Pre CDM –Gold Standard version 01- VER Verification Report

GOLD STANDARD REF. NO. : GS777

Monitoring Period: 2008-11-10 to 2009-11-09
(incl. both days)

Report No: GS -002 V03

Date: 2010-09-21

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Handelsregister Hamburg , Abt. B., Nr. 52078

Gold Standard Verification Report

REPORT NO: GS -002, rev.03

Date of first issue: 2010-08-12	Project No.: GS -002	
Approved by: Mr. Markus Weber	Organisational unit: Germanischer Lloyd Certification	
Client: South Pole Carbon Asset Management Ltd.	Client ref.: Mr. Patrick Burgi	
Applied methodologies	AMS III.H "Methane Recovery in Wastewater Treatment" (Version 09) AMS-I.D "Grid connected renewable electricity generation" (Version 13)	
Monitoring Period 2008-11-10 to 2009-11-09	No. of days: 365	
Monitoring Report	Draft Version and date 01/ 2010-04-21	Final Version and date 03/2010-08-06

Summary:

Germanischer Lloyd Certification GmbH (GLC) has performed the Pre-CDM GS VER verification of the project: "Bangna Starch Wastewater Treatment and Biogas Utilization Project", with regard to the relevant requirements for Gold Standard VER Version 01. The project reduces GHG emissions due to the capture of methane (biogas) from a wastewater treatment and usage for power generation. The electricity generated is delivered to the regional grid of Thailand. This verification covers the period from 2008-11-10 to 2009-11-09 (including both days).

The GHG emission reductions were correctly calculated on the basis of the approved monitoring methodology of AMS.III.H, version 09 " Methane Recovery in Wastewater Treatment" and AMS-I.D "Grid connected renewable electricity generation" (Version 13).

During the course of verification GLC has raised 12 CARs and 3 CLs which were successfully closed by the client.

As a result of the Pre-CDM GS VER verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. Germanischer Lloyd Certification GmbH herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Emission reductions 2008	**2562**	t CO_{2e}
Emission reductions 2009	**20102**	t CO_{2e}
Emission Reductions Total	**22664**	t CO_{2e}

The project's sustainability matrix parameters were also assessed and found satisfactory in line with the approved GS-Annex.

Report No.: GS-002		
Report title: "Bangna Starch Wastewater Treatment and Biogas Utilization Project "		
Work carried out by: Mr. Srikanth Meesa Mr. Sampon Pachrit		
Work verified by: Ms. Anu Chaudhary Ms. Yanwei Chen (Trainee) Markus Weber		
Date of this revision: 2010-09-21	Rev. No.: 03	Number of pages: 58

Indexing Terms

Gold Standard, Voluntary Emission Reduction, Greenhouse Gases

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Abbreviations

CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CO_2	Carbon dioxide
CO_2eq	Carbon dioxide equivalent
CH_4	Methane
COD	Chemical Oxygen Demand
CR	Clarification Request
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GS	Gold Standard
Kwe	Kilowatt (Electrical)
MP	Monitoring Plan
MR	Monitoring Report
PEA	Provincial Electricity Authority
PDD	Project Design Document
PP	Project Participant
QA/QC	Quality Assurance / Quality Control
SCADA	Supervisory Control and Data Acquisition
TAC	Technical Advisory Committee
UASB	Upflow Anaorobic Sludge Blanket Reactor
UNFCCC	United Nations Framework Convention on Climate Change
VER	Voluntary Emission Reduction
VVM	Validation and Verification Manual

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1 INTRODUCTION

South Pole Carbon Asset Management Ltd. has commissioned Germanischer Lloyd Certification GmbH (GLC) to carry out the Pre CDM Gold Standard (GS) VER verification of the registered GS project GS - 565 "Bangna Starch Wastewater Treatment and Biogas Utilization Project," This project is also registered as a CDM Project with the reference number 2556.

The verifiers have reviewed the implementation of the monitoring plan (MP) with regard to the relevant requirements for CDM project activities.

GHG data for the monitoring period covering 2008-11-10 to 2009-11-099 was verified in a detailed manner applying the set of requirements, audit practices and principles as required under the Validation and Verification Manual /1/ of the UNFCCC and GS VER VVM dated July 2007/2/ which is a part of version 01 and it's clarifications. Since the current project was validated based on version 01, the verification team considered the confirmation of the regional GS manager and conducted the current verification applying the GS version 01 guidelines as well.

This report summarizes the findings and conclusions of this pre CDM GS-VER verification of the above mentioned UNFCCC and GS registered project activity.

1.1 Objective

The objective of the verification is the review and ex-post determination of the GHG emission reductions by an independent entity. It includes

- that the project activity has been implemented and operated as per the registered PDD and the approved GS –Annex and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- that the monitoring report and other supporting documents provided are complete and verifiable and in accordance with applicable GS and CDM requirements;
- that actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology and approved GS Annex monitoring plan on sustainability parameters;
- that the data is recorded and stored as per the monitoring methodology.

1.2 Scope

The verification of this registered project is based on the validated project design document /4/, the monitoring report /6/, Approved GS- Annex/3/, emission reduction calculation spread sheet /19/, supporting documents made available to the verifier and information collected through performing interviews and during the on-site assessment. Furthermore publicly available information was considered as far as available and required.

The verification is carried out on the basis of the following requirements, applicable for this project activity:

- Article 12 of the Kyoto Protocol /17/,

- guidelines for the implementation of Article 12 of the Kyoto Protocol as presented in the Marrakech Accords under decision 3/CMP.1 /18/ and subsequent decisions made by the Executive Board and COP/MOP,
- other relevant rules, including the host country legislation,
- CDM Validation and Verification Manual /1/,
- GS VER VVM /2/
- monitoring plan as given in the registered PDD /4/,
- Approved CDM Methodology AMS III.H "Methane Recovery in Wastewater Treatment" (Version 09) and AMS-I.D "Grid connected renewable electricity generation" (Version 13)./14/

1.3 GHG Project Description

1.3.1 Project Characteristics

Essential data of the project is presented in the following Table 1-1.

Table 1-1: Project Characteristics

Item	Data	
Project title	Bangna Starch Wastewater Treatment and Biogas Utilization Project	
Project Description	The project activity involves the production of biogas from wastewater treatment using UASB. In the absence of the UASB the wastewater would have been treated in anaerobic lagoons where methane would have emitted to the atmosphere. The biogas captured is combusted in the gas engines to generate electricity which will be supplied to the PEA. Again in the absence of the project activity, the same amount of electricity would have been generated by fossil fuel fired power plants.	
Project size	☐ Large Scale ☒ Small Scale	
CDM Reference No.	2556	
Date of CDM registration	2009-11-10	
GS Reference No :	GS 565	
Date of GS registration	2010-06-25	
Project Scope (according to UNFCCC sectoral scope numbers for CDM)	1	Energy Industries (renewable - / non-renewable sources)
	13	Waste handling and disposal
Applied Methodologies	AMS III.H "Methane Recovery in Wastewater Treatment" (Version 09) and AMS-I.D "Grid connected renewable electricity generation" (Version 13)	
Crediting period	Renewable Crediting Period (7 y)	

1.3.2 Involved Parties and Project Participants

The following parties to the Kyoto Protocol and project participants are involved in this project activity (Table 1-2).

Table 1-2: Project Parties and project participants

Characteristic	Party	Project Participants
Host party	Thailand	P & Papop Renewable Co. Ltd.
Annex -1 party	Switzerland	South Pole Carbon Asset Management Ltd.

1.3.3 Project Location

The details of the project location are given in table 1-3:

Table 1-3: Project Location

No.	Project Location
Host Country	Thailand
Region:	Northern part of Thailand
Project location address:	45 Rimmaenumparn, Theenanon Road, Yangthalat, Kalasin 46120

1.3.4 Technical Project Description

The key parameters for the project are given in table 1-4:

Table 1-4: Technical data of the plant

Sr. No.	Equipment		Technical Specifications
1	UASB	1	Wastewater to be treated : 3750 m^3/d Removal efficiency : 70-95 % Average COD loading : 6 -20 kg COD/m^3/d.
2	Gas engines	2.85 MW (0.95X3)	Make: GUASCOR S.A. Type: SFGLD560 Electrical Power : 950 (24h/24) Kwe

2 METHODOLOGY

2.1 Verification Process

The verification process is based on the guidelines described in the latest version of the Validation and Verification Manual/1/ and GS VER VVM/2/. In addition to that, standard auditing techniques have been applied. The verification team performs first a desk review, followed by an on-site visit to review the project realisation. The findings are recorded in a detailed verification questionnaire. In case of lack of clarity or inconsistencies related findings will be raised. The annex of this report comprises a list of the raised non-conformities and clarification requests. The next step is to close out the findings through direct communication with the PP and finally prepare the final verification report. This verification report and other supporting documents then undergo a technical review by "GLC GmbH" prior to the submission to GS -TAC.

2.2 Verification Team

The appointment of the team takes into account the required scope and sector specific knowledge requirements for verifying the ER achieved by the project activity in the relevant monitoring period for this verification.

The verification team consists of the following members:

Table 2-1: Team members' qualification and knowledge

	Name	Function 1)	Scope Specific Knowledge	Sector Specific Knowledge	Host Country Knowledge	Type of involvement					
						Desk Review	On-site visit / interviews	Reporting	Supervision of work	Technical review	Expert input
☒Mr. ☐Ms.	Srikanth Meesa	ATL	x	x		x	x	x	x		
☒Mr. ☐Ms.	Sampon Pachrit	E			x		x				x
☐Mr. ☒Mrs.	Anu Chaudhary	TR	x	x						x	
☐Mr. ☒Ms.	Yanwei Chen	TR (trainee)	x	x						x	
☒Mr. ☐Ms	Markus Weber	TR	x	x						x	

1) ATL: Assessment Team Leader; A: Auditor, E: Expert; TR: Technical Reviewer

2.3 Desk review

During 2010-05-26 to 2010-05-31, GLC conducted a desk review of all documents initially provided by the client and publicly available documents relevant for the verification. The main reviewed documents are listed below:

- The registered PDD, including the monitoring plan and the corresponding validation report;
- Approved GS –Annex and GS Validation Report
- The applied monitoring methodologies
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board and GS;
- Any other information and references relevant to the project activity's resulting emission reductions (e.g., IPCC reports, data on electricity generation in the national grid or laboratory analysis and national regulations).

2.4 On-site assessment

On 2010-06-01 and 2010-06-02 Mr. Srikanth Meesa and Mr. Sampon Pachrit from GLC's verification team carried out an on-site visit.

The on-site visit focused on the following tasks:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- Assessment of sustainability matrix monitoring parameters.

Representatives of South Pole Carbon Asset Management Ltd. and P & Papop Renewable Co. Ltd. including the operational staff of the plant were interviewed. The main topics of the interviews are summarised in Table 2-2.

Table 2-2: Interviewed persons and interview topics

Interview Topic	Interviewed persons
- General aspects of the project - Technical equipment and operation - Changes since validation - Monitoring and measurement equipment	Project Participant 1: P & Papop Renewable Co. Ltd. Mr. Suchai Rattananadhtkul, Manager, Papop Mr. Watchara boonyued, Engineering, Papop

Interview Topic	Interviewed persons
- Remaining issues from validation - Calibration procedures - Quality management system - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data management - Data uncertainty and residual risks - GHG calculation - Procedural aspects of the verification - Maintenance - Environmental aspects	Mr. Eakachai prasartmongkol, plant manager, Papop Project Participant 2: South Pole Carbon Asset Management Ltd. Mr. Harshpreet Singh, CDM Consultant Ms. Suwipa Rukwongtrakool, CDM consultant
- GS sustainability Matrix Parameters	Local stakeholders/villagers Mr. Supot Puthaygam , Community leader, Village Khua. Mr. Kritthavee Atthana, Community member, Village Khua.

2.5 Resolution of Findings and Reporting

On the basis of the desk review, the on-site visit, follow-up interviews and further background investigation, the list of findings described in the annex were raised. The team has raised a

Corrective Action Request (CARs), if:

- the project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- the CDM requirements have not been met;
- there is a risk that emission reductions cannot be monitored or calculated.

Clarification Request (CL), if:

- information is insufficient or not clear enough to determine whether the applicable CDM and GS-VER requirements have been met.

In case the team has identified essential risks for further periodic verifications or the actual status requires a special focus on this item for the next consecutive verification, or an adjustment of the monitoring plan is recommended a Forward Action Request (FAR) was raised.

All CARs, CLs and FARs raised have been sent to the client with the request to address the findings. After the findings have been answered by the client in an appropriate manner, the CARs, CLs and FARs will closed out.

For a detailed list of all CARs, CLs and FARs raised in the course of the verification please refer to chapter 3.

The list of findings was sent to the client with the request to provide clarifications or corrections. Once all the findings were closed, the final verification report was prepared.

2.6 Technical Review

In the timeframe 2010-08-29 – 2010-09-09 GLC has carried out a technical review of the whole verification process and the draft verification report. The technical reviewer is a competent GHG auditor being appointed for the scope this project falls under.

As a result of the internal review process the verification opinion and the topic specific assessments as prepared by the verification team leader might have been confirmed or revised. Furthermore reporting improvements might be achieved.

3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "Bangna Starch Wastewater Treatment and Biogas Utilization Project " project in Thailand for the period 2008-11-10- 2009-11-09. The findings of the verification are documented in more detail in a verification questionnaire.

3.1 Remaining issues, FARs from previous validation or verification

By assessing the Validation Report for the project activity, the verification team identified no missing steps, open issues or material discrepancy from the validation phase of the project activity. Thus, there were no pending issues from the validation phase of the project. There are no previous verifications for this project,moreover the project was registered on 10 November 2009 and hence there are no other verifications till now.

Under consideration of the GS rules and procedures and related updates and clarifications dated 17th December 2007, the verification team has verified the following conditions:

Table 3-1: Assessment of Pre-CDM GS VER eligibility conditions:

S. No.	Condition	Assessment
1	The project developer can provide proof that the final version of the PDD has been submitted for validation to the DOE prior to 31st of January 2008. This is extended to 31st of January 2009 with reference to clarification obtained from GS. /2/	The following link confirms that the final PDD was submitted for validation to the DOE before 31 January 2009. http://cdm.unfccc.int/Projects/Validation/DB/36WM86R87J04LDSV1QA9SWIE04S87W/view.html
2	The DOE must provide a verification report covering the GS VER period either with the first verification of GS CERs or separately.	PPs have commissioned GLC to perform GS VER verification for the period prior to the CDM registration. The current report fulfils the requirement of a separate report and will be

S. No.	Condition	Assessment
		provided to the GS registry. Thus it can be confirmed that it is inline with the GS requirement.
3	The reasons for the mismatch between the start of project operation and the CDM registration date are provided (in section 3.1 of the MR) and confirmed by the DOE as part of the verification report covering the GS VER period.	The project operation start date is December 2007/8/ and is the date on which the project was commissioned. This project was registered on 10 November 2009/4/ as a CDM project. The validation has started during September 2008 and the validation process finished by November 2009. PP has provided the chronology of events that took place between project start date and the registration date transparently in the PDD. All the provided information was checked as most of the events were part of the validation and available in the registered PDD and the validation report (http://cdm.unfccc.int/Projects/DB/RWTUV1241593452.75/view). Thus it is evident that the provided information is reliable and was checked during validation. Hence the verification team confirms that the project meets this GS requirement.
4	GS VERs may be issued for a maximum of 12 months prior to the project's CDM registration date.	PPs are claiming the VERs only for a period of 1 year (10 November 2008 - 9 November 2009) prior to the CDM registration date i.e. 10 November 2009/4/. Hence this condition is met.
5	GS VERs will only be issued after the project has been successfully registered as a GS CDM project.	The project is registered as a CDM project on 10 November 2009 and as a GS project on 25 June 2010/3/. Hence it is eligible to claim the GS –VERs for a period of 1 year before the date of CDM registration as per the GS requirements.

3.2 Project implementation in accordance with the registered PDD

During the verification an onsite visit was carried out. The project involves the installation of UASB to treat the waste water generated during the tapioca based starch manufacturing process and 3 gas engines (0.95 MWX3=2.85 MW) to generate electricity using the biogas produced by the UASBs. In the absence of the project the wastewater would be treated in open anaerobic lagoons which emit the potential GHG methane to the atmosphere. The project's salient features i.e. all the equipments are installed as per the design. All the technical specifications of the project equipments were checked during the on site visit and found inline with registered PDD. Hence the verification team confirms that the project is implemented in line with the registered PDD.

Gold standard sustainability matrix parameters were also assessed and found in line with the approved GS- Annex. All these parameters are assessed in section 3.4 below.

3.3 Compliance of the monitoring plan with the monitoring methodology

During the document review and furthermore during the on-site visit the verification team has reviewed the registered monitoring plan and compared it with the monitoring methodology to verify their compliance. Based on this review and as discussed in the above section 3.2, the verification team confirms that the monitoring plan of the registered PDD is in compliance with the monitoring methodology except for the following deviation.

Table 3-2: Assessment of deviation

Deviation	Assessment
As per para 18 of AMS.I.D "The amount of electricity generated using biomass fuels calculated as per paragraph 16 shall be compared with the amount of electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used. The lower of the two values should be used to calculate emission reductions." However this calculation is not included in the registered MP.	Due to the missing calculation and comparison GLC has raised CAR No 7. As a consequence the PP has calculated the generated energy using the specific fuel consumption as per the methodology. This theoretical amount was than compared to the actual generated energy amount. It was found that the actual generated energy amount is lesser than the calculated energy amount and thus was applied for the determination of the emission reduction. This is also presented in the revised MR. As this approach fulfils the requirement GLC considers it to be acceptable.

3.4 Compliance of the monitoring with the monitoring plan

The following deviations were observed related to the monitoring parameters which are used to calculate the emission reductions during the course of verification.

Table 3-3: Assessment of deviation

Deviation	Assessment
<u>Calibration of the monitoring equipments :</u> *Liquid and gas flow meters:* As per the registered MP, liquid flow meters should be calibrated once in a year. However, they are not calibrated as per the specified frequency. Hence, a deviation is taken that the liquid and gas flow meters shall be calibrated once	As there are no guidelines available on this kind of deviations for GS-VER projects the verification team is of the opinion that the deviation is acceptable as it is inline with the latest version of the general guidance para 17 (c) *"Measuring equipment should be certified to national or IEC standards and*

Deviation	Assessment
in a period of 3 years which, however is in line with the general guidance (please refer to the right box). Moreover the latest calibration certificate indicates that the meter is working well.	*calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years;* /13/ and also the latest calibration certificates/7/ both liquid and gas flow meters provided, indicate that the meters are functioning well and the error is within the permissible limits. PPs have adequately explained the same in the MR.
Gas analyzer: As per the registered MP, the online gas analyzer will be used to measure the concentration of methane in the generated biogas and it will be calibrated as per the specifications of the manufacturer or the applicable industrial standards. As per the recommendation of the manufacturer, stated in the operational manual it should be calibrated and serviced once in 6 months. However, for the current verification period portable gas analyzer was used instead of online gas analyzer to measure the methane content and was internally calibrated once in a week using a standard gas.	The readings observed are taken on 95 % confidence level as per para 30 of the applied methodology AMS.III.H. Thus it is inline with the guideline and this deviation is acceptable, though it is not implemented as per the registered PDD. Verification team has checked the calibration certificates/7/ of the portable gas analyzers provided by the external agencies to the PPs and found that the analyzer is working well as the error of the test results is within the permissible limits. PP has internally calibrated once in a week using the calibration procedure provided by the equipment manufacturer and all the records were reviewed and found that the error is in the permissible limits. Moreover during verification site visit, the plant personnel were interviewed and were found competent to maintain the quality of data. The verification team has interviewed the equipment manufacturer to confirm whether it would be acceptable. The equipment manufacturer has confirmed that if PP is calibrating the analyzer once in a week using a standard gas and calibrating it as per calibration manual the readings are sufficiently reliable and accurate. As discussed above, PP is calibrating the analyzers once in a week as per the procedure provided by the manufacturer. Hence verification team is of the opinion this deviation is acceptable as it would not affect the quality of the measured methane content.
Energy meters: The registered PDD states that the energy generation and consumption	Verification team is of the opinion that it is appropriate to consider the monthly reading reports

Deviation	Assessment
will be measured via internal meters. However, during site visit the verification team learned that internal meters and electricity measurement meters from the local electricity authority PEA have been installed. The PP, on a daily basis takes readings of the internal meters, whereas the PEA on a monthly basis takes the readings of the external meters and provides on a monthly basis a report to the PP. In order to enhance transparency of the electricity measurements the PP decided to consider only the readings of the PEA meters for the determination of the emission reductions. This was also done for the month November 2008 and November 2009. However, as for these month only a few days fall within the monitoring period (21 days of November 2008 and 10 days of November 2009) the PP have determined the amount of generated electricity only based on the daily readings of the internal meters. Concerning the energy consumption of the month November 2008 and November 2009 the PP has considered the monthly amount as determined by PEA, which is a conservative approach. PEA personnel have informed the verification team that the meters shall be calibrated once in a year as per a regulation whichI was implemented in November 2009. As per the available information there were no clear guidelines for calibration for VSPP (vey small power producers) before November 2009. However, as informed by PEA all external meters were calibrated on a regular basis. The verification team has reviewed the calibration certificates. The internal energy consumption and	provided by the PEA which is the electricity authority that draws the electricity from the project activity. Moreover it is a third party. The PEA personnel was interviewed by the verification team and informed that the PEA is authorized to perform the calibration. Thus, the calibration is not under the purview of the PPs. Furthermore based on the regulation which was implemented in November 2009 the calibration frequency for external meters should be 1 year. Upon PPs request PEA has provided all the calibration certificates available for the energy meters which revealed that they were functioning well. Calibration frequency of the internal energy meters is in line with para 17 (c) of the latest version of the general CDM guidance/13/ for SSC projects.

Deviation	Assessment
generation meters were installed in January 2008. According to the general CDM guideline for SSC projects a calibration is only required on a three years basis. Thus the next calibration would be due in January 2011.	
COD: The PDD states that one measurement and analysis of the COD concentration shall be conducted for the wastewater stream before and after the treatment in the digester. The results are to be recorded in log sheet and later transferred to electronic files. Sampling will be performed at 95% confidence level." Actually, COD data is measured daily using a colorimetric method and recorded in the log book.	The daily measurement of the COD represents a good practice and all the data provided in the final ER sheet is found consistent with the log books. Moreover, standard solution is used to calibrate the instrument every time before taking the reading. Thus it ensures the quality of the data. During on site visit, verification team has also interviewed the persons involved in measuring and recording the COD and was found competent. Thus this deviation is acceptable as it would not affect the quality of the measured COD data.
$COD_{y, ww, treated}$: COD of wastewater discharged to the river after treatment should be measured on a daily basis in an on site laboratory. However, a third party authorized by the government is performing the COD sampling and measurements once in a month.	The monthly COD measurements and analysis by a third party instead of measurements and analysis by the site owned laboratory enhance the transparency and reliability of the procedure and thus is considered by GLC to be acceptable. The frequency of monthly measurements fulfils the requirements of the local discharge permit. The deviation of the frequency from daily to monthly is due to the focus of the PP of the fulfillment of the legal regulations. In addition it should be noted that the change of the COD concentration is measured and analyzed on a daily basis at the inlet and outlet of the digester. These measurements allow a daily review of the COD concentration development and thus fulfill the required daily COD monitoring. With respect to the provided COD concentration figures it is obvious that the treatment (considering the UASB only) reduces the COD concentration significantly (on average 97%) and thus is efficient. Furthermore the PP considered the maximum COD concentration at the discharge points to determine the emission reductions which is conservative.

Deviation	Assessment
	Hence GLC considers the deviation to be acceptable.
<u>On-line monitoring system:</u> As per the registered PDD all data such as wastewater treated, amount of biogas generation, consumption, flaring and electricity generation shall be monitored and recorded through an online SCADA system. However it is not implemented during the current verification period due to operational problems in the SCADA system. As a consequence the PP could not record and store the data electronically on a continuous basis.	During the verification site visit, all the manually recorded data was checked for consistency. It was also found that all the log books are reviewed by the senior personnel regularly. Moreover an excel sheet of tantalizer values was also made available which is found consistent with the submitted final emission reduction sheet. Thus it is clear that the monitoring system implemented ensures the quality of the data, though it is not implemented as per the registered monitoring plan. Hence, this deviation is acceptable.

The monitoring plan requires the monitoring of the following data:

Table 3-4: List of monitoring parameters and assessment:

	Assessment/ Observation
Data/Parameter: (as per the Registered PDD):	Volume of wastewater treated in the year y($Q_{y,ww}$)
Measuring frequency:	Continuously. The data is recorded daily in the log books by the plant operator on site and are regularly verified by the plant controller and manager. Verification team has checked log books and interviewed the site personnel and found the data provided in the MR is consistent with the log books and plant operating personnel are competent.
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD, the data should be recorded and stored electronically on a continuous basis. However this deviation is assessed in the Table 3.3 above which is acceptable. The data is measured continuously and recorded daily in the log books. Log books are checked by the plant controller and the manager. This ensures the quality of the data though it is not recorded and stored electronically.
Type of monitoring equipment:	Liquid flow meter Manufacturer : Endress + Hauser Type : Differential pressure flow meter S.No :93120819000 Accuracy : ±0.5 %

Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The PDD does not specify the accuracy of the monitoring equipement, however an accuracy class of ± 0.5 represents a good industrial practice and thus is acceptable.
Calibration frequency /interval:	As per the registered MP, the flow meter should be calibrated once in a year/7/. However, is not implemented during the current verification period. And meters are calibrated once in March 2007 and in November 2009. This deviation is assessed in Table 3.3 above and was found to be acceptable.
Is the calibration interval in line with the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	As mentioned above the calibration interval is line with the general guidance, hence it is acceptable/13/.
Company performing the calibration:	Endress + Hauser (EH). EH is the manufacturer and hence authorized to perform the calibration.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and found that meter is functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	Yes. As discussed above all the calibration certificates were verified.
If applicable, has the reported data been cross-checked with other available data?	Yes. The value was checked with the log book data.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	The chemical oxygen demand removed by the treatment system j i.e. project activity. ($COD_{y,removed,l}$)
Measuring frequency:	Daily. COD removed by the treatment system is calculated and recorded in the log books daily by plant operator. Verification team has checked the log books and the data is consistent with the data provided in the final emission reduction sheet. COD measuring plant personnel were interviewed and found that they are competent enough to ensure the quality of data.
Reporting frequency:	Daily
Is measuring and reporting frequency in	Yes, the monitoring plan requires a daily measuring

accordance with the registered monitoring plan and monitoring methodology? (Yes / No)	and analysis frequency, which is fulfilled by the PP The data is recorded in the log book which is in line with the registered PDD. Kindly refer the table 3.3 above.
Type of monitoring equipment:	Hach DR/890 Series Colorimeter wavelength accuracy ±1 nm
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	A standard solution is used to calibrate the colorimeter before taking the reading. Thus, it ensures the quality of data.
Calibration frequency /interval:	As stated above, the measuring instrument is calibrated every time before taking the reading using a standard solution. It represents a good practice and also ensures the quality of data.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Yes. As discussed above the calibration frequency represents the best practice.
Company performing the calibration:	The calibration is conducted in accordance with the equipment manual of company HACH. During the site visit, the person responsible for monitoring the COD value demonstrated the standard solution and calibration procedure and was found competent enough to follow the procedure which ensures the quality of measured COD data. Moreover the plant controller and the manager will cross check the data regularly.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. Kindly refer above
Is (are) calibration(s) valid for the whole reporting period?	Yes. Kindly refer above.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data was cross checked with log books available during the site visit.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter:	The chemical oxygen demand of waste water

(as per the registered PDD):	entering the anaerobic treatment system. (COD_{inlet})
Measuring frequency:	Daily. The COD of waste water entering the anaerobic treatment system is measured and recorded in the log books daily by plant operator. Verification team has checked the log books and the data is consistent with the data provided in the final emission reduction sheet. This is discussed in Table 3.3 above. COD measuring plant personnel were interviewed and found competent enough to ensure the quality of data.
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the daily measurments are in accordance with the monitoring plan.
Type of monitoring equipment:	Hach DR/890 Series Colorimeter wavelength accuracy ±1 nm
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	A standard solution is used to calibrate the measuring instrument before taking the reading. Thus, it ensures a sufficient quality of data.
Calibration frequency /interval:	As stated above the measuring instrument is calibrated every time before taking reading using a standard solution. It represents a good practice and also ensures the quality of data.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Yes. As discussed above the calibration frequency represents the best practice.
Company performing the calibration:	The calibration is conducted in accordance with the equipment manual of company HACH. During the site visit, the person responsible for monitoring the COD value demonstrated the standard solution and calibration procedure and was found competent enough to follow the procedure which ensures the quality of measured COD data. Moreover the plant controller and the manager will cross check the data regularly.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. Kindly refer above
Is(are) calibration(s) valid for the whole reporting period?	Yes. Kindly refer above.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data was cross checked with log books available during the site visit.
How were the values in the monitoring report	Please see 3.5 and 3.6

verified?	
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	The chemical oxygen demand of waste water leaving the anaerobic system. (COD_{outlet})
Measuring frequency:	Daily. COD of the Waste water leaving the anaerobic treatment system is measured and recorded in the log books daily by plant operator. Verification team has checked the log books and the data is consistent with the data provided in the final emission reduction sheet. COD measuring plant personnel were interviewed and found that they are competent enough to ensure the quality of data. Kindly refer Table 3.3 above.
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the daily measurements are in accordance with the monitoring report.
Type of monitoring equipment:	Hach DR/890 Series Colorimeter wavelength accuracy ±1 nm
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	No. A standard solution is used to calibrate the calorimeter before taking the reading. Thus, it ensures the quality of data.
Calibration frequency /interval:	As stated above the calorimeter is calibrated every time before taking reading using a standard solution. It represents a good practice and also ensures the quality of data.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Yes. As discussed above the calibration frequency represents the best practice.
Company performing the calibration:	The calibration is conducted in accordance with the equipment manual of company HACH. During the site visit, the person responsible for monitoring the COD value demonstrated the standard solution and calibration procedure and was found competent enough to follow the procedure which ensures the quality of measured COD data. Moreover the plant

	controller and the manager will cross check the data regularly.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. Kindly refer above
Is(are) calibration(s) valid for the whole reporting period?	Yes. Kindly refer above.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data was cross checked with log books available during the site visit.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	Chemical oxygen demand of the wastewater prior to discharge $COD_{y, ww, treated}$
Measuring frequency:	Monthly. The COD of WW prior to discharge will be measured by a third party once in a month.
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the registered monitoring plan and monitoring methodology? (Yes / No)	No. However, the deviation of the frequency from daily to monthly is due to the focus of the PP of the fulfillment of the legal regulations. In addition it should be noted that the change of the COD concentration is measured and analyzed on a daily basis at the inlet and outlet of the digester. These measurements allow a daily review of the COD concentration development and thus fulfill the required daily COD monitoring. The monthly COD measurements and analysis by a third party instead of measurements and analysis by the site owned laboratory enhance the transparency and reliability of the procedure and thus is considered by GLC to be acceptable. The frequency of monthly measurements fulfils the requirements of the local discharge permit. With respect to the provided COD concentration figures it is obvious that the treatment reduces the COD concentration significantly and is efficient. Thus, GLC considers this deviation to be acceptable.

Type of monitoring equipment:	Measured by third party (Environmental Engineering Laboratory, Faculty of Engineering, KKU).
Is accuracy of the monitoring equipment as stated in the registered PDD? If the Registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	As per the registered PDD COD testing device will be subjected to periodic calibration. COD of waste water before discharge is measured by an authorized third party approved by the Thailand government to conduct the COD measurements. Thus it ensures the quality of the data and represents a good practice.
Calibration frequency /interval:	Refer above
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	
Company performing the calibration:	Third Party (Environmental Engineering Laboratory, Faculty of Engineering, KKU)
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	NA
Is(are) calibration(s) valid for the whole reporting period?	NA
If applicable, has the reported data been cross-checked with other available data?	No
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	Amount of final sludge generated by the wastewater treatment. $S_{y, final}$
Measuring frequency:	Sludge would be measured when it is removed and send out of the plant. It is weighed before sending out and will be recorded in the log books.
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	There is no defined frequency in the registered PDD. However, it was checked during the site visit and found that there is no sludge sent out till now.
Type of monitoring equipment:	Weigh bridge. As there is no sludge it is not required.
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring	Refer above

equipment represent good monitoring practise?	
Calibration frequency /interval:	NA. Refer above
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	NA. Refer above
Company performing the calibration:	NA. Refer above
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	NA. Refer above
Is(are) calibration(s) valid for the whole reporting period?	NA. Refer above
If applicable, has the reported data been cross-checked with other available data?	NA. Refer above
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	Methane content in biogas (% CH_4)
Measuring frequency:	Continuously. The data is recorded daily in the log books by the plant operator. Verification team has checked log books and interviewed the site personnel. It was found the values provided in the final MR and the ER sheet are consistent with the log book data and the plant operating personnel competent.
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD, the methane content should be measured continuously using online gas analyzer. However, it is not implemented a per the registered PDD and this deviation is discussed above in Table 3.3 Methane values are taken on 95 % confidence level as per the applied methodology para 36.
Type of monitoring equipment:	2 Portable gas analyzers Manufacturer : Geotech (both) 1 S.No : G659 (From the date of commissoing (Jan 2008) till March 2009) 2 S.No: BM11452 (used from March 2009) Type : Infrared

	Accuracy : ± 3 % (for more than methane content of 50 %)
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy class of the meters is ± 3 % (for more than methane content of 50 %) and represents a good practice.
Calibration frequency /interval:	The internal frequency is once a week. Kindly also refer deviation table 3.3 above.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Kindly also refer above.
Company performing the calibration:	Entech. Internal calibration using a standard gas.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration records and the certificates were checked and found the analyzers were found functioning properly /7/.
Is (are) calibration(s) valid for the whole reporting period?	Yes. As discussed above all the calibration records and certificates were verified.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data reported in the ER sheet is checked with the log books available during site visit.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	Amount of biogas that is generated in year y ($Q_{biogas, total, y}$)
Measuring frequency:	Continuously. The data is recorded daily into the log books by the plant operator. Verification team has checked log books and interviewed the plant personnel on –site and found that the data provided in the ER sheet is consistent with the log books and plant operating personnel are competent.
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD, the data should be measured continuously and recorded electronically using a SCADA system. However this deviation is explained in the table above 3.3. As the readings were checked by the plant controller and the manager regularly, the data is of good quality.

Type of monitoring equipment:	Gas flow meter Manufacturer : Endress+ Hauser Type : Differential temperature flow meter Accuracy : ± 1%
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy class of the meter is ±1 and is stated in the MR. This was confirmed after checking the calibration certificates.
Calibration frequency /interval:	As per the registered PDD, it should be calibrated as per the manufacturer specification and applicable industrial standards. However it is deviated i.e. there is meters are calibrated once in a 3 year which is in line with the general guidance/13/ and is explained in the table above 3.3. The latest calibration certificates were checked and found that the error is in the permissible limits.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	As discussed above the calibration frequency is in line with the general guidance and is acceptable.
Company performing the calibration:	Endress+Hauser has provided the calibrated meter during commissioning in 2007 and internal calibration was done using a master meter during 2008 and 2009. Master meter was calibrated by an approved laboratory in Thailand/7/. Calibration certificate of the master meter is provided to the verification team.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates/7/ were checked and found the meter is found functioning properly.
Is(are) calibration(s) valid for the whole reporting period?	Yes. As discussed above all the calibration certificates were verified.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data reported in the MR and ER sheet is verified with the log books.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter:	Amount of biogas that is flared in year y ($Q_{biogas, flare, y}$

(as per the registered PDD):	)
Measuring frequency:	Continuously. The data is recorded daily into the log books by the plant personnel. Verification team has checked log books and interviewed the site personnel and found that the data provided in the ER sheet is consistent with the log books and plant operating personnel are competent.
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD, the data should be measured continuously and recorded electronically using a SCADA system. However this deviation is explained in the table 3.3 above. As the readings were checked by the senior employees regularly, the data is of good quality.
Type of monitoring equipment:	Gas flow meter Make : Endress+Hauser Type : Differential temperature flow meter Accuracy : ± 1%
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy class of the meter is ±1 and is stated in the MR. This was confirmed after checking the calibration certificates.
Calibration frequency /interval:	As per the registered PDD, it should be calibrated as per the manufacturer specification and applicable industrial standards. However it is deviated i.e. there is meters are calibrated once in a 3 year which is in line with the general guidance/13/ and is explained in the deviation table above. The latest calibration certificates were checked and found that the error is in the permissible limits/7/.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	As discussed above the calibration frequency is in line with the general guidance and is acceptable.
Company performing the calibration:	Endress+Hauser has provided the calibrated meter during commissioning in 2007 and internal calibration was done using a master meter during 2008 and 2009. Master meter was calibrated by an approved laboratory in Thailand/7/. Calibration certificate of the master meter is provided to the verification team.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and found the meter is found functioning properly.
Is(are) calibration(s) valid for the whole reporting period?	Yes. As discussed above all the calibration certificates were verified.

If applicable, has the reported data been cross-checked with other available data?	Yes. The data reported in the MR and ER sheet is verified with the log books.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	Amount of biogas that is sent to the electricity generator. ($Q_{biogas, generator, y}$)
Measuring frequency:	Continuously. The data is recorded daily into the log books by the plant operator. Verification team has checked log books and interviewed the site personnel and found that the data provided in the ER sheet is consistent with the log books and plant operating personnel are competent.
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD, the data should be measured continuously and recorded electronically using a SCADA system. However this deviation is explained above in the table 3.3. As the readings were checked by the plant controller and the manager regularly, the data is of good quality.
Type of monitoring equipment:	Gas flow meter Manufacturer : Endress+Hauser Type : Differential temperature flow meter Accuracy : ± 1%
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy class of the meter is ±1 and is stated in the MR. This was confirmed after checking the calibration certificates/7/ .
Calibration frequency /interval:	As per the registered PDD, it should be calibrated as per the manufacturer specification and applicable industrial standards. However this deviation is discussed in table 3.3 above i.e. the meters are calibrated once in a 3 year which is in line with the general guidance/13/. The latest calibration certificates were checked and found that the error is with in the permissible limits.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency	As discussed above the calibration frequency is in line with the general guidance and is acceptable.

of calibration, does the selected frequency represent good monitoring practise?	
Company performing the calibration:	Endress+Hauser has provided the calibrated meter during commissioning in 2007 and internal calibration was done using a master meter during 2008 and 2009. Master meter was calibrated by an approved laboratory in Thailand. Calibration certificate of the master meter is provided to the verification team.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and found the meter is found functioning properly.
Is(are) calibration(s) valid for the whole reporting period?	Yes. As discussed above all the calibration certificates were verified.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data reported in the MR and ER sheet is verified with the log books.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the approved GS -Annex):	T_{flare} Sufficient temperature in flare detection period
Measuring frequency:	Continuously. The data is monitored by an automated system. However it is not monitored during the current verification period. Hence flare efficiency is taken as 0.
Reporting frequency:	NA
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per approved GS- annex it should be automatically logged by the online monitoring system SCADA. However this was not monitored during the current verification period.
Type of monitoring equipment:	Thermocouple
Is accuracy of the monitoring equipment as stated in the approved GS -annex? If the approved GS -annex does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	No. Kindly refer above.
Calibration frequency /interval:	Thermocouple will be replaced with a new one as soon as the reading found faulty. As per GS- annex it will be calibrated once a year.
Is the calibration interval in line with the monitoring plan of the GS -annex? If the	Yes.

registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	
Company performing the calibration:	NA. Kindly refer above.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	NA. Kindly refer above.
Is(are) calibration(s) valid for the whole reporting period?	NA
If applicable, has the reported data been cross-checked with other available data?	NA
How were the values in the monitoring report verified?	NA
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	NA

	Assessment/ Observation	
Data/Parameter: (as per the registered PDD):	Electricity consumed by waste water treatment facility over the year. EC_y	
Measuring frequency:	Continuously. The data is recorded daily in the log books by the plant operator for the internal energy consumption meter. A monthly report is generated by the local electricity board (PEA) on the electricity export and import which is measured by the export and import meters. Log books data of the internal energy meter which are used to measure the total consumption was checked and found of good quality.	
Reporting frequency:	Monthly	
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD the consumption data will be taken as per the internal meters data. However it is more appropriate to take the data provided by the local grid (PEA). Hence the monthly reading provided by the PEA were taken which are more authentic. Kindly refer table 3.3 above.	
Type of monitoring equipment:	Energy Meter S. No : 20963014 Accuracy class : ± 0.5	Internal energy meter S.No : 402786 Accuracy class : 0.2
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy class of the meters is ± 0.5. This was confirmed during the site visit and by checking the calibration certificates.	
Calibration frequency /interval:	As per the registered PDD The meters shall be	

	subjected to periodic calibration according to the equipment's specifications and applicable industrial standards. The calibration certificate of the meter is submitted to the verification team which was calibrated by the PEA/7/. The calibration certificate indicates that the meters were functioning well. Kindly refer table 3.3 above.
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	No. Kindly refer above.
Company performing the calibration:	PEA. PEA is the national electrical body which is authorized to perform the calibration of the meters.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates/7/ were checked and found the meter is found functioning properly.
Is(are) calibration(s) valid for the whole reporting period?	Yes. As discussed above all the calibration certificates were verified.
If applicable, has the reported data been cross-checked with other available data?	Yes. The net electricity supply to PEA is calculated with the PEA meter reading and the internal energy meter readings and the difference is found ~ 1.1% which can be attributed to transmission.
How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the registered PDD):	Electricity generated during year y by power generation facility EG_y
Measuring frequency:	Continuously. The data is recorded daily in the log books by the plant operator for the internal energy meter. A monthly report is generated by the local electricity board (PEA) on the electricity export and import which is measured by the export and import meters. Log books data of the internal energy meter which are used to measure EG_y was checked and found of good quality
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD the consumption data will be taken as per the internal meters data. However it is more appropriate to take the data provided by the local grid (PEA). Hence the monthly reading provided

	by the PEA were taken which are more authentic. Kindly refer table 3.3 above.	
Type of monitoring equipment:	Energy Meter S. No : 20964863 (till Deceber 2008); 20963040 (From January 2009) Accuracy class : ± 0.5	Internal Energy Meter : S.No : M10190010-00 Accuracy Class : 0.2
Is accuracy of the monitoring equipment as stated in the registered PDD? If the registered PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	Yes. The accuracy class of the meters is ± 0.5. This was confirmed after checking the calibration certificates/7/.	
Calibration frequency /interval:	As per the registered PDD The meters shall be subjected to periodic calibration according to the equipment's specifications and applicable industrial standards. The calibration certificate of the meter is submitted to the verification team which was calibrated by the PEA/7/. The calibration certificate indicates that the meters were functioning well.. Kindly refer table 3.3 above.	
Is the calibration interval in line with the monitoring plan of the registered PDD? If the registered PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	No. Kindly refer above.	
Company performing the calibration:	PEA. PEA is the national electrical body which is authorized to perform the calibration of the meters.	
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and found the meter is found functioning properly.	
Is(are) calibration(s) valid for the whole reporting period?	Yes. As discussed above all the calibration certificates were verified.	
If applicable, has the reported data been cross-checked with other available data?	Yes. The net electricity supply to PEA is calculated with the PEA meter reading and the internal energy meter readings and the difference is found ~ 1.1% which can be attributed to transmission.	
How were the values in the monitoring report verified?	Please see 3.5 and 3.6	
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6	

GS Monitoring Parameters:

	Assessment/ Observation
Data/Parameter: (as per the approved GS –Annex):	Air quality: Odour from t*he wastewater treatment plant* *Volume of biogas produced and used for combustion* PP has also submitted the air quality report/24/ which indicates all the major pollutant parameters are in the permissible limits.
Measuring frequency:	Daily
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. As per the GS–Annex the biogas generated and combusted is measured daily and recorded in the log books by the plant operator. As discussed above the monitoring personnel are found technically competent enough to measure and record the data.
Type of monitoring equipment:	Gas flow meter Type : Differential temperature flow meter Make : Endress+Hauser Accuracy : ± 1%
Is accuracy of the monitoring equipment as stated in the approved GS- Annex? If the approved GS - Annex does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy class is 1 which represents a good monitoring practice.
Calibration frequency /interval:	As per GS Annex meters shall be calibrated/7/ as per appropriate industry standards. However, the meters are calibrated once in 3 years which is inline with the latest version of the general guidance /13/. Kindly refer table 3.3 above.
Is the calibration interval in line with the monitoring plan of the approved GS- Annex? If the approved GS- Annex does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	Kindly refer above.
Company performing the calibration:	Endress+Hauser and internal calibration using a master meter during 2008 and 2009. Calibration certificate of the master meter is provided to the verification team.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and the meter is found functioning properly.
Is(are) calibration(s) valid for the whole reporting period?	Yes.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data presented in the MR and ER sheet was compared with the log book data during the site visit.

How were the values in the monitoring report verified?	Please see 3.5 and 3.6
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Please see 3.5 and 3.6

	Assessment/ Observation
Data/Parameter: (as per the approved GS- Annex):	Employment (numbers): Number of employed staff who come from the local community and the level of income generation into the area.
Way of monitoring agreed by PPs: Number of employees and the level of income generation will be recorded through salary payment records.	PP has submitted information sheet on the employees and the payments made by the company to the employees./25/ However, the PP - P&Papop doesn't hire the employees directly so the accounting provisions of payments to employees are not under its jurisdiction where as, they pay to the managing company P&Papop on the basis of invoice/25/. The contract between the PP - P&Papop and the managing company Papop was also checked during the validation. As all the required documents were provided and the available personnel onsite were interviewed during the site visit, verification team is convinced that the PP is monitoring this parameter as per approved GS –Annex.

	Assessment/ Observation
Data/Parameter: (as per the approved GS- Annex):	Power generation capacity of project activity
Measuring frequency:	Continuously. The data is recorded daily in the log books by the plant operator. The verification team has checked the log books and interviewed the site personnel and found the provided data in the ER sheet is consistent with the log books and plant operating personnel are competent.
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the registered PDD the consumption data will be taken as per the internal meters data. However it is more appropriate to take the data provided by the local grid (PEA). Hence the monthly reading provided by the PEA were taken which are more authentic.

Type of monitoring equipment:	There is no capacity additions observed
Is accuracy of the monitoring equipment as stated in the approved GS- Annex? If the approved GS- Annex does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy class of the meters is ± 0.5. This was confirmed after checking the calibration certificates. There are no additional equipments or replacement of existing equipments. Verification team confirms this by conducting a physical site inspection.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Kindly refer above.

	Assessment/ Observation
Data/Parameter: (as per the approved GS- Annex):	Occurrence of wastewater overflow and its compensation measure
Way of monitoring: As per the approved GS – annex, internal report will be prepared and recorded whenever such event occurs and the stakeholders will compensated as per document provided during validation.	During verification site visit, PP has informed that there were no such incidences. Verification team has interviewed the local stakeholders (referred in table2.2) to confirm the same and convinced that there were was no wastewater overflow during the current verification period.

	Assessment/ Observation
Data/Parameter: (as per the approved GS- Annex):	Amount of treated wastewater released to the villagers (m^3)
Way of monitoring: As per the GS- Annex, In the absence of volumetric wastewater flow meter to monitor the same, weighing bridge is used to measure the weight of vehicle before and after it transport wastewater out of the plant; the difference is deemed as the amount of wastewater released to the villagers. In recording this parameter, plant operators shall manually archive the monitored data onto hard copy log sheets then transfer to the computer for electronic storage.	During verification site visit, PP has informed that there were no such incidences. Verification team has interviewed the local stakeholders (referred in table2.2) to confirm the same and convinced that there were was no wastewater release to the villagers during the current verification period.

3.5 Assessment of data and calculation of GHG Emission Reductions

The document review and the site visit revealed that a complete set of data for the specified monitoring period is available GHG emissions reductions for the project and the emission reductions were correctly calculated using the formulae stated in the registered PDD and as per the applied methodologies. The verification team has reviewed the emission reduction (ER) spread sheet and checked all the formulae.

As per the MP of the registered PDD and the approved GS –Annex all the parameters mentioned in section 3.4 should be monitored and they were all monitored during the current verification period.

The emission factor is calculated ex-ante. The baseline grid emission factor 0.5057 is applied and is in-line with the registered PDD. All the ex-ante parameters are also stated in the MR and all were assessed during the validation. Flare efficiency is taken as zero as it was not monitored during the current verification period.

As per the applied methodology AMS.III.H version 09, para 34 shall be applied of calculation of emission reduction. A clarification from the UNFCCC meth panel was sought on that and as per the clarification response: "The SSC WG recommended a revision to AMS-III.H at this meeting, clarifying how emission reductions are to be calculated ex ante and ex post for the various scenarios in the methodology. These recommended revisions include the requirement that emission reductions shall be the lowest of 1) the amount of biogas recovered and fuelled or flared (MDy) during the crediting period, that is monitored ex post and 2) ex post calculated baseline, project and leakage emissions based on actual monitored data for the project activity."

As per the above mentioned requirement, PPs have calculated and compared the ex-ante and ex-post emission reductions and considered the conservative of both as the final emission reductions and this is transparently presented in the MR and ER sheet.

The emission reductions being claimed during the current periodic verification: 2008-11-10 to 2009-11-09 are lower than the estimated emission reductions in the registered PDD, as given in the table below.

Period	As per PDD estimated ERs	Monitoring report (achieved ERs)
Emission Reductions/anum	41701	22664
% Deviation (+/-)	-	~(-) 45.65%

The reason of the reduction in emission reductions is due to the less quantity of wastewater with varying COD loading had been treated during the verification period which has led to the less biogas production and power generation.

3.6 Monitoring Management and quality assurance

The allocation of responsibilities is described in the MR and the same was found implanted during verification site visit. During the site visit all the required plant records and log books were verified and

found the data is consistent with the provided MR and ER sheet. Hence, the DOE confirms that the calculations laid down in the monitoring report/6/ are in line with the actual log book data/10/. Training records of the employees were also made available to the verification team during the site visit/20/.

The verification team has observed and found that the organisation structure is followed as per the submitted final MR/6/. Moreover it was also found that competent staff is employed by the project participants and they were interviewed to assess how they perform the monitoring and maintain the data. The verification team is satisfied with the quality the staff, data and operational system.

All internal data are subjected to QA/QC measures. During verification site visit the verification team has verified the various documents which are included in the references and interviewed the personnel stated in Table 2.2 above. Verification team is convinced that the PPs are following the required QA-QC measures as per the monitoring plan of the registered PDD. All monitored data are archived in Physical and Electronic form. The data will be kept for the whole crediting period and additional 2 years as given in the registered PDD/4/.

As discussed above the, verification team concludes that management and operational system of the project is implemented and running well to ensure data required to calculate the emission reductions, which are discussed in section 3.1-3.5.

4 VERIFICATION STATEMENT

Germanischer Lloyd Certification GmbH (GLC) has performed the pre CDM GS-VER verification of the project: "Bangna Starch Wastewater Treatment and Biogas Utilization Project", with regard to the relevant requirements for GS- and CDM project activities. The project reduces GHG emissions due to methane avoidance from the wastewater treatment and power generation from the biogas generated from the wastewater treatment process. It displaces an equivalent amount of electricity, which would have otherwise been generated by the fossil fuel based grid. This verification covers the period from 2008-11-10 to 2009-11-09 (including both days).

P & Papop Renewable Co. Ltd. and South Pole Carbon Asset Management Ltd. are responsible for the collection of data in accordance with the validated monitoring plan and the reporting of GHG emission reductions from the project.

It is GLC's responsibility to express an independent verification statement on the reported GHG emission reductions from the project. GLC does not express any opinion on the selected baseline scenario or on the validated and registered PDD.

GLC conducted the verification on the basis of the monitoring methodologies AMS.III.H, version 09 " Methane Recovery in Wastewater Treatment" and AMS-I.D "Grid connected renewable electricity generation" (Version 13), the monitoring plan included in the PDD and GS –Annex of the project and the monitoring report of "2008-11-10, version 03 of the monitoring report".

GLC's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. GLC planned and performed the verification by obtaining evidence and other information and explanations that GLC considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In GLC's opinion, the GHG emissions reduction for the Wastewater treatment Project as reported in the Monitoring Report issued on "2010-08-06, version 03 of the monitoring report" are calculated without material misstatements in a conservative and appropriate manner.

The GHG emission reductions were correctly calculated on the basis of the approved monitoring methodologies AMS.III.G, version 09 and AMS.I.D version 13 and monitoring plan of the registered PDD.

Germanischer Lloyd Certification GmbH herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Emission reductions 2008	2562	t CO_2e
Emission reductions 2009	20102	t CO_2e
Emission Reductions Total	22664	t CO_2e

Srikanth Meesa	Markus Weber
Verification Team Leader	Final approval
Mumbai, 2010- 09-21	Hamburg, 2010-09-21

5. REFERENCES

Reference	Document
1.	Clean Development Mechanism Validation and Verification Manual (Version 01.2 as per EB 55)
2.	GS VVM for voluntary offset projects dated June 2007 Clarification date 19th December 2007. Mail from GS to the PP regarding the pre-CDM VER eligibility Mail from the GS reading the applicability of GS version 01 for the projects validated applying GS version 01.
3.	Approved GS –Annex, version 03, revision dated 7 April 2010 which is registered on 25 June 2010. (https://gs1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=565)
4.	PDD of registered CDM project (UNFCCC ref. no. : 2556): "Bangna Starch Wastewater Treatment and Biogas Utilization Project" version 3.1, dated 2010-09-25. (http://cdm.unfccc.int/Projects/DB/RWTUV1241593452.75/view)
5.	Validation Report for CDM project (UNFCCC ref. no. : 2556) "Bangna Starch Wastewater Treatment and Biogas Utilization Project" dated 2009-11-10.
6.	Monitoring Report of the GS –VER project "Bangna Starch Wastewater Treatment and Biogas Utilization Project" version 01, dated 2010-04-21 Monitoring Report of the GS –VER project "Bangna Starch Wastewater Treatment and Biogas Utilization Project" version 02, dated 2010-07-02 Monitoring Report of the GS –VER project "Bangna Starch Wastewater Treatment and Biogas Utilization Project" version 03, dated 2010-08-06. Monitoring Report of the GS –VER project "Bangna Starch Wastewater Treatment and Biogas Utilization Project" version 04, dated 2010-09-06. Monitoring Report of the GS –VER project "Bangna Starch Wastewater Treatment and Biogas Utilization Project" version 05, dated 2010-09-20.
7.	Calibration certificates of monitoring equipments for the current verification period (2008-11-10-2009-11-09) • Wastewater flow meter calibrated during March 2007 and November 2009. • Gas flow meters calibrated during May 2007, August 2008 and November 2009. • Master gas meters used to calibrate the gas flow meters during 2008 and 2009. • Portable bio-gas analysers during July 2006, June 2009 and January 2009 by external agency. • Internal calibration records (once a week) of the portable gas analyzers. • COD measuring equipment calibrated using a standard solution before taking the reading External Energy meters during February 2009 and May 2006. • Mail from the gas anlayzer manufacturer stating that internal calibration of once in a week is

Reference	Document
	acceptable and will not affect the quality of the methane content.
8.	Commissioning certificates for plant dated December 2007. Proof of first biogas use registration January 2008.
9.	Technical specifications of the project activity main components such as USAB and the Gen sets.
10.	Log book data • COD inet, COD outlet • Quantity of wastewater entering the treatment system • Quanity of biogas generation, consumed by the gas engines and gas flared • Electricity generation and consumption monitored by the internal meters.
11.	PEA monthly report on electricity export and import for the current verification period (2008-11-10-2009-11-09)
12.	Monthly data on COD of the wastewater delivered to the river measured by third party for the current verification period.
13.	General guidance to SSC CDM methodologies, version 14.1 EB 55. (http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf)
14.	AMS.III.H, version 09 " Methane Recovery in Wastewater Treatment" AMS-I.D, version 13 "Grid connected renewable electricity generation"
15.	Germanischer Lloyd Certification GmbH CDM GHG Services Manual (incl. procedures and forms)
16.	IPCC: 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
17.	UNFCCC: Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998)
18.	UNFCCC: Decision 3/CMP. 1 (Marrakesh – Accords)
19.	Emission reduction calculation spreadsheet" version 01, dated 2010-04-21 Emission reduction calculation spreadsheet" version 02, dated 2010-07-02 Emission reduction calculation spreadsheet" version 03, dated 2010-08-06 Emission reduction calculation spreadsheet" version 04, dated 2010-09-06 Emission reduction calculation spreadsheet" version 05, dated 2010-09-20
20.	Information on the experience of plant personnel and skilled people Training records of the employees
21.	Process flow diagram

Reference	Document
22.	Water analysis report from laboratories
23.	Operation and Maintenance procedures of UASB, gas engines and the flaring system.
24.	Air pollution certificates before and after the project activity.
25.	Information sheet of the employees and their level of income Invoice sheet sent by the management company Contract between the management company and the PP : Papop dated
26.	Site visit Photographs

ANNEX: FINDINGS LIST

(RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS)

Corrective Action Requests (CAR), Clarification Requests (CL) and Forward Action Requests (FAR)

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
CAR 1 The PPs are requested to correct the commissioning date of the project activity in section 1.2 of the submitted monitoring report (MR), with respect to the provided evidence during the verification site visit.	03/07/2010	The MR has been revised to include the commissioning date of UASB and gas engines. The supporting documents are provided during site visit.	06/08/2010	OK. The response is reflected in the revised MR. Hence the CAR is closed.	09/08/2010
CAR 2 PPs are requested to revise section 4.2 of the MR to include the following points for all the monitoring parameters in order to meet the requirements stated in the latest MR template provided by the CDM EB (EB 54). • Monitoring equipment type, accuracy class, serial number, calibration frequency, date of calibration and validity. • Measuring/reading/recording frequency.	03/07/2010	The project proponent has revised the MR to include the suggested information. The details are as below: • The MR is improved as per the suggested format and the relevant information on meters is included in the revised version. • The measuring and recording frequency of the parameters is included in the monitoring	06/08/2010	OK. The revised contains the information of equipment type, serial number and date of calibration and its validity. Measuring and recording frequency is also included in the revised MR. Hence the CAR is closed.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
		report.			
CAR 3 PPs are requested to address the following points related to the gap in the calibration frequency during the chosen monitoring period which was observed during the verification site visit. Refer the guideline on the calibration frequency requirements (EB 48, Annex 60). • The wastewater flow meter was calibrated in March 2007 and in November 2009. However as per the registered monitoring plan it should be calibrated once a year. • There is a gap of 3 -4 months in all gas flow meters calibration frequency. However it should undergo a periodic calibration once a year.	03/07/2010	As per the registered monitoring plan, the wastewater flow meter and gas flow meters shall be calibrated annually. However prior to the project registration, the registered monitoring plan is not implemented completely. The project commissioning takes place in end of year 2007. For the period prior to project registration the project proponent refers to the EB 55 Annex-35 and the latest calibrations available. As per EB 55, Annex-35; " *Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in 3 years;"* For the waste water flow meters	06/08/2010	OK. All calibration certificates (both liquid and gas flow meters) were checked and found that they all are calibrated at least once in 3 years; moreover the latest calibration certificates are also found with in the permissible error limits. This deviation in the calibration frequency is acceptable as it is meeting the requirements of guideline referred in EB 55 annex 35. Hence the CAR is closed.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
		and gas flow meters no applicable manufacturer specifications are applicable for the calibration period. • For the wastewater flow meter the meters are calibrated in March 2007 and November 2009, which is within 3 years and the latest calibration demonstrates the error reported is in range of the standard error of equipment. The latest calibration reports 0.5% error, which is within the range of standard error. • For the gas flow meters the calibrations are done in Aug 2008 and Nov 2009. The errors reported are lower than standard error and the calibrations take place within 3 years of previous calibrations.			

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
		Thereby project proponent believes, that for current monitoring period the measurements shall be deemed accurate and without any potential errors.			
CAR 4 Verification team has observed the following deviations in relation to the implementation of the registered monitoring plan (MP) in the current monitoring period. Hence the PPs are requested to address these deviations with respect to the GS requirements. • It is stated in the registered MP that online measurement of methane will be done. However 2 portable gas analysers were used to measure the methane content. Now, it shall be calculated on 95 % confidential level as per para 36 of the applied monitoring methodology AMS.III.H (version	03/07/2010	The deviations in the monitoring period, in respect to the registered monitoring plan are explained as below: • The registered MP states that, online methane analyzer shall be used to monitor the methane percentage in biogas; however the online meter is not available. The project proponent uses the portable methane analyzer to regularly monitor the methane percentage in the biogas. The 95% confidence interval is established the excel sheet and the	06/08/2010	OK. Methane content is now calculated on 95% confidence level in the revised MR and the ER sheet. This deviation is acceptable as it is inline with Para 36 of AMS.III.H version 09.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
09). • SCADA will be used to measure the wastewater and gas flow quantity. However it was recorded manually from the flow meters during the monitoring period. • COD sampling will be performed at 95 % confidence level. However the COD is sampled daily and the daily measurement of COD values were made available.		conservative value is used for calculation purposes. • During the monitoring period, the SCADA system is still under stabilization, thereby the values from the meters are recorded directly from the flow meters. The readings are taken for totalizer values; and checked on daily basis. In case of any human error on a particular day; the same is noticed or adjusted on next day as the reading for totalizer is recorded. • Daily sampling of waste water for the COD monitoring is in line with the registered monitoring plan. The 95% sampling for COD		OK. The provided response adequately addresses the finding. During the verification site visit, it was also found a competent team is in place on site to record and verify the data. OK. As the COD is measured daily, there is no need of sampling.	

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
• It is stated that SCADA will be used to monitor continuously to measure the sufficient temperature and the period of enclosed flare.		is an editorial mistake. However the relevance of 95% would come into picture if the daily readings are not available and 95% confidence limits are estimated to be used conservatively for estimating emission reductions. • The SCADA is connected to the thermocouple and is capable of monitoring the temperature readings. During the monitoring period, the SCADA is not stabilized and hence the temperature recordings are not available. To be conservative flare efficiency of 0% is used for the monitoring period.		OK. For the current verification period the flare efficiency is considered as 0% which is conservative. The CAR is closed.	
CAR 5 In section 4.2 of the MR it is mentioned that the flare efficiency is 0 as there is no	03/07/2010	The MR and the excel sheet are revised for flare efficiency to be	06/08/2010	OK. The revision is reflected in the revised MR and the ER sheet. The CAR is closed.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
arrangement to monitor it. The same was also witnessed during the verification site visit. However the provided emission reduction calculation sheet and in section 7.2 of the MR flare efficiency is stated as 50%. The PPs are requested to correct it and send the revised documents.		0%.			
CAR 6 The Gold Standard (GS) monitoring parameters stated in section 7.3 of the MR shall be corrected with respect to the finally approved GS- Annex submitted to the GS registry.	03/07/2010	The final version of GS-Annex has been provided. The registration date is on 25 June 2010. The GS monitoring parameters are included in line with GS-Annex.	06/08/2010	OK. Now, the revised MR is in-line with final GS –annex registered on 25 June 2010. The CAR is closed.	09/08/2010
CAR 7 As per Para 18 of the applied monitoring methodology AMS.I.D (version 13) the amount of electricity generated using the biomass fuels (biogas) shall be compared with amount of electricity generated calculating the specific fuel consumption and amount of fuel used. However this point is not addressed	03/07/2010	The comparison between the actual amount of energy generated and the energy generation potential is described in the excel sheet. The calculation shows that, the gas engines are not over performing. The minor under performance is due to	06/08/2010	OK. The provided calculation was verified to calculate the specific fuel consumption and the actual consumption using conversion and found the actual values are lesser than the designed values. Thus the CAR is closed.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
neither in the registered MP nor in the MR. The PPs are requested to address the same.		operation at 80% loads (compared to 100% design load) and actual efficiency would always be lower than design efficiency.			
CAR 8 Electricity generation and consumption data was taken from the internal meters available in the plant as per the registered monitoring plan in the MR section 4.2. However during the verification site visit, it was found and discussed it would be authentic to take the electricity generation and consumption data recorded at the point of transmission to the grid. As the local grid authority would provide the monthly generation and consumption record sheet to the PP. Hence this should be corrected in the revised MR and submit all the necessary monthly generation and consumption record sheets to the verification team.	03/07/2010	The monthly reports for electricity have been provided. The value for EG_y is taken from export value in the monthly metering report done by PEA. Similarly EC_y is also used form same report. For months of Nov 2008 and Nov 2009, as these months are part of monitoring period only partially, EG_y is taken from internal meter and EC_y is taken as higher of the internal consumption meter or the consumption from PEA for complete month. This ensures conservativeness of net energy supplied to the grid in over all emission reduction estimation.	06/08/2010	All the required data such as PEA monthly meter readings are submitted to the verification team. The Provided PPA does not contain any information on calibration of the energy meters and it's frequency. PPs have provided the calibration certifiactes which indicates that the meters were functioning well.	09/08/2010
CAR 9	03/07/2010		06/08/2010	OK. The corrections are made in the	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
PPs are requested to correct the data provided on COD in the submitted emission reduction calculation sheet : The COD data on 22 January 2009 is not clear in the provided copy of the log book record. Moreover the provided data on 22 January is the actual data of 23 January 2010. From this date till the end of monitoring period the selected day's COD data shows the data of the next day. As per the log sheet there is no COD data on 30 June 2009.		The log book has been provided and the value for 22nd January 2009 is taken as 0; to be conservative in terms of emission reduction estimations. The COD reading for 30th June 2009 is corrected to 0. The COD record in the calculation sheet has been corrected.		revised emission reduction calculation sheet. Thus the CAR is closed.	
CAR 10 PPs are requested to correct the data provided on wastewater flow and gas flow in the submitted emission reduction calculation sheet with respect to the findings discussed below : • Wastewater flow data shall be checked with log book and corrected for the months: 14, 19, 22, 24 and	03/07/2010	The data in calculation sheet has been corrected based on the log book as commented by DOE. The values for the mentioned dates are checked and corrected in the revised version of the excel sheet and monitoring report.	06/08/2010	All the required corrections have been made in the revised emission reduction sheet. Verifcation team has checked all the reading once again and they are found consistent with the log books. Hence the CAR is closed.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
28 November, 6 and 30 December in 2008, 11 April, 27 and 30 June, 8 August and 23 October in 2009. • Gas flow meter (Qgen total) (GM1) data shall be checked with the log book for the following dates and corrected. 04- 06 December and 1, 2, 4 and 5 June and 8 August in 2009. • Gas flow meter (Qgenset) (GM2) data shall be checked with the log book for the following dates and corrected. Whole 2008 data and 30 June, 06 and 07 February in 2009. • Data provided related to the quantity of biogas flared is not matching with the provided log book data and should be corrected.					
CAR 11 For the sake of transparency and completeness, PPs are requested to correct the following in the MR.	03/07/2010	As per the request the project layout diagram is improved.	06/08/2010	OK. The layout is improved to address the findings in the MR and it adequately represents the project activity for the current verification period. The CAR is closed.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
• The provided Fig 1: project layout should be revised to include the monitoring location of both energy generation and consumption i.e. the transmission point of the grid. • State clearly that the wastewater is discharged to the river instead of environment.					
CAR 12 During the verification site visit, it was informed and discussed that the value of the COD discharged will be changed from 120 mg/l to 150 mg/l to make the values more conservative as some months data shows the COD value is more than 120 mg/l. Hence the PPs are requested to revise the same in the MR.	03/07/2010	The value of COD discharged has been changed to 170 mg/l, which is a maximum value during monitoring period, to be conservative. As the daily values or COD discharge are not available, the highest recorded value is used for the estimation of project emissions.	06/08/2010	OK. The COD value is conservatively applied. This CAR is closed.	09/08/2010

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)*	Date *(dd/mm/yyyy)*	Project Participants Response ***This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence***	Date *(dd/mm/yyyy)*	GLC Assessment ***The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.***	Date *(dd/mm/yyyy)*
CL 1 Two portable gas analysers were used. It is not clear from which date the old analyser was used. The old analyser was calibrated in January 2006 and the new one is calibrated in January 2009. However these analysers should be calibrated once a year as per the manufacturer. In this regard the PPs are requested to clarify how the measured methane content data during the monitoring period is reliable and accurate.	03/07/2010	The first portable gas analyser was used from October 2007 to February 2009. The manufacturer's specification requires the analyzer to be serviced once every 12 months. It also recommends field calibration is required at regular intervals. The zero-check is required to be performed on daily basis. In case the zero tests fails the instrument shall be returned back to the manufacturer. In this case the gas analyzer is tested in June 2006 and June 2009, i.e. at a gap of three years which is not in line with manufacturer's specification; however the test report shows satisfactory results. This implies that gas analyzer is working fine. The internal field calibrations are done regularly; usually on weekly basis if the biogas plant is operational. The zero check is performed daily.		As per the provided manufacturer's manual the portable gas analyzer should be calibrated and serviced once in 6 months. It was also informed that the analyzers are zero checked before taking the reading and one in a week the analyser is calibrated internally using a standard gas. All this data is submitted to the verification team. However verification team has interviewed the manufactuer Geotech " whether the internal calibration would be acceptable ". The techincal staff of the manufacturer have confimed that the if the PP is performing the internal calibration as per the procedure provided in the calibration manual it would be of good quality. In this case PP is calibrating the anlyser using a standard gas once in a week. This calibration reords were also submitted and found that the error is with in the permissible limits. This indicates that the data provided on methane content is of good quality. Hence the CL is	09/08/2010

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		For the second gas analyzer, the instrument is used since March 2009, and the test report is available for January 2009. The zero check is done daily for this instrument as well. The internal field calibrations are also done with standard gas mixture for this equipment as demonstrated during site visit.		closed.	
CL 2 PPs are requested to clarify the following point : The provided COD is data is varying highly i.e. as lowest 4560 mg/l to highest 34,000 mg/l. Why there is such a huge deviation in the measured COD data.	03/07/2010	The reason for varying COD was discussed during the site visit as following: The COD content of waste water depends on the amount of organic content in waste water after starch manufacture. The efficiency of starch extraction is an important factor deciding the content of organics in the waste water. On some days, there could be some loss of starch into the waste water, which increases the COD	06/08/2010	OK. As discussed in the response, the reason for variation in COD values was discussed. Verification team was informed that the variation in the COD values is due to changes in the starch production process. Fundamentally, during production some days there can be more organic content and some days it can be less. Hence verification team is convinced with the response provided by the PPs. Thus the CL is closed.	09/08/2010

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		of waste water beyond limit, and on some days discharge of water at starch factory may lead to lowering of COD concentration in waste water.			
CL 3 The PPs are requested to clarify the following points : • The data on 24 November 2008 and 29 April 2009 was found corrected two times. Justify the reliability and credibility of the data. • As all the data is recorded, transferred manually to the electronic format. How the errors due to manual intervention can be avoided.	03/07/2010	• On some days, during the check by plant manager, if a reading is noted to be not clear enough. The same is over written to avoid confusion. The over writing doesn't imply that log readings have been changed retroactively, but rewritten. In case of 24th November 2008, the COD value is taken as zero for conservative approach to estimation of emission reductions. • The registered monitoring plan for the project activity and the actual plan are to	06/08/2010	OK. The values on 24 November and 29 April are taken as 0 is and 13,360 which were available on the log sheet in the revised ER sheet. OK. Though there is no online data recording and transfer, the data recorded by the plant personnel is verified by the senior personnel. During the site visit it was also found that the competent staff is employed to record and maintain the data of the	09/08/2010

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		use SCADA system to capture the data on regular basis from the continuous basis. This would ensure limiting the errors caused due to human intervention. However during this monitoring period, the automated records are not available as SCADA system is not fully stable. For the current monitoring period, the errors are addressed as follows: - The plant manager checks the data on regular basis and after the readings are input in excel from log sheet a recheck is done. This reduces the scope of errors during data transfer. - Since the totalizer		monitoring parameters. Moreover the totalizer readings were made available to the verification team. Hence verification team is fully convinced that the provided data is of good quality. Thus the CL is closed.	

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		readings are reported in log sheets, even if a wrong value is entered on one day, the same would come under suspicion on the following day when a new totalized value is recorded. This ensures the errors are minimized over a period of time such as a month or a year.			