And according to the spreadsheet "QC by BP", it shows that 2% and 10% of the plants have been conducted QC on QC by BP and PBPD respectively for the monitoring period. The verification team considers that the PP has implemented the QC procedures sufficiently to prevent the occurrence of error. And since the findings can be corrected with related traceable records, it is accepted. **CL02** is therefore closed.
4.	CL03	Regarding to the information shown in the monitoring report, please response to the followings: 1. Please clearly describe the technical description (i.e. details of the applied	1.5, 3.1, 3.2	1. The locations are detailed in the excel workbook and in figure 1 and table 4 of the MRI. Due to the sheer size of the database, it is not possible to list all the locations of the units in the MR. reference is included in chapter 1.4. A technical description is added in the new chapter 1.3.	1. The verification team considers the location of the plants has been reasonably covered by showing 1. the provinces covered by the programme; 2. The detailed address (up to village level, and with detailed household participant name and ID no. as well as the plant no.). And the technical description is

		technology, location of the project activity, etc.) of the project activity with reference with the PDD. 2. Please clearly describe the monitoring system with respect to the sustainable indicators listed in the PDD.		2. Text is added to chapter 2 between chapter 2 and section 2.1 addressing this issue. SD monitoring system: text changes in chapter 3.32, referencing to the monitoring plan. Table 9 on page 18 also describes what the CMS study has covered. In chapter 3.32 the source(s) of applied data is added.	added in the MR, which is consistent with the PDD. 2. Chapter 3.32 of the revised MR is checked, respective source of the references are added for the monitored sustainable indicators. The methods of monitoring sustainable indicators are clear now. **CL03** is therefore closed.
5.	CL04	Regarding the accuracy of the newton balances used during CMS, please clarify the technical specifications of the balances and describe how the calibrations were carried out with relevant substantiation.	3.2.1, 3.3.2, 3.2.2	The newton scales used are calibrated using certified weights. A calibration report detailing the procedure is attached in the replies The brand name: Nhơn Hòa Vietnamese producer Capacity of weighting: 5 kg Accuracy: ± 1% More details can be found here: http://nhonhoascale.com.vn/index.php?option=com_product&task=detail&cat=15&subcat=74&id=119	A calibration report provided by the survey team (i.e. AMDI) is reviewed, it described the calibration procedures of the newton scale used in during the surveys. The scales were calibrated with certified weight stone everyday before use. It also describes the procedures in case the weight being measured out of the range of the newton scale. The maximum capacity and accuracy of the balance are confirmed from the related website. The verification team considers the measurement of the newton scale is sufficiently accurate. **CL04** is therefore closed.
6.	CL05	Please clarify whether the monitoring of parameters $MS_{(T,S,K)}$, $MS_{(P,S,K)}$, $N_{(T)}$ are implemented in accordance with the monitoring plan. Please also provide evidence for the confirmation of the CMS survey date.	3.3.1	Chapter 3.2 detail where the emission source parameters originate from. N(T), this number is obtained through the CMS survey according to the monitoring plan The updated page 35 describes how $MS_{(T,S,K)}$, $MS_{(P,S,K)}$ are presented in table 30 and 31.	The verification team has checked the provided records for the CMS , they were conducted in 20/04/2012 and 27/04/2012. Related part describing the measurement of for these parameters is reviewed and found consistent with the procedures stated in “Calibration Scale

				See the revised monitoring report. This was monitored using the newton scale. A calibration report and instruction report is provided to the DOE which includes the manure management procedures. (see file calibration report that was sent last time) The set of CMS records were provided are includes. Copies of the 34 surveys, 2 for each province is included in the reply package for record. The date of the survey is included on page 18, just beneath the header of chapter 2.2	Report" prepared by AMDI. The date of conducting CMS is added to the MR. The verification team has checked the records of the CMS survey, it is confirmed that the CMS survey had been conducted in all the 17 provinces during the period of April to May of 2012. It can be cross-checked with the interviewed survey team for the implementation of the survey. **CL05** is therefore closed.
7.	CL06	Please demonstrate, by providing related references at the each stage of the CMS survey, that the QA/QC procedures are followed.	3.3.2	Chapter 4 details the QA/QC system, and details the steps of each step. Some information is added. Each survey form was checked by the survey team leader. Each form contains a signature on the first page of the team leader that checked to form, see the first page, section Dia Diem on the right side under Nguoi giam sat. The provided CMS survey forms evidence this.	The verification team has checked the CMS survey form and confirmed the appropriate QC procedures have been implemented as per the response which is based on the MR. **CL06** is therefore closed.
8.	CL07	Please clarify the organizational structure, role and responsibilities, emergency procedures of the monitoring	3.8	Survey execution – independent consultant: AMDI Survey training, Nexus, AMDI and BP Survey design and development: BP,	The organizational structure of the PP (i.e. BPD) and the correlated partners with regards to implementing the monitoring plan is clarified for the implementation of CMS is clear. The MR has

		system in the MR.		SNV, AMDI and Nexus MR: Nexus, with Eric Buysman as team leader on behalf of Nexus, with QC of Nexus The key person involved is the carbon consultant to Nexus Carbon for Development (me), for the survey execution AMDI (director and the statistician of AMDI)	also indicated BPD as the personnel to implement the US. The organization for implementing the monitoring plan is clear. **CL07** is therefore closed.
9.	CL08	It is found inconsistency of the information in the monitoring database and the reference sources, please clarify the differences for the followings: 1. The no. of dairy cow in temperate zone is zero according the CMS survey result, please clarify why the monitoring database spreadshhet state that there is 28% of manure from dairy cow being claimed for feed into the biodigester. 2. Referring to the calculation of the weighted average emission factor for each category of livestock in sheets "PR EF_temperate" and "PREF_warm" of the monitoring database, however, it is found that	3.9, 4.1.5, 4.1.8, 4.1.9, 5.1, 5.2	1. As the dairy population in the temperate zone is 0, there is no manure residing in the AWMS. The cell F17 and F20 where linked with P17 and P20 respectively. The cell F17 and 20 are changed to 0%, table 30 is updated accordingly in the MR. This change does not affect the results. 2. The GS accepted the calculation of the temperature. The temperature for each zone will be calculated by averaging the temperature of the participating provinces in each zone without applying a specific weight. With other words, the average temperature of zone A with 3 provinces is = (T province 1 + T province 2 + T Province 3)/3 For the project emissions from the bio-slurry see MR 1.6 chapter 3.224 on page 38 and the updated excel workbook.	1. Related revision is checked, it is now consistent with the monitoring database. 2. OK. By reviewing the GS comment and the EF spreadsheet, it is confirmed that the suggested calculations is accepted by the GS and correctly applied in the calculations. The project emissions from bio-slurry is included in the ER calculations. By reviewing the calculations, a default factor representing the remaining methane production capacity of liquid digestate (fraction) is adopted from the EB66 Annex 32. According to the equation (7) of the reference, $F_{ww,CH4,default}$ is used to multiply with the quantity of methane produced in the digester in year *y* and with GWP_{CH4}. Since there is no clear guidelines on the determination of project emissions from digestate, the verification team considers the calculations are deemed to be in compliance with the IPCC Tier 2 approach. **CL08** is therefore closed.

		the values are not consistent with the linked reference cells in the monitoring database spreadsheet. Please clarify the source of the applied average annual temperature for each province.			
10.	CL09	For the verification of the following SD indicators, please provide the related substantiation: 1. Quality of employment (ID3) 2. Technology transfer and technological self-reliance (ID6)	3.9, 4.1.10	The MR is updated according to the outcome of the registration review. Please have a look at page 42-45. Also see the attached evidences	1. The quality of the employment is monitored by the *Number of masons and technicians participating in the trainings* which is sourced from the training reports. For the verification of the no. of masons and technicians trained by BP, the related evidences are verified. The quality of employment is checked from the list of training records. It is confirmed that a total of 256 masons and 166 technicians were trained in this monitoring period. 2. OK. The training reports and the list of training records are checked , it is confirmed that a total of 256 mason were trained for the construction of KT1 and KT2 in this monitoring period. **CL09** is therefore closed.

Table 3 is based on the review of the registered PDD and the request by GS during the 1st verification. (Refer to Section 3.6 and 3.7 of this report)

Table 3: List of forward action requests (FARs)

FAR number	Observation	Reference	Summary of project participants' response	Verification team conclusion
FAR01	**FAR01** Please confirm if any double-counting of the biogas digester households between the VGS and potential subsequent CPA in the CDM PoA under the UNFCCC.	Appendix A Table 3 of the registered PDD /4.2/		
FAR02	**FAR02** Please ensure the trained masons and technicians were chosen in line with the defined rules in the monitoring of SD parameter of **Quality of Employment** as requested by GS during the 1st verification.	Section 3.7 of this report		
FAR03	**FAR03** Please ensure the digestate management system implemented by the biogas users in project scenario is monitored and the project emissions is taken account for the methane emissions from digestate as requested by GS during the 1st verification.	Section 3.7 of this report		
FAR04	**FAR04** Please ensure the GS approved emission factor of charcoal production is applied as requested by GS during the 1st verification.	Section 3.7 of this report		
FAR05	**FAR05** Please ensure BFT is conducted once for each crediting period and PFT is carried out bi-annually for the project activity as approved by GS during the 1st verification referring to Annex 5 of the applied GS methodology.	Section 3.7 of this report		

Appendix B

Certification statement

to the Verification report 01 996 9105066812-GS 1st Veri

Certification statement

TUV Rheinland (China) Ltd., the DOE, has performed the verification of the registered CDM project activity "GS Registration № 1083", "Biogas Program for Animal Husbandry Sector of Vietnam" in Vietnam. The project activity is designed to generate emission reductions by avoiding the methane emissions from animal wastes and displacing the emission from fuel consumption by the using renewable energy.

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project. It is DOE's responsibility to express an independent verification statement on the reported GHG emission reductions from the project. The DOE does not express any opinion on the selected baseline scenario or on the validated and registered PDD.

The verification was performed to identify the compliance of the project activity with implementation and monitoring requirements, and to verify the actual amount of achieved emission reductions, through obtaining evidence and information on-site that included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied, ii) the collection of evidence supporting the reported data and iii) emission reductions that are claimed is free from material errors, omissions or misstatements.

The verification is based on:

— PDD version 3.1, registered with the Gold Standard Foundation on 28/06/2012;

— GS Passport version 3.1, registered with Gold Standard Foundation on 28/06/2012;

— Approved monitoring methodology "Technologies and practices to displace decentralized thermal energy consumption", version 1.0;

— Monitoring report version 2.3, dated 21/02/2013.

This statement covers verification period of 552 days between 28/06/2010 and 31/06/2011.

The DOE has raised 09 clarification and 01 corrective action requests, all of which have been successfully resolved by PPs. Forward action requests have been raised in the Validation Report of the project activity and has been verified by the verification team.

The DOE considers necessary to give reasonable assurance that reported GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology and the monitoring plan contained in the registered PDD are fairly stated.
The DOE , hereby certifies that the project activity, achieved emission reductions by sources of GHG equal to 510,952 tCO_2 equivalent and all monitoring requirements have been fulfilled.

The DOE states that the Claimed emission reductions are free from material errors, omissions and misstatements with a reasonable level of assurance.

2013-02-22 Date	2013-02-22 Date	2013-02-21 Date
Mr. Praveen Nagaraje Urs DOE Manager TUV Rheinland (China) Ltd.	Name: Walter Tang Technical Reviewer TUV Rheinland China Ltd.	Name: Tommy Lo Team Leader TUV Rheinland Hong Kong Ltd.

Appendix C

CERTIFICATES OF COMPETENCE

Qualification

Lo, Tommy /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.:
(AuditorenRegNr)

Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Lead Auditor
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☐ yes
EAC Scopes: (EAC Branchen)	CDM 13 - Waste handling and disposal CDM 01 - Energy industries (renewable - / non-renewable sources) CDM 05 - Chemical industry		
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	04/28/2008	Valid to: (Gültig bis)	10/11/2015

Remarks:	CDM 01 limited to TA1.2 - Renewable Energies CDM 13 limited to TA13.1 / 13.2 - Waste handling and disposal (as GHG auditor from 2009-10-14)
Languages:	Chinese English Mandarin Chinese simplified Chinese traditional

Experience Exchange

Date	Location	Remarks	Accreditation(s)
2010-12-21	Beijing	GC CDM Auditor Experience Exchange, Beijing, 2010-12-21to23 United Nations Framework Convention on Climate Change	

Monitoring

Latest Monitoring:
(letzte Beurteilung)

Next Monitoring:
(nächste Beurteilung)

Remarks:

History of scope allocation

Date:	2012-03-17
Change:	EAC CDM added
By:	Praveen Urs
Reason:	
Date:	
Change:	
By:	
Reason:	
Date:	2011-01-13
Change:	EAC CDM removed
By:	Manfred Brinkmann
Reason:	CDM 01 limited to TA1.2 - Renewable Energies
Date:	
Change:	
By:	
Reason:	
Date:	2010-05-25
Change:	EAC CDM added
By:	Manfred Brinkmann
Reason:	First appointment as expert: 2008/04/29
Date:	2008-04-29
Change:	EAC CDM, CDM added
By:	Manfred Brinkmann
Reason:	

History

Created:	04/27/2008 03:19:00 PM ZE9	Manfred Brinkmann/Jpn/TUV
Modified:	10/10/2012 07:47:39 PM	Praveen Urs/Chn/TUV
	03/17/2012 08:18:09 PM	Praveen Urs/Chn/TUV
	01/13/2011 03:13:56 PM ZE9	Manfred Brinkmann/Jpn/TUV
	01/13/2011 03:12:34 PM ZE9	
	01/13/2011 03:12:05 PM ZE9	
	09/13/2010 11:37:26 PM ZE9	

Export to ICMS

Last Export:

Qualification

Chan, Timothy /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.:
(AuditorenRegNr)

Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Auditor
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☐ yes
EAC Scopes: (EAC Branchen)	CDM 13 - Waste handling and disposal CDM 02 - Energy distribution CDM 01 - Energy industries (renewable - / non-renewable sources)		
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	03/20/2012	Valid to: (Gültig bis)	03/19/2015

Remarks:	TA 1.2, TA 2.2 , TA 13.1
Languages:	Cantonese Chinese English

Experience Exchange

Date	Location	Remarks	Accreditation(s)

Monitoring

Latest Monitoring: (letzte Beurteilung)	Next Monitoring: (nächste Beurteilung)

Remarks:

View / Edit Monitoring

History of scope allocation

Date:	2012-10-08
Change:	EAC CDM added
By:	Praveen Urs
Reason:	

Date:	2012-03-20
Change:	EAC CDM added
By:	Praveen Urs
Reason:	

Date:	2012-03-20
Change:	EAC CDM added
By:	Praveen Urs
Reason:	

History

Created:	05/19/2011 12:55:01 PM	Timothy Chan/Hk/Chn/TUV
Modified:	10/08/2012 12:05:43 PM	Praveen Urs/Chn/TUV
	10/08/2012 12:05:12 PM	Praveen Urs/Chn/TUV
	09/28/2012 12:23:05 PM	Praveen Urs/Chn/TUV
	03/20/2012 05:16:31 PM	
	05/19/2011 12:55:43 PM	

Export to ICMS

Last Export:

Qualification

Tang, Walter /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.:
(AuditorenRegNr)

Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Lead Auditor
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☒ yes
EAC Scopes: (EAC Branchen)	CDM 01 - Energy industries (renewable - / non-renewable sources) CDM 02 - Energy distribution CDM 03 - Energy demand CDM 13 - Waste handling and disposal CDM 04 - Manufacturing industries		
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	10/11/2011	Valid to: (Gültig bis)	09/11/2015

Remarks:	Appointed as Technical Reviewer for TA 1.1, 1.2, 2.1, 2.2, 3.1 Direct work experience. TA 4.3, 4.5, 13.1 based on Annex D para 9 of the Accrediation Standard
Languages:	Chinese simplified English

Experience Exchange

Date	Location	Remarks	Accreditation(s)

Monitoring

Latest Monitoring: (letzte Beurteilung)	Next Monitoring:

(nächste Beurteilung)

Remarks:

History of scope allocation

Date: 2012-02-13
Change: EAC CDM added
By: Praveen Urs
Reason:

Date: 2012-02-13
Change: EAC CDM, CDM, CDM, CDM added
By: Praveen Urs
Reason:

History

Created:	12/06/2011 05:00:51 PM	Walter Tang/Chn/TUV
Modified:	07/06/2012 04:47:48 PM	Praveen Urs/Chn/TUV
	07/02/2012 03:08:57 PM	Praveen Urs/Chn/TUV
	07/02/2012 03:08:48 PM	Praveen Urs/Chn/TUV
	05/15/2012 03:30:46 PM	
	02/13/2012 08:00:10 PM	
	12/06/2011 05:01:30 PM	

Export to ICMS

Last Export: