

VERIFICATION REPORT OF “SD BIOSUPPLY WASTEWATER TREATMENT AND BIOGAS UTILIZATION PROJECT”



Document Prepared By: Germanischer Lloyd Certification GmbH

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Version	03

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Summary:

Germanischer Lloyd Certification GmbH (GLC) has performed the VCS verification of the project “SD Biosupply Wastewater Treatment and Biogas Utilization Project” with regard to the relevant requirements for VCS project activities.

The project was validated and registered with reference no. 416 under VCS (Verified Carbon Standard) program on 06-05-2010. This is the 2nd verification of this project which covers the period from 01-01-2009 to 31-05-2012.

The project activity involves treatment of wastewater produced in starch manufacturing process at Somdej Flour Mill Co. Ltd. through UASB (Up-flow Anaerobic Sludge Blanket) technology. The use of UASB to treat the wastewater generated in the plant enables capturing of methane produced during the process as well as meets the effluent standards. The captured methane is utilized as fuel in existing heat generating devices in the starch factory replacing heavy fuel oil. Surplus methane, if any, is flared in an open flare.

The methodologies applied for the project to estimate the GHG emission reduction is **AMS III.H., version 12 – Methane Recovery in Wastewater Treatment** and **AMS I.C., version 14 – Thermal energy production with or without electricity**^{/10/}.

The project is verified against the VCS Version 3^{/2/}. A risk based approach has been followed in this verification. In the course of verification, 12 Corrective Action Requests (CAR) and 2 Clarification Request (CL) have been raised. All the CARs and CLs have been closed out successfully. The verification is based on the monitoring plan of registered VCS Project Description document (VCS PD)^{/3/}, requirements of VCS (VCS Standard and VCS Program Guide of VCS Version 3)^{/2/} and CDM Validation and Verification Standard^{/1/}. The project document is found at VCS registry under the Project ID 416 which can be accessible by below given link: <https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=416&lat=16.677833&lon=103.805464&bp=1>

Also Monitoring report (MR)^{/4/}, Emission reduction calculation spread sheet (ER sheet)^{/5/}, Project Description (VCS PD)^{/3/} and other supporting documents have been made available to the verification team by project participants.

As a result of the verification, the verifiers confirm that:

The GHG emission reduction in the verification period from 01-01-2009 to 31-05-2012, including both the days, is: **98,903 tCO₂e**.

The emission reduction during each vintage of the monitoring period is as below:

Emission reductions in 2009:	34,311	t CO ₂ e
Emission reductions in 2010:	24,475	t CO ₂ e
Emission reductions in 2011:	27,881	t CO ₂ e
Emission reductions in 2012:	12,236	t CO ₂ e
(From 01-01-2012 to 31-05-2012)		
Total Emission Reductions during monitoring period:	98,903	t CO₂e

GLC does not assume any responsibility towards the issuance and utilization of VCUs hereby verified and certified. Request for issuance of VCUs shall be made by the project proponent to an approved VCS Program Registry based on the requirements set out under the most recent version of the VCS Program Guidelines clause on VCS Registration. The verification of reported emission reductions is based on the information made available to GLC and the engagement conditions detailed in this report. Hence, GLC cannot be held liable by any party for decisions made or not made based on this report.

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1 INTRODUCTION

South Pole Carbon Asset Management Ltd. has commissioned Germanischer Lloyd Certification GmbH (GLC) to carry out the 2nd verification of the emission reductions reported for the VCS project activity “SD Biosupply Wastewater Treatment and Biogas Utilization Project” with regard to the relevant requirements for VCS program as per the VCS version 3⁽²⁾.

This verification report summarizes:

- (i) The findings from the VCS verification for the current monitoring period from 01-01-2009 to 31-05-2012; and
- (ii) VCU certification statement for the emission reductions.

1.1 Objective

VCS Verification is the independent review and ex post determination by a Verification Entity or Designated Operational Entity (DOE) (which is approved/registered as a verifier by VCSA) of the monitored reductions in GHG emissions that have occurred as a result of the registered VCS project activity during the defined verification period.

VCS Certification is the written assurance by a Certification Entity (which is approved/ registered as a certifier by VCSA) that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the “SD Biosupply Wastewater Treatment and Biogas Utilization Project” for the monitoring period covering from 01-01-2009 to 31-05-2012.

One of the objectives is also to confirm that the monitoring system is implemented and fully functional to generate Verified Carbon Units (VCUs) without any double counting.

1.2 Scope and Criteria

The scope of the verification is:

- To ensure that the project activity has been implemented and operated as per the latest version of the VCS PD and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place.
- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan as per the latest version of the VCS PD.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from significant misstatement.

- To verify that the reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

The project design, its eligibility as project activity under VCS guidelines and the correct application of the approved baseline and monitoring methodologies for small-scale CDM project activities; AMS III.H., version 12: Methane Recovery in Wastewater Treatment and AMS I.C., version 14: Thermal energy production with or without electricity^{/10/} have already been validated by the DOE 'SGS' (Report No. CCP.VOL0307 issued on 19-11-2009)^{/6/}. As stated in the validation report, the validation opinion of "SGS" was that the project activity as described in the registered VCS PD dated 19-11-2009 meets all VCS Program requirements as set out in the VCSA Rules (Voluntary Carbon Standard – 2007 and Voluntary Carbon Standard Program Guidelines 2007) and all relevant host country criteria.

The verification team has focused on the identification of significant reporting risks and verifying the mitigation measures for these risks based on the recommendations in the "Validation and Verification Standard"^{/1/}, "ISO 14064-3 Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions and employed a risk-based approach"^{/11/}.

According to the requirements and guidance of VCS Version 3^{/2/}, the criteria of this verification include the relevant applicable rules and steps for verification under the CDM excluding the following:

- The public availability of the VER/VCS Monitoring Report;
- Confirmation of contribution of the project activity towards sustainable development in the country where the project is located
- The public availability of the Verification Report and VCU Certification Statement.

1.3 Level of assurance

As the VCS Version 3 only recognizes verified emission reductions, GLC has focused on providing a reasonable level of assurance that the emission reduction calculation methodology used is appropriate and correctly applied, and that emission reductions have been accurately monitored.

In accordance with the recommendation in the Validation and Verification Standard, GLC may "discount verified emission reductions or requests a discount of these by using conservative assumptions for uncertainties in emission reduction calculations that cannot be fully quantified or that cannot give a desired level of assurance". For verifying/certifying VCUs, the desired level of assurance was based on the combined quantitative assessment of the accuracy of monitoring project performance and the identification of material risks. For this verification, GLC is able to give a reasonable level of assurance.

1.4 Summary Description of the Project

The project activity involves installation of an anaerobic wastewater treatment facility at Somdej Flour Mill Co. Ltd., a starch manufacturing plant in Thailand.

The starch plant has a total production capacity of 300 tones of native starch per day generating approximately 2000 m³ of wastewater every production day. Prior to project implementation, the waste water was treated with an open lagoon based pond system with gravitational flow (cascading flow through 8 lagoons). The minimum depth of these ponds being more than 2 m and the average atmospheric temperature in the region about 28°C, these conditions resulted in anaerobic environment within the ponds resulting in methane generation from the organic content of the wastewater, characterized by its COD, which was released into the atmosphere.

The use of UASB technology to treat wastewater enables not only the avoidance of methane into the atmosphere but also capturing of methane produced and meeting the effluent standards. The captured methane (or biogas) is utilized as fuel in existing heat generating devices (boilers) in the plant replacing heavy fuel oil and the surplus biogas, if any, is flared into the atmosphere through an open flare, thereby contributing to green house gas (GHG) emission reduction.

There are two boilers at the starch factory with a total installed capacity of 7.268 MW_{th} in which the biogas is used as fuel along with HFO. The boilers were retrofitted to fire dual fuel during the project implementation. During the 2nd monitoring period the boilers were replaced with new boilers; one in 2010 and the other in 2012.

As per the registered VCS PD (VCS Ref. No: 416) of the VCS project, baseline emissions are calculated as the sum of fugitive methane emissions from lagoons in the baseline case and CO₂ emissions by fossil fuel usage in the boilers in the absence of the project activity. Project emissions are calculated as the fugitive methane emissions from the project activity, the electricity consumption and the fossil fuel consumption in boilers in present scenario. The emission reduction is calculated as the difference of baseline emissions and the project emissions as the leakage emissions are considered to be negligible for the project activity as per the applied methodologies.

The total emission reduction for the 2nd verification period from 01-01-2009 to 31-05-2012 is 98,903 tCO₂e. The emission reductions are calculated conservatively as per the applied methodologies.

Further background information on the project activity can be found in the VCS Project Design document (VCS PD) as well as the Validation report which are available on the VCS website:

<https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=416&lat=16.677833&lon=103.805464&bp=1>

The 1st verification corresponds to the monitoring period from 28-03-2006 to 31-12-2008^{7/}. The Verification report and Monitoring Report of the 1st verification are also available on the VCS website at the link mentioned above.

The project activity was implemented at starch manufacturing facility of Somdej Flour Mill co., Ltd., located at 99 Moo 10, Somdej-Khuchinarai Road, Kambong sub-district, Huai Phueng district, Kalasin, Thailand.

Main components of the project activity include Acidification ponds, UASB, Gas storage pond, Thermal oil boilers, Cascading open lagoons system (Evaporation ponds) and Open flaring system.

The project characteristics are as mentioned below:

Item	Data
Title of the project activity	SD Biosupply Wastewater Treatment and Biogas Utilization Project
Project Location (specific Address, Country)	Address: 99 Moo 10, Somdej-Khuchinarai Road, Kambong sub-district, Huai Phueng district, Kalasin, Thailand Country: Thailand Latitude: 16° 40'40.20"N (16.6778) Longitude: 103° 48' 19.67"E (103.8055)
Project proponents	SD Biosupply Co., Ltd
	South Pole Carbon Asset Management Ltd.
Project Entities	SD Biosupply Co., Ltd. 113 Soi Chokchaijonjamrern, Rama III Road, Bangpongpan, Yannawa, Bangkok 10120 Thailand
	South Pole Carbon Asset Management Ltd., Technoparkstrasse 1 Zurich -8005 Switzerland
Applied Methodologies	AMS III.H., version 12: Methane Recovery in Wastewater Treatment AMS I.C., version 14: Thermal energy production with or without electricity
Sectoral Scope	Sectoral Scope 13 : Waste handling and disposal Sectoral Scope 1: Energy Industries
Project crediting period	From 28-03-2006 to 27-03-2016
Period verified in this verification	From 01-01-2009 to 31-05-2012

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

2.1 Validation Process

NA

2.2 Validation Findings

2.2.1 Gap Validation

NA

2.2.2 Methodology Deviations

NA

2.2.3 New Project Activity Instances

Not applicable since this is not a grouped project

2.3 Validation Conclusion

NA

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification process was carried out inline with the requirements VCS Version3 ^{/2/}. In addition, the verification team followed the guidelines of the CDM Validation and Verification Standard ^{/1/}. Standard auditing techniques and GLC's CDM Procedures^{/32/} were also applied during the verification. The verification team performed first a desk review, followed by an on-site visit to review the project realization.

The verification process was based on assessment of the validated VCS Project Description document (VCS PD)^{/3/}, the monitoring report^{/4/}, emission reduction calculation spreadsheet (ER sheet)^{/5/}, supporting documents made available to the verification team and information collected through performing interviews during the on-site assessment. Furthermore publicly available information was considered as far as available and required

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

- Requirements and guidance of VCS Version 3 ^{/2/}.
- Applicable CDM guidelines and requirements, including applicable relevant methodological decisions made by the CDM Executive Board.

- Other relevant rules, including the host country legislation,
- CDM Validation and Verification Standard ^{/1/},
- Monitoring plan as given in the registered VCS PD ^{/3/},
- Approved CDM Methodologies; AMS III.H., version 12 – “Methane Recovery in Wastewater Treatment” and AMS I.C., version 14 – “Thermal energy production with or without electricity” ^{/10/}

3.2 Document Review

During the desk review all documents initially provided by the client and publicly available documents relevant for the verification were reviewed. The main documents are listed below:

- The validated VCS PD ^{/3/}, including the monitoring plan and the corresponding validation report ^{/6/},
- Monitoring Report ^{/4/} and Emission reduction calculation sheet ^{/5/};
- The applied monitoring methodologies ^{/10/};
- Requirements and guidance of VCS ^{/2/} as well as applicable methodological relevant decisions, clarifications and guidance from the CDM Executive Board;
- Any other information and references relevant to the project activity’s resulting emission reductions (e.g., IPCC reports ^{/33/}, data on electricity generation in the national grid or laboratory analysis and national regulations).
- Addressing of FARs identified during the validation and previous verification

3.3 Interviews

Representatives of SD Biosupply Co., Ltd including the operational staff of the biogas plant and South Pole Carbon Asset Management Ltd. (project consultant) were interviewed to confirm selected information and to resolve issues identified in the document review.

The main topics of the interviews are summarized in below table:

Interview Topic	Interviewed persons and source of information
• General aspects of the project • Project equipment operation and technical details	Mr. Narong Tiyavanich, Factory Manager, SD Biosupply Co., Ltd. Ms. Supunnee Fakklang, Asst. Plant Manager, SD Biosupply Co., Ltd.

Interview Topic	Interviewed persons and source of information
• Changes since validation • Monitoring and measurement equipment • Remaining issues from validation and previous verification • 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	Ms. Nisachon Sertsatit, Biogas Plant Supervisor, SD Biosupply Co., Ltd. Mr. Suchai Rattananadhekul, CDM Manager, Papop Co., Ltd. Mr. Santosh Kumar Singh, Head of Implementation, South Pole Carbon Asset Management Ltd. Ms. Narumon Tiangviriya, CDM Project Manager, South Pole Carbon Asset Management Ltd.

3.4 Site Inspections

From 18-07-2012 to 19-07-2012 GLC carried out an on-site verification of the project activity. During the visit, GLC's verification team verified that the actual implementation of the project was as described in the registered VCS PD.

On-site inspection included review of data and records, interviews with the plant manager, shift engineers, biogas supervisor, operations and maintenance personnel confirming all data sources used in the Monitoring Report.

The main tasks covered during the on-site visit included, but were not limited to:

- Verified whether the project was implemented as per the description in the VCS PD^{/3/}
- Confirmation that all monitoring equipments have been installed and operated as per the monitoring plan in the VCS PD^{/3/}.
- 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.
- Calibration records of all metering equipment were checked and calibration procedure was verified.
- The monitored data was checked completely.

3.5 Resolution of Any Material Discrepancy

On the basis of the desk review, the on-site visit, follow-up interviews and further background investigation the verification report is completed.

Findings established during the verification may be that:

- i) The verification is not able to obtain sufficient evidence for the reported emission reductions or part of the reported emission reductions. In this case these emission reductions shall not be verified and certified;
- ii) The verification has identified significant misstatements in the reported emission reductions.

A detailed list of verification findings form the draft verification report, which is sent to the client for resolution of raised CARs and CLs.

Nonconformities raised during the verification can either be seen as a non-fulfilment of criteria ensuring the proper implementation of a project or where a risk to deliver high quality emission reductions is identified.

Corrective Action Requests (CARs) are issued, 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 or VCS requirements have not been met;
- there is a risk that emission reductions cannot be monitored or calculated.

Forward Action Requests (FAR) indicate essential risks for further periodic verifications. Forward Action Requests are issued, if:

- The actual status requires a special focus on this item for the next consecutive verification, or an adjustment of the monitoring plan is recommended.

The verification team uses the term Clarification Request (CL), which is issued if:

- Information is insufficient or not clear enough to determine whether the applicable CDM or VCS requirements have been met.

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

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

On the basis of the on-site visit and the reviewed project documentation, the verification team confirms that the project was implemented as described in the registered VCS PD. All the physical components and project boundary are in conformity with the description in registered VCS PD. The project activity was implemented in August 2005 and in operation since then. Based on the VCS PD and the available information at VCS database it is confirmed that the project's crediting period is from 28-03-2006 to 27-03-2016. While the 1st verification covered the period from 28-03-2006 to 31-12-2008, the 2nd verification covers the period from 01-01-2009 to 31-05-2012.

The project activity involves capturing of methane generated from the wastewater treatment through UASB technology. The captured methane (biogas) is utilized as fuel in thermal oil boilers replacing heavy fuel oil.

There are two thermal oil boilers located in the starch factory for drying purpose. However, the onsite inspection revealed that the existing boilers were replaced with new boilers during the monitoring period; one in 2010 and the other in 2012. Therefore, a CAR was raised to address the issue (please refer to CAR 1 in the enclosed Annex 3). The CAR was closed upon addressing it appropriately. The information has been provided in the revised MR by the PPs for the sake of transparency in response to the CAR.

GLC verification team has also verified that all the parameters are monitored as described in the monitoring plan of the VCS PD in order to estimate the emission reduction.

As per the applied methodologies; AMS III.H., version 12 and AMS I.C., version 14 ^{/10/}, the project boundary is defined as below:

"The project boundary is the physical, geographical site where the wastewater and sludge treatment takes place in baseline and project situation. It covers all facilities affected by the project activity including sites where the processing, transportation and application or disposal of waste products as well as biogas takes place".

“The physical, geographical site of the project equipment producing the renewable energy delineates the project boundary. The boundary also extends to the industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment that is affected by the project activity”.

Based on document review and onsite verification, it is confirmed that all the emission sources within the boundary have been considered appropriately.

Implementation status of the monitoring plan and the completeness of monitoring

The verification team has followed two steps to assess the completeness of the monitoring. The first step is document review and the second one is on-site interviews and observations. As a part of the step 1, the verification team has reviewed the submitted documents such as MR ^{/4/}, ER sheets ^{/5/} and supporting documents stated in Annex 2. The monitoring parameters have been monitored with calibrated monitoring equipment as described in the monitoring plan of the registered VCS PD ^{/3/}. It is confirmed that the monitoring mechanism is effective and reliable. Wherever a parameter was not sufficiently monitored as per the monitoring plan of the VCS PD, a deviation was applied by the PPs and the emission reduction was calculated by a conservative approach. In cases where calibration of monitoring equipment was not performed within the due date recommended by the manufacturer, necessary findings have been raised. The PPs have appropriately addressed the findings inline with the applicable CDM guidelines^{/23/} and the emission reductions have been calculated conservatively. Annex 3 may please be referred for the detailed resolution of findings.

Therefore, from the document review and onsite verification, it is confirmed that all the parameters were monitored in accordance with the registered monitoring plan during the monitoring period. Following are the details of monitoring in accordance with the monitoring plan of the registered VCS PD:

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of the VCS PD):	Q _{ww, y} Volume of wastewater treated in year y (m ³)
Measuring frequency:	Continuously The parameter is measured on a continuous basis and recorded by the flow meter (FM1).
Reporting frequency:	Daily The parameter is recorded from the totaliser of the meter by the operators on a daily basis into log sheets. The data is reported to Biogas Supervisor on a daily basis. Based on operator log sheet information, the Biogas Supervisor checks the values and prepares another report that consists of daily values of all monitored parameters and submits to the Assistant Plant Manager. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the reports both in hard and soft format to the Factory Manager for approval. The approved documents in

	hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.		
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies are inline with the monitoring plan of the registered VCS PD. The verification also interviewed the plant's operating team and found that the team is competent enough to monitor the data as required by the monitoring plan and monitoring methodology.		
Type of monitoring equipment:	Type of Meter	Electro magnetic flow meter (FM1)	
	Model	Promag 10W	
	Serial number	6B00F220000	EB0011320000
	Accuracy	± 0.5% ^{/13/}	± 0.5% ^{/13/}
	The meter with S/N 6B00F220000 was replaced with another meter with S/N EB0011320000 on 14-01-2012.		
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. However, the PP has installed electro magnetic flow meter with an accuracy class of 0.5%. GLC, based on the experience of verifying similar other projects, understands that the accuracy of the meters represents good monitoring practice.		
Calibration frequency /interval:	The flow meter is calibrated at least once every 2 years or as per the manufacturer's recommendation.		
	Meter	6B00F220000	EB0011320000
	Latest Calibration ^{/12/}	08-09-2010	15-11-2011
	Previous Calibration ^{/12/}	17-03-2009 25-03-2008	
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration,	Yes. As per the monitoring plan of the VCS PD, periodic calibrations are ensured. However, the PPs have developed annual calibration plan ^{/14/} to		

does the selected frequency represent good monitoring practice?	calibrate all the monitoring equipment once a year during the plant's annual maintenance period. Based on GLC's experience it is confirmed that the chosen calibration frequency of at least 2 years is appropriate. Furthermore, from the above mentioned calibration dates it is clear that the actual calibration gap is less than 2 years. Therefore, it is considered to be appropriate and it represents good practice.
Company performing the calibration:	The calibration in 2008 and 2011 was carried out by "Endress + Hauser" ^{/12/} The calibration in 2009 and 2010 was carried out by "Miracle International Technology Co., Ltd."
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration reports were checked and the meter was found functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	Yes. The calibration is valid for the whole reporting period.
If applicable, has the reported data been cross-checked with other available data?	Yes, the reported data was cross checked with the operator log sheets ^{/21/} during the site visit. The data was found to be correct.
How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports approved by the Plant Manager ^{/21/} . The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of the VCS PD):	COD _{ww, untreated, y} COD of wastewater entering the treatment plant (mg/l)
Measuring frequency:	Daily. It is confirmed based on onsite verification that wastewater samples are collected from the wastewater inlet to the UASB and COD is determined during each shift (i.e. 3 times a day), COD of the wastewater is analysed with the help of

	colorimeter and the average value of the 3 shifts is recorded in a daily log sheet.	
Reporting frequency:	Daily The measured data is logged in on a daily basis and reported to Biogas Supervisor. The Biogas Supervisor checks the values and enters the data in another sheet, calculates the daily average from the 3 readings and submits it to the Asst. Plant Manager. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the reports both in hard and soft format to the Factory Manager for approval. The approved documents in hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.	
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The monitoring plan states that COD would be analysed daily. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies comply with the monitoring plan of the registered VCS PD. The verification also interviewed the plant's operating team and found that the team is competent enough to monitor the data as required by the monitoring plan and monitoring methodology	
Type of monitoring equipment:	Type of meter	Portable Colorimeter
	Model	DR/890
	Serial number	HAC 04109C53333
	Accuracy	$\pm 0.24\%$ ^{1/3/}
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. However, it was observed during the verification site visit that the PP has a good monitoring system. GLC, based on the experience of verifying similar other projects, understands that the accuracy of the colorimeter represents good monitoring practice.	
Calibration frequency /interval:	The colorimeter is calibrated annually or as per manufacturer's recommendation. From the calibration reports it is learnt that the recommended calibration frequency by the calibration agency is 1 year.	

	The calibration dates of the meter are: 26-04-2011^{/12/} 19-05-2010 02-11-2009 06-05-2008 The latest calibration after the end of monitoring period was carried out on 12-06-2012. Therefore, it is clear from the above mentioned calibration dates that there is a delay in calibration in 2009 and in 2012. Since the recommended calibration frequency by the calibration agency is 1 year, a CAR was raised. In response to the CAR (refer to CAR2) the PP's have applied the calibration guidelines of CDM according to Annex 60 of EB 52 report^{/23/}. The error identified during 2009 calibration was 4.55% and during 2012 calibration was 1.05% while meter accuracy was mentioned as 0.24%. Therefore, an error of 4.55% was applied to the measured values of COD for a period from 05-05-2009 to 01-11-2009 and an error of 1.05% for a period from 26-04-2012 to 31-05-2012 conservatively. The emission reduction is proportional to the COD removed. Since the COD removed is calculated as the difference of the COD at inlet of UASB and the COD at outlet of UASB, for baseline emissions calculation the error has been applied negatively so as to result lower value of COD. For project emission calculation, the error has been applied positively. The approach is considered to be appropriate since it has resulted in conservative emission reductions.
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	The VCS PD does not specify the calibration interval of meter. However, the PPs have developed annual calibration plan ^{/14/} to calibrate all the monitoring equipment once a year during the plant's annual maintenance period. Since the annual shut down is planned based on the availability of raw material, the shut period would not be in the same month every year. Therefore, as informed by the plant's operating team, there was a delay in calibration.
Company performing the calibration:	Envi Science Company Limited., Bangkok ^{/12/}
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and the meter was found functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	As discussed above, there was a calibration delay by few months. The calibration delay has been addressed by the PPs appropriately.
If applicable, has the reported data been cross-	Yes, the reported data was cross checked with the

checked with other available data?	operator log sheets ^{21/} during the site visit. The data was found to be correct.
How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports approved by the Plant Manager ^{21/} . The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information. However, on few days some inconsistency between the log sheet values and the reported values in the ER sheet has been observed. Therefore, a CAR was raised (refer to CAR 5). The values have been corrected in response to the CAR.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of the VCS PD):	COD _{y, out, UASB} COD of water exiting the UASB treatment process (mg/l)
Measuring frequency:	Daily. It is confirmed based on onsite verification that wastewater samples are collected from the wastewater outlet to the UASB and COD is determined during each shift (i.e. 3 times a day)., COD of the wastewater is analysed with the help of colorimeter and the average value of the 3 shifts is recorded in a daily log sheet.
Reporting frequency:	Daily The measured data is logged in on a daily basis and reported to Biogas Supervisor. The Biogas Supervisor checks the values and enters the data in another sheet, calculates the daily average from the 3 readings and submits it to the Asst. Plant Manager. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the reports both in hard and soft format to the Factory Manager for approval. The approved documents in hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly

	basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.	
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The monitoring plan states that COD would be analysed daily. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies comply with the monitoring plan of the registered VCS PD. The verification also interviewed the plant's operating team and found that the team is competent enough to monitor the data as required by the monitoring plan and monitoring methodology	
Type of monitoring equipment:	Type of meter	Portable Colorimeter
	Model	DR/890
	Serial number	HAC 04109C53333
	Accuracy	± 0.24% ^{/13/}
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. However, it was observed during the verification site visit that the PP has a good monitoring system. GLC, based on the experience of verifying similar other projects, understands that the accuracy of the colorimeter represents good monitoring practice.	
Calibration frequency /interval:	The colorimeter is calibrated annually or as per manufacturer's recommendation. From the calibration reports it is learnt that the recommended calibration frequency by the calibration agency is 1 year. The calibration dates of the meter are: 26-04-2011 ^{/12/} 19-05-2010 02-11-2009 06-05-2008 The latest calibration after the end of monitoring period was carried out on 12-06-2012. Therefore, it is clear from the above mentioned calibration dates that there is a delay in calibration in 2009 and in 2012. Since the recommended calibration frequency by the calibration agency is 1 year, a CAR was raised. In response to the CAR (refer to CAR2) the PP's have applied the calibration guidelines of CDM according to Annex 60 of EB 52 report ^{/23/}. The error identified during 2009 calibration was 4.55% and during 2012 calibration was 1.05% while meter	

	accuracy was mentioned as 0.24%. Therefore, an error of 4.55% was applied to the measured values of COD for a period from 05-05-2009 to 01-11-2009 and an error of 1.05% for a period from 26-04-2012 to 31-05-2012 conservatively. The emission reduction is proportional to the COD removed. Since the COD removed is calculated as the difference of the COD at inlet of UASB and the COD at outlet of UASB, for baseline emissions calculation the error has been applied positively so as to result higher value of COD. For project emission calculation, the error has been applied negatively. The approach is considered to be appropriate since it has resulted in conservative emission reductions.
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	The VCS PD does not specify the calibration interval of meter. However, the PPs have developed annual calibration plan ^{/14/} to calibrate all the monitoring equipment once a year during the plant's annual maintenance period. Since the annual shut down is planned based on the availability of raw material, the shut period would not be in the same month every year. Therefore, as informed by the plant's operating team, there was a delay in calibration.
Company performing the calibration:	Envi Science Company Limited., Bangkok ^{/12/}
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and the meter was found functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	As discussed above, there was a calibration delay by few months. The calibration delay has been addressed by the PPs appropriately.
If applicable, has the reported data been cross-checked with other available data?	Yes, the reported data was cross checked with the operator log sheets ^{/21/} during the site visit. The data was found to be correct.
How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports approved by the Plant Manager ^{/21/} . The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

	Assessment/ Observation		
Data / Parameter: (as in monitoring plan of the VCS PD):	BG _{prod, y} Amount of biogas produced by the digester (Nm ³)		
Measuring frequency:	Continuously The parameter is measured on a continuous basis and recorded by the gas flow meter (GM1).		
Reporting frequency:	Daily The parameter is recorded from the totaliser of the meter by the operators on a daily basis into log sheets. The data is reported to Biogas Supervisor on a daily basis. Based on operator log sheet information, the Biogas Supervisor checks the values and prepares another report that consists of daily values of all monitored parameters and submits to the Assistant Plant Manager. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the reports both in hard and soft format to the Factory Manager for approval. The approved documents in hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.		
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies are inline with the monitoring plan of the registered VCS PD and monitoring methodology. The verification also interviewed the plant's operating team and found that the team is competent enough to monitor the data as required by the monitoring plan and monitoring methodology		
Type of monitoring equipment:	Type of meter	Thermal Mass flow meter (GM1)	
	Model	FT2-06ISSTE3DD BO	T-mass 65l
	Serial number	6571	EA033E02000
	Accuracy	± 1% + 0.2% FS ^{/13/}	± 1.5% ^{/13/}

	The meter with S/N 6571 was replaced with another meter having S/N EA033E02000 on 11-12-2011.									
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. However, it was observed during the verification site visit that the PP has a good monitoring practice and installed meters of good accuracy in the order of ±1.5%. GLC, based on the experience of verifying similar other projects, understands that the accuracy of the meters represents good monitoring practice.									
Calibration frequency /interval:	The flow meter is calibrated at least once every 2 years or as per the manufacturer's recommendation. <table><tr><td>Meter</td><td>6571</td><td>EA033E02000</td></tr><tr><td>Latest Calibration ^{/12/}</td><td>09-05-2011</td><td>10-10-2011</td></tr><tr><td>Previous Calibration ^{/12/}</td><td>27-05-2010 24-06-2009 05-09-2008</td><td></td></tr></table> PPs have also provided manufacturer 'Endress+Hauser' recommendations for calibrations to the verification team. The document states, • "If the gas is clean and dry and the instrument is operating under normal ambient conditions then re-calibrate every 5-10 years. • If the same process conditions apply but the device is located outside then reduce the calibration periodicity to 3-5 years dependent on the hostility of the environment. • If the gas is wet, has particles within or is corrosive then the calibration intervals should be reduced accordingly. • The use of electronic verification tools, to check sensor status and electronics performance can be applied on a 1-3 year basis. If this is combined with periodic maintenance and inspection routines then the calibration intervals suggested above can be extended by a factor of two." Therefore, it can be confirmed that the calibration interval is inline with the manufacturer's recommendation.	Meter	6571	EA033E02000	Latest Calibration ^{/12/}	09-05-2011	10-10-2011	Previous Calibration ^{/12/}	27-05-2010 24-06-2009 05-09-2008	
Meter	6571	EA033E02000								
Latest Calibration ^{/12/}	09-05-2011	10-10-2011								
Previous Calibration ^{/12/}	27-05-2010 24-06-2009 05-09-2008									
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD	Yes. As per the monitoring plan of the VCS PD, periodic calibrations are ensured. However, the PPs									

does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	have developed annual calibration plan ^{/23/} to calibrate all the monitoring equipment once a year during the plant's annual maintenance period. Based on GLC's experience it is confirmed that the chosen calibration frequency of at least 2 years is appropriate. Furthermore, from the above mentioned calibration dates it is clear that the actual calibration gap is less than 2 years. Therefore, it is considered to be appropriate and it represents good practice.
Company performing the calibration:	The calibration of 6571 was initially carried out by the manufacturer FOX in 2008 and in 2009, 2010 and 2011 it was carried out by Miracle International Technology Co., Ltd., Bangkok ^{/12/} The calibration of EA033E02000 was calibrated by the manufacturer "Endress + Hauser" on 10-10-2011 ^{/12/}
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and the meter was found functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	Yes. Calibration is valid for the whole reporting period.
If applicable, has the reported data been cross-checked with other available data?	Yes, the reported data was cross checked with the operator log sheets ^{/21/} during the site visit. The data was found to be correct.
How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports approved by the Plant Manager ^{/21/} . The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

Assessment/ Observation	
Data / Parameter: (as in monitoring plan of the VCS PD):	W _{CH4} Methane content in the biogas in the year y (%)
Measuring frequency:	The parameter is periodically measured using portable gas analyzer. From the onsite interviews with the operating team it is confirmed that the parameter is measured 3 times during the 1 st shift, 2

	times during the 2 nd shift and 2 times during the 3 rd shift every operational day and recorded in operator log sheets.									
Reporting frequency:	Daily The measured data is reported to Biogas Supervisor on a daily basis. The Biogas Supervisor checks the values and enters the data in another sheet and submits it to the Asst. Plant Manager. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the reports both in hard and soft format to the Factory Manager for approval. The approved documents in hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.									
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. Since the parameter is measured periodically using portable gas analyzer, 95% confidence level has been applied to the measured values and the value has been considered on a conservative basis for emission reduction calculation. Therefore, the monitoring method of biogas concentration is inline with the monitoring plan and also with the monitoring methodology.									
Type of monitoring equipment:	<table><tr><td>Type of meter</td><td>Portable gas analyzer</td></tr><tr><td>Model</td><td>X-am 7000</td></tr><tr><td>Serial number</td><td>ARAM-0090</td></tr><tr><td>Accuracy</td><td>± 0.9% ^{/13/}</td></tr></table> It is to be noted that the meter was procured in 2010. Therefore, a deviation was applied by the PPs for the parameter during 2009. The deviation was accepted since it results in conservative estimation of emission reduction. The assessment of the deviation is provided at the end of the section. Besides, CAR 4 may please be referred in Annex 3.		Type of meter	Portable gas analyzer	Model	X-am 7000	Serial number	ARAM-0090	Accuracy	± 0.9% ^{/13/}
Type of meter	Portable gas analyzer									
Model	X-am 7000									
Serial number	ARAM-0090									
Accuracy	± 0.9% ^{/13/}									
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. However, the accuracy of gas analyser is ± 0.9%. GLC, based on its experience of verifying similar other projects, confirms that the accuracy of the meter represents good monitoring practice.									

Calibration frequency /interval:	According to manufacturer's recommendation, the gas analyzer shall be calibrated once in 6 months. The calibration dates during the monitoring period are as below: 18-01-2012 ^{/12/} 08-06-2011 12-01-2011 23-06-2010 12-01-2010 It is clear from the above mentioned calibration dates that the re-calibration was conducted after 6 months period in January 2011 and January 2012. Therefore, a CAR was raised. In response to the CAR (refer to CAR2) the PP's have applied the calibration guidelines of CDM according to Annex 60 of EB 52 report ^{/23/}. As per the calibration reports ^{/12/}, the error identified during the calibration conducted on 12-01-2011 was 4% and during the calibration conducted on 18-01-2012 calibration was 0% while meter accuracy was mentioned as 0.9%. Therefore, an error of 4% was applied to the measured values of CH₄ content for a period from 20-12-2010 to 11-01-2011 and an error of 0.9% for a period from 05-12-2011 to 17-01-2012 conservatively. The error has been applied negatively for baseline emissions calculation and positively for project emissions calculation so as to result in lower value of emission reduction. The approach is considered to be appropriate since it has resulted in conservative emission reductions.
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	The VCS PD states that regular calibration shall be ensured. Therefore, from the above mentioned calibration dates and the conservative approach taken by the PPs, it can be confirmed that the calibration interval is inline with the monitoring plan of the VCS PD and it represents good monitoring practice.
Company performing the calibration:	The gas analyser was calibrated by Draeger Safety (Thailand) Limited, Bangkok ^{/12/}
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and the meter was found functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	As discussed above, there was calibration delay by few days. The calibration delay has been addressed by the PPs appropriately.
If applicable, has the reported data been cross-checked with other available data?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports

	approved by the Plant Manager ^{21/} . The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.
How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified during the site visit with the log sheets ^{14/} . The reported values in the MR and ER sheet were found to be consistent with the log sheet information.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of the VCS PD):	$BG_{TOFlare, y} / FV_{RG, h}$ Amount of biogas (volumetric flow) sent to the flare system (Nm^3)
Measuring frequency:	Continuously The parameter is measured on a continuous basis and recorded by the gas flow meter (GM3). However, for a period from January 2009 to June 2009, the parameter was calculated as the difference of biogas production and biogas utilized in boilers in accordance with the applied deviation-4. Assessment of the deviation is provided at the end of the section.
Reporting frequency:	Daily The parameter is recorded from the totaliser of the meter by the operators on a daily basis into log sheets. The data is reported to Biogas Supervisor on a daily basis. Based on operator log sheet information, the Biogas Supervisor checks the values and prepares another report that consists of daily values of all monitored parameters and submits to the Assistant Plant Manager. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the reports both in hard and soft format to the Factory Manager for approval. The approved documents in hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset

	Management Ltd. on a monthly basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.		
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies are inline with the monitoring plan of the registered VCS PD and monitoring methodology. The verification also interviewed the plant's operating team and found that the team is competent enough to monitor the data as required by the monitoring plan and monitoring methodology		
Type of monitoring equipment:	Type of meter	Thermal Mass flow meter (GM3)	
	Model	FT2-06ISSTE3DD BO	T-mass AT70
	Serial number	7544	EJ-10209
	Accuracy	± 1% + 0.2% FS ^{/13/}	± 1.5% ^{/13/}
	The meter with S/N 7544 was replaced with another meter having S/N EJ-10209 on 09-12-2011.		
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. However, it was observed during the verification site visit that the PP has a good monitoring practice and installed meters of good accuracy in the order of ±1.5%. GLC, based on the experience of verifying similar other projects, understands that the accuracy of the meters represents good monitoring practice.		
Calibration frequency /interval:	The flow meter is calibrated at least once every 2 years or as per the manufacturer's recommendation.		
	Meter	7544	EJ-10209
	Latest Calibration ^{/12/}	09-05-2011	24-06-2009
	Previous Calibration ^{/12/}	29-05-2010 26-05-2009	
	PPs have also provided manufacturer 'Endress+Hauser' recommendations for calibrations to the verification team. The document states,		

	• “If the gas is clean and dry and the instrument is operating under normal ambient conditions then re-calibrate every 5-10 years. • If the same process conditions apply but the device is located outside then reduce the calibration periodicity to 3-5 years dependent on the hostility of the environment. • If the gas is wet, has particles within or is corrosive then the calibration intervals should be reduced accordingly. • The use of electronic verification tools, to check sensor status and electronics performance can be applied on a 1-3 year basis. If this is combined with periodic maintenance and inspection routines then the calibration intervals suggested above can be extended by a factor of two.” Therefore, it can be confirmed that the calibration interval is inline with the manufacturer's recommendation.
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes. As per the monitoring plan of the VCS PD, periodic calibrations are ensured. However, the PPs have developed annual calibration plan^{/14/} to calibrate all the monitoring equipment once a year during the plant's annual maintenance period. Based on GLC's experience it is confirmed that the chosen calibration frequency of at least 2 years is appropriate. Therefore, it is considered to be appropriate and it represents good practice.
Company performing the calibration:	The calibration of 7544 was initially carried out by the manufacturer FOX in 2009 and by Miracle International Technology Co., Ltd., Bangkok in 2010 and 2011^{/12/} The calibration of EJ-10209 was calibrated by Miracle International Technology Co., Ltd., Bangkok on 24-06-2009^{/12/}
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and the meter was found functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	Yes. Calibration is valid for the whole reporting period.
If applicable, has the reported data been cross-checked with other available data?	Yes, the reported data was cross checked with the operator log sheets ^{/21/} during the site visit. The data was found to be correct.
How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports approved by the Plant Manager ^{/21/} . The reported values in the MR and ER sheet were found to be

	consistent with the daily reports and the operator log sheet information.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of the VCS PD):	$\eta_{\text{flare-h}}$ Flare efficiency (%)
Measuring frequency:	Default value for open flares as per "Tool to determine project emissions from flaring gases containing methane"
Reporting frequency:	NA
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	The flare efficiency shall be determined based on the flame detection period. According to the monitoring plan of the VCS PD, "The default factor of 50% might be only applied if a flame is detected at the flare for more than 20 minutes in hour h, whenever biogas is sent to the flare system. If the biogas is sent to the flare for a period shorter than one hour, the flare detection signal shall be available for at least 1/3 of this period, following the same logic of the flaring tool (20 minutes out of 1 hour). If these conditions are not met, 0% default value should be used for this period". In response to a CAR, the flare efficiency has been reconsidered by the PPs as 0% since the flame detection period was not monitored during the monitoring period. Therefore, it is confirmed that the monitoring approach for the parameter is in accordance with the monitoring plan of the VCS PD. Assuming the flare efficiency as 0% is more conservative according to "Tool to determine project emissions from flaring gases containing methane"^{n/24/}.
Type of monitoring equipment:	NA
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring	NA

equipment, does the monitoring equipment represent good monitoring practice?	
Calibration frequency /interval:	NA
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	NA
Company performing the calibration:	NA
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?	NA
How were the values in the monitoring report verified?	The flare efficiency has been considered as 0% which is inline with the "Tool to determine project emissions from flaring gases containing methane".
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of the VCS PD):	BG _{combusted, y} Amount of biogas sent to boiler in the year y (Nm ³)
Measuring frequency:	Continuously The parameter is measured on a continuous basis and recorded by the gas flow meter (GM2).
Reporting frequency:	Daily The parameter is recorded from the totaliser of the meter by the operators on a daily basis into log sheets. The data is reported to Biogas Supervisor on a daily basis. Based on operator log sheet information, the Biogas Supervisor checks the values and prepares another report that consists of daily values of all monitored parameters and submits to the Assistant Plant Manager. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the

	reports both in hard and soft format to the Factory Manager for approval. The approved documents in hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.		
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies are inline with the monitoring plan of the registered VCS PD and monitoring methodology. The verification also interviewed the plant's operating team and found that the team is competent enough to monitor the data as required by the monitoring plan and monitoring methodology		
Type of monitoring equipment:	Type of Meter	Thermal Mass flow meter (GM2)	
	Model	T-mass AT70	FT2-06SSSTE3 DDBO
	Serial number	EJ-10209	7328
	Accuracy	$\pm 1.5\%$ ^{/13/}	$\pm 1\%R + 0.2\% FS$ ^{/13/}
	The meter with S/N EJ-10209 was replaced with meter having S/N 7328 on 19-07-2009 and the meter with S/N 7328 was replaced with the meter having S/N EA033D02000 on 11-12-2011.		
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. However, it was observed during the verification site visit that the PP has a good monitoring practice and installed meters of good accuracy in the order of $\pm 1.5\%$. GLC, based on the experience of verifying similar other projects, understands that the accuracy of the meters represents good monitoring practice.		
Calibration frequency /interval:	The flow meter is calibrated at least once every 2 years or as per the manufacturer's recommendation.		

	Meter	Calibration dates ^{/12/}
	EJ-10209	26-02-2005 24-06-2009
	7328	27/03/2009 29/05/2010 09/05/2011
	EA033D02000	07/10/2011
	In response to a CAR (please refer to CAR 2 in Annex 3), PPs have provided manufacturer 'Endress+ Hauser' recommendation for calibrations. The document states, <i>"if the gas is clean and dry and the instrument is operating under normal ambient conditions then, re-calibrate every 5-10 years"</i> . Since a scrubber and a dryer have been installed to clean and dry the biogas, the calibration frequency is considered to be appropriate.	
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes. As per the monitoring plan of the VCS PD, periodic calibrations are ensured. However, the PPs have developed annual calibration plan ^{/14/} to calibrate all the monitoring equipment once a year during the plant's annual maintenance period. Based on GLC's experience it is confirmed that the chosen calibration frequency of at least 2 years is appropriate. Furthermore, from the above mentioned calibration dates it is clear that the actual calibration gap is less than 2 years except the calibration in 2009 for which CAR2 was raised. Therefore, it is considered to be appropriate and it represents good practice.	
Company performing the calibration:	The meter with S/N EJ-10209 was calibrated by Miracle International Technology Co., Ltd. in 2009 The meter with S/N 7328 was calibrated by Miracle International Technology Co., Ltd. in 2010 and 2011 The calibration of EA033D02000 was calibrated by the manufacturer "Endress + Hauser" on 07-10-2011 ^{/12/}	
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration certificates were checked and the meter was found functioning properly.	
Is (are) calibration(s) valid for the whole reporting period?	Yes. Calibration is valid for the whole reporting period.	
If applicable, has the reported data been cross-checked with other available data?	Yes, the reported data was cross checked with the operator log sheets ^{/21/} during the site visit. The data was found to be correct.	

How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports approved by the Plant Manager ^{21/} . The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

Assessment/ Observation	
Data / Parameter: (as in monitoring plan of the VCS PD):	EC _y Electricity from the grid consumed by the project activity (wastewater treatment, biogas recovery and biogas utilisation/flaring systems) – MWh
Measuring frequency:	Continuously The parameter is measured continuously by energy meter provided at the point of supply to the wastewater treatment plant.
Reporting frequency:	Monthly The meter is owned by the electricity provided i.e. Provincial Electricity Authority (PEA). The electricity consumption is recorded by the PEA representatives every month and monthly invoices are sent to the PP.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies are inline with the monitoring plan of the registered VCS PD and monitoring methodology.
Type of monitoring equipment:	Type of Meter Electricity meter
	Serial number 25249127
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. Besides, it is the responsibility of PEA to maintain the accuracy of electricity meters as per the national grid code.

Calibration frequency /interval:	Since the meter is owned by the PEA, the calibration is carried out by the PEA. It is also confirmed from the onsite verification that the meter is well secured and sealed by the PEA. The PP is not authorised to touch the meter.
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	NA
Company performing the calibration:	NA
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?	NA
How were the values in the monitoring report verified?	The values in the MR and ER sheet have been verified with the monthly invoices sent by the PEA which are more authentic. The reported values have been found correct.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

	Assessment/ Observation
Data / Parameter: (as in monitoring plan of the VCS PD):	S _{final} , PJ, y Amount of final sludge generated by the wastewater treatment in the year y and type of application/disposal (Tonne/ and type of application)
Measuring frequency:	Whenever the sludge is removed from the reactor (i.e. UASB), it is weighed through weighing machine available at starch factory. The quantity of sludge and its application is recorded. However, no sludge was removed during the monitoring period. This is confirmed through onsite interviews.
Reporting frequency:	Not applicable for this monitoring period

Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	NA
Type of monitoring equipment:	NA
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	NA
Calibration frequency /interval:	NA
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	NA
Company performing the calibration:	NA
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?	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 in monitoring plan of the VCS PD):	EG _{thermal, y} Net quantity of thermal energy supplied by the dual fuel operated boiler (using biogas and HFO) after implementation of the project activity (TJ/year)
Measuring frequency:	This parameter is calculated based on the quantity of fuel (biogas and HFO) used in the boilers. It is also crosschecked from the amount of starch dried and the historic specific fuel consumption. Minimum of these two is used to calculate the baseline emissions from the onsite thermal energy generation.

	Quantity of biogas consumption and HFO fired in the boilers are monitored continuously using appropriate metering system as described under the parameters BG _{combusted, y} and FC _{HFO, y} . Starch production is monitored daily.
Reporting frequency:	The parameter is calculated
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	As per the monitoring plan of the VCS PD, the parameter has to be calculated based on the measurements of thermal oil flow rate through boiler and the temperature difference of thermal oil across the boiler. However, a deviation was taken by the PPs as the flow meter to measure the hot thermal oil was not available. The deviation was described in section 2.2 of the MR and the assessment of the deviation is provided at the end of the section. As per the deviation, the parameter is calculated by two approaches; one is energy input from fuel consumption in boilers and the other is energy required for starch drying from starch production and historical specific fuel consumption.
Type of monitoring equipment:	This parameter is calculated. However, please refer to the parameters BG _{combusted, y} and FC _{HFO, y} for details about biogas flow meter and oil flow meter respectively.
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	The VCS PD does not specify the accuracy of monitoring equipment. However, there is a deviation in monitoring approach of the parameter as discussed above.
Calibration frequency /interval:	Refer to parameters BG _{combusted, y} and FC _{HFO, y}
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Refer to parameters BG _{combusted, y} and FC _{HFO, y}
Company performing the calibration:	Refer to parameters BG _{combusted, y} and FC _{HFO, y}
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Refer to parameters BG _{combusted, y} and FC _{HFO, y}
Is (are) calibration(s) valid for the whole reporting period?	Refer to parameters BG _{combusted, y} and FC _{HFO, y}
If applicable, has the reported data been cross-checked with other available data?	Yes, the parameter is calculated by two approaches as mentioned above. EG _{thermal} estimated by fuel consumption was crosschecked with the starch production and historical specific fuel consumption.
How were the values in the monitoring report verified?	The values in the MR and ER sheet were verified with the log records of biogas and HFO consumption in boilers ^{/26/} and starch production ^{/26/} .

	The estimated values of the parameters were found to be conservative.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description

Assessment/ Observation			
Data / Parameter: (as in monitoring plan of the VCS PD):	FC_{HFO, y} Quantity of fossil fuel co-fired or fired along with biogas during year y (Liters/y)		
Measuring frequency:	Continuously The parameter is measured continuously using fuel oil meters (OM1 and OM2).		
Reporting frequency:	Daily The parameter is recorded from the totaliser of the meter by the operators daily into log sheets. The data is reported to Assistant Plant Manager on a daily basis. The Asst. Manger transfers the data into electronic files (i.e. excel sheets) and submits the reports both in hard and soft format to the Factory Manager for approval. The approved documents in hard and soft format are stored. The Asst. Plant Manager also sends the data to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly basis for calculating emission reduction. This information is confirmed based on the onsite interviews and the verification team is of the opinion that the monitoring system represents good practice.		
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. From the document review and onsite verification, it is confirmed that the measuring and reporting frequencies are inline with the monitoring plan of the registered VCS PD and monitoring methodology. The verification also interviewed the plant's operating team and found that the team is competent enough to monitor the data as required by the monitoring plan and monitoring methodology		
Type of monitoring equipment:	<table> <tr> <td>Type of</td><td>Liquid flow meter (OM1 and</td></tr> </table>	Type of	Liquid flow meter (OM1 and
Type of	Liquid flow meter (OM1 and		

	meter	OM2)	
	Model	25RC	
	Serial number	TMC0157-43	TMC-4-1-0068-044
	Accuracy	$\pm 1\%$ ^{/13/}	$\pm 1\%$ ^{/13/}
There are two oil flow meters one for each boiler.			
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCS PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	VCS PD does not specify the accuracy of monitoring equipment. GLC, based on the experience of verifying similar other projects, confirms that the accuracy of 1% for oil flow meters represents good monitoring practice.		
Calibration frequency /interval:	The flow meters are calibrated at least once every 2 years or as per the manufacturer's recommendation. Both the oil flow meters were calibrated on the following dates: 28-04-2011^{/12/} 14-05-2010 17-05-2009 The meters were not calibrated before 17-05-2009.		
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	The VCS PD does not specify the calibration frequency. However, the chosen calibration frequency of at least 2 years represents good monitoring practice. Moreover, the plant's team has developed annual calibration plan for all monitoring equipment. It is also evident from the calibration reports (calibration dates mentioned above) that the oil flow meters are annually calibrated. Nevertheless, the calibration gap from the beginning of the monitoring period till 17-05-2009 has been appropriately addressed by the PP. The error identified during the calibration was 0.04% for OM1 and 0.3% for OM2 while the maximum permissible error of the meters is 1%. Therefore, an error of 1% was applied for the measured values of oil flow for the delayed period and was calculated conservatively.		
Company performing the calibration:	The calibration of the oil flow meters was carried out by "Miracle International Technology Co., Ltd." which is a reputed calibration agency located in Bangkok.		
Did calibration confirm proper functioning of	Yes. The calibration reports were checked and the		

monitoring equipment? (Yes / No):	meter was found functioning properly.
Is (are) calibration(s) valid for the whole reporting period?	Yes. The calibration is valid for the whole reporting period.
If applicable, has the reported data been cross-checked with other available data?	Yes, the reported data was cross checked with the operator log sheets ^{/21/} during the site visit. The data was found to be correct. The fuel consumption was also crosschecked with the fuel purchase and stock records of Purchase Department, Somdej Flour Mill Co., Ltd. The quantity was comparable.
How were the values in the monitoring report verified?	The values mentioned in the monitoring report and ER sheet have been verified with the daily reports approved by the Plant Manager. The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.
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?	Yes, it is confirmed from document review and onsite verification that the data management ensures correct transfer of data and reporting of emission reductions and the necessary QA/QC procedures are in place. Please refer to sections 4.2 to 4.4 for further description.

Thus GLC confirms that

- the monitoring complies with the monitoring plan of the VCS PD
- All parameters such as baseline, project and leakage emission parameters are monitored as described in the monitoring plan.
- The frequency of monitoring, the accuracy of the measurement equipments and the calibration frequency are in line with the monitoring plan.

Remaining Issues from Validation or Previous Verification

The verification team has also reviewed validation report and the 1st verification report available on VCS database at

<https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=416&lat=16.677833&lon=103.805464&bp=1>

From the validation report issued on 19-11-2009 by validating DOE^{/6/}, the verification team identified one observation which was recommended to be verified during the verification. There was also a FAR raised by the DOE during the 1st verification^{/7/}. These issues have been closed for this verification. The issues in

detail, PP's response and the assessment of the verification team is provided under CAR11 and CAR12 in the enclosed Annex 3.

Deviations from the Monitoring Plan

Four deviations from the monitoring plan have been applied by the PPs during the monitoring period. Description of the deviations and the assessment on conservativeness of the deviation is provided below:

Description of deviation	Assessment by verification team
<u>Deviation-1</u> In the registered VCS PD, the equation for the calculation of MDy was given as: $MDy = BG_{burnt,y} * W_{CH_4} * D_{CH_4} * FE * GWP_{CH_4}$ This equation is not very transparent in accounting for biogas flared and biogas combusted in the boilers. Therefore, the detailed equation can be written as: $MDy = W_{CH_4} * D_{CH_4} * GWP_{CH_4} * [(BG_{toflare,y} * FE) + (BG_{combusted,y} * DE)]$ Given that the parameter DE (destruction efficiency) was not explicitly explained in the VCS PD, it can be taken as 100% to be conservative. This is in line with the clarification provided by SSC WG.	Since the biogas is combusted in boilers, it is appropriate to consider the destruction efficiency as 100% for the portion of the biogas combusted in boilers. In response to a query, the Small Scale Working Group (SSC WG) committee provides the below response^{/9/}: <i>"...The SSC WG, taking into account the inputs in the submission and public comment received, agreed to clarify that, as in the case of AMS-III.D, if the biogas is combusted for a gainful use of the released energy as in an engine or a power plant, a destruction efficiency of 100% can be used for the portion of biogas that is combusted when applying AMS-III.H, i.e. use a value of 100% for FE in equation 16 in paragraph 32 for the portion of biogas that is combusted for a gainful use."</i> Therefore, the approach followed by the PPs is considered to be appropriate and therefore the deviation is accepted.
<u>Deviation-2</u> As per paragraph 15, AMS I.C version 14, for steam/heat produced using fossil fuels, the baseline emissions are calculated as $BE_{thermal, CO_2,y} = (EG_{thermal, y} / \eta_{BL, thermal}) * EF_{FF, CO_2}$ Paragraph 29 (b) (i) mentions "(a) metering the thermal and/or electrical energy produced; (i) in the case of heat energy (e.g. hot air, hot water), direct measurement of flow and temperature is required". As the direct measurement of temperature (in	The baseline emissions due to thermal energy generation by the boilers can also be estimated based on the fuel consumption. Prior to the implementation of the project activity, HFO was used as fuel in boilers. From the available fuel consumption and dry starch production details, the specific fuel consumption is calculated to be 33.8, 34.7 and 36.5 Litres per ton of dry starch during the years 2002, 2003 and 2004 respectively. Therefore, the lowest value based on the historical specific fuel consumption of the plant has been considered by the PPs for baseline emission calculations for thermal energy generation. The

and out) and the flow of the thermal fluid were not conducted, this is a deviation from the monitoring plan in the VCS PD. Therefore, $EG_{thermal,y}$ can be estimated based on amount of heat required for starch drying which in turn is estimated on heat requirements per tonne of starch based on historical data. The approach estimates the thermal energy delivered by the project activity based on historical fuel oil consumption and starch production for the given year. The conservativeness of approach is ensured by comparing the total energy delivered by the fuels burnt in the project activity and thermal energy estimate based on historical fuel oil consumption values.	lowest value of 33.8 litres per ton is also closer to the industry average value of 33.6 litres per ton. HFO is used as fuel in boiler in majority of the starch manufacturing plants in Thailand. Therefore, an average value of HFO consumption per ton of dry starch production has been established. The value has been checked by the verification team with the provided evidence. From the given source, it is found that the range of HFO consumption is from 25.9 Litres per ton to 39.4 Litres per ton and the average value is 33.6 Litres per ton^{/29/}. Besides, conservativeness of the approach has also been crosschecked by the fuel consumption (biogas and HFO) approach during the monitoring period i.e. the thermal energy required for drying of starch has been estimated by two approaches; one by the historical specific fuel consumption and the starch production during the year and the other by the actual fuel consumption (biogas and HFO) in the year. Lowest of the values during the year has been considered for calculating the baseline emissions. The deviation has been transparently described in section 2.2 of the MR. The verification team is of the opinion that the approach followed by the PPs is appropriate and hence the deviation is accepted.
<u>Deviation-3</u> As per paragraph 36, AMS III.H version 12, "...the fraction of methane in the gas should be measured with a continuous analyzer or, alternatively, with periodical measurements at a 95% confidence level." Footnote 13 of the same methodology mentions "fraction of methane (CH_4) in biogas shall be measured using equipment that can directly measure methane content in the biogas, estimation methane content of biogas based on measurement of other constituents of biogas such as CO_2 is not permitted."	Since the gas analyser was not available to measure methane content ($\%CH_4$) during 2009, a deviation was taken by the PPs. The methane content was monitored periodically during the years 2010 – 2012. Therefore, in order to consider the methane content values on a conservative basis for 2009, the PPs have applied 95% confidence level to the average of the measured values during the period 2010 – 2012. This has resulted in lower bound value of 57.9% and upper bound value of 74.1%. It can be confirmed from the ER sheet that 57.9% has been used for baseline emission calculation and 74.1% for project emission. The design value of methane content in biogas is

The methane analyzer was installed in January 2010. Before that time (in year 2009), the project applied the instrument measuring the fraction of CO₂ and estimated the fraction of CH₄ by subtract the fraction of CO₂ from 100% therefore; the available CH₄ fraction in year 2009 is not applicable and thus, it is deviated from the validated monitoring plan and the applied methodology. In the absence of the CH₄ fraction data in year 2009, the average data available from January 2010 to May 2012 is calculated with 95% confidence level, results in 57.9% and 74.1% methane content. To be conservative, the lower CH₄ content value is applied for the baseline emission calculation and the higher CH₄ content value is applied for the project emission calculation.	65% according to the technical proposal submitted by the technology supplier. Therefore, the verification team is of the opinion that the approach followed by the PPs results in more conservative estimation of emission reduction. Besides, the emission reduction is also estimated using COD approach to check the conservativeness. Therefore, the deviation is accepted.
<u>Deviation-4</u> As per paragraph 36, AMS III.H version 12, "In all cases, the amount of biogas recovered, fuelled, flared or utilized e.g., injected into a natural gas distribution via a dedicated piped network) shall be monitored <i>ex post</i>, using continuous flow meter." As the gas flow meter to monitor the amount of biogas sent to flare (GM3) was not available before June 2009, it is deviated from the validated monitoring plan and the applied methodology. The 1st monitoring period in years 2006-2008 applied the difference of the values between the meter readings from biogas produced (GM1) and biogas combusted in boiler (GM2) as AMS III.H V14, paragraph 36, and the clarification from CDM small scale working group (SSC WG) No.376 allows the determination of the biogas captured from the two separately monitored fractions (biogas utilized and flared). For this 2nd monitoring period, the deviated approach from the 1st monitoring period is applied for the period from January 2009 to June 2009 when the GM3 was not installed. As the	Since the flow meter (GM3) was not installed till June 2009, a deviation was applied for the period from 01-01- 2009 to 31-05-2009. The deviated approach is same as that followed for the 1st verification period. The amount of biogas flared was calculated as the difference of biogas produced (measured by GM1) and biogas utilised in boilers (measured by GM2). The SSC WG has also clarified (SSC_376)^{/8/} that if the biogas flared and fuelled (or utilized) are continuously monitored separately, the two fractions can be added to determine the biogas recovered then recovered biogas need not be monitored separately. Similar approach was followed by the PPs to determine the biogas flared. However, since there is a biogas storage tank, the gas consumption in boilers can be more than the gas production and therefore, the difference results in negative value. Only positive values have been considered for the sake of conservativeness. It is of the opinion of verification team that the approach results in conservative estimation of emission reduction. Hence, the deviation is accepted.

project has biogas storage tank, it happens some times that the amount of biogas combusted is higher than the biogas generated and creates negative value for the gas flared. To be conservative, the negative values are excluded from the summation of biogas to flare. From June 2009 to May 2012, the data readings from the gas meter (GM3) are applied.	
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4.2 Accuracy of GHG Emission Reduction or Removal Calculations

GHG emissions reductions for the project and the baseline scenario were correctly calculated using the formulae described in the applied methodology for this project. The verification team has reviewed the emission reduction (ER) spread sheet and checked all the formulae and found they are correct and inline with the monitoring plan of the registered PD and the applied monitoring methodology.

The emission reduction due to methane capturing and utilisation in onsite boilers was estimated by measuring the required parameters using appropriate monitoring equipment and using the formulae described in the methodologies; AMS III.H., version 12 and AMS I.C., version 14 and the VCS PD except the deviations described in the above section. All the monitored parameters are described above in section 4.1. All the ex-ante parameters which are used in the calculation of emission reduction are presented in section 3.1 of the MR transparently. It is confirmed that all the ex-ante parameters have been correctly used in the emission reduction calculation. According to the applied methodologies, the conservativeness of the achieved emission reduction was checked and the calculation has been transparently provided in the ER sheet.

The detailed emission reduction calculation is presented in the ER spread sheet. All the formulae and the calculation procedure were checked by the verification team. It was observed that the emission reduction was determined in a conservative manner. The emission reduction being claimed during the period from 01-01-2009 to 31-05-2012 is approximately 57% higher than the estimated emission reductions in the registered VCS PD, as given in the table below.

Table: Emission Reductions

Period	Estimated VCUs as per VCS PD	Achieved VCUs as per Monitoring Report
Emission Reductions	62,976*	98,903
% Deviation (+/-)	0	(+) 57 %

* The estimated emission reduction as per the VCS PD is 18,432 tCO₂e per annum. Therefore, for the total monitoring period of 3 years and 5 months, the value is calculated to be 62,976 tCO₂e.

In response to CAR 10, the PPs have provided the reasons for the increase in emission reduction. The primary reasons are increased number of operating days and the quality of raw material which resulted in higher wastewater generation. It is also evident from the specific wastewater generation that the specific wastewater generation during the monitoring period is in the range of 7.38 to 10.1 m³ per ton of dry starch while it was considered as 4.7 m³/ton as per the VCS PD^{/3/}. The number of operating days depends upon the availability of raw material. During the monitoring period, the starch factory received special order which forced the project owner to operate the plant for more number of days. However, the availability

and quality of raw material depends on several factors which are beyond the control of project proponents. The verification team confirms that the increase in emission reduction is justified sufficiently by the PPs.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

During the verification site visit, all relevant documents were checked to assess the correctness and quality of data submitted by the project participants, which are used to determine emission reductions.

Inlet and outlet COD of UASB, quantity of wastewater through UASB, biogas production, biogas consumption for boilers, biogas consumption for flaring, methane concentration of biogas, quantity of HFO fired in boilers etc. were verified with the log book values to ensure that there is no over estimation of the VCUs. The provided data was found to be of adequate quality.

All records needed for monitoring are archived in line with the requirements of the registered monitoring plan. No significant, lack of evidence and missing data were detected during onsite verification. Hence, the verification team confirms that the monitoring system ensures required quality of the monitoring system to ensure the quality of the monitored data. All internal data are subjected to QA/QC measures.

The plant was certified by ISO 9001:2000^{/31/}. It is confirmed from the onsite interviews that the best practices of ISO have been implemented for the monitoring system. The document procedures, work instructions and forms have been established and implemented in accordance with ISO 9001. Monitoring of parameters, data recording and data archiving are required to be well managed as per the ISO 9001^{/31/} requirements. The ISO system also outlines proper monitoring plan in terms of monitoring frequency as well as accuracy.

All the meters (wastewater flow meter, biogas flow meters, fuel oil meters, COD meter, and gas analyzer) were calibrated at appropriate calibration frequency (described in section 4.1) to ensure the quality of the data. However, there was a slight delay in calibration of COD meter, gas analyser and oil flow meters as mentioned under CAR 2. In response to the CAR, the delay has been addressed appropriately by taking conservative approaches in accordance with the applicable CDM guidelines. Hence the verification team confirms that the quality of data is reasonably good and the emission reductions have been calculated conservatively. The plant's team has also developed an annual calibration plan^{/21/} in order to ensure high level of accuracy of the parameters. It is confirmed from the onsite interviews that the meters have been scheduled for re-calibration during the annual shut down period.

It was verified through onsite interviews that the plant's team involved in the monitoring of project activity is well experienced. Hence, the verification team concludes that competent staff is employed by the project proponent to carry out the relevant tasks with sufficient accuracy. Furthermore, it was learnt from the onsite interviews with the operating team that internal training programmes^{/22/} are conducted on annual basis as per ISO requirements. Annual training plan, Personal training records, Training registration forms, Training evaluation forms, etc. were verified during the site visit. The training programmes would be in the areas of Quality control, Maintenance, Safety and Operation of biogas plant.

GLC is of the opinion that this method of estimation is accurate and results in conservative estimation of emission reduction and is line with the applicable VCS requirements.

4.4 Management and Operational System

GLC was able to verify that authorities and responsibilities for monitoring and reporting of all data related to the emission reductions were clearly defined for the monitoring period from 01-01-2009 to 31-05-2012. Moreover, all project related equipments were confirmed to be operated by qualified and trained staff. The

frequency of monitoring measurement, as well as applicable calibrations and reporting details were conducted as outlined in the monitoring plan available in the latest version of the VCS PD.

The allocation of the responsibilities is documented in a written form and is followed as described in the registered VCS PD. Routines for the archiving of data are defined and documented. During the site visit all the required plant records were verified and found that the data is consistent with the provided in the final MR^(4/) and ER sheets^(5/).

The monitoring plan described in section 3.3 of the MR is confirmed to be correct. All the parameters of the monitoring plan are monitored using appropriate metering system. The parameters related to wastewater flow, biogas flow and fuel oil consumption are measured continuously and the cumulative value is displayed in the totaliser of the meters. The totaliser readings are recorded by the operators daily in the log sheets. In case of COD, the wastewater samples are collected once during each shift and the COD is analysed and in case of methane content, %CH₄ is measured multiple times during each shift. The values are recorded by the operators in the log sheets.

The log sheets are submitted to the Biogas Supervisor on a daily basis. The Biogas Supervisor checks the recorded data and prepares another set of data sheets and submits to the Asst. Plant Manager. The Asst. Plant Manager transfers the data into electronic format and submits the data sheets in soft and hard format to the Plant Manager for approval on a daily basis. The approved data sheets are stored in proper files. The reported data in the MR and ER sheet was verified with the approved data sheets during the onsite verification and was also crosschecked with the operator log sheets. The data was found to be consistent. However, some inconsistency between the log sheets and the reported data in ER sheet during some of the days. Therefore, a CAR (CAR5 in Annex 3) was raised. The data was corrected in response to the CAR.

The Asst. Manager also enters the data in ER sheet format and submits to the project consultant i.e. South Pole Carbon Asset Management Ltd. on a monthly basis.

The hard copies of the data sheets are stored in files and labelled clearly for easy identification. Soft copy of the data is stored in the Plant Manager's computer and is backed up in Asst. Manager's and Biogas Supervisor's computers. The data is also available at South Pole's server. It is therefore confirmed that the monitoring and storage represents good monitoring practice.

The verification team has interviewed the plant personnel who are involved in the monitoring of the parameters that are used to determine the emission reductions of the VER project. It is confirmed based on the interviews that the plant's team is competent enough to monitor the parameters as described in the monitoring plan.

As discussed above, the verification team concludes that management and operational system of the project is implemented and operated well. Thus it ensures the quality of data which is required in calculating the emission reductions.

5 VERIFICATION CONCLUSION

Germanischer Lloyd Certification GmbH (GLC) has performed the 2nd verification of the project: “SD Biosupply Wastewater Treatment and Biogas Utilization Project” with regard to the applicable relevant requirements for VCS project activity.

The project activity involves treatment of wastewater produced in a starch manufacturing process at Somdej Flour Mill Co. Ltd. through UASB technology. The use of UASB to treat the wastewater enables capturing of methane produced during the process which would otherwise be released into the atmosphere. The captured methane (or biogas) is utilised as fuel in existing boilers in the plant replacing heavy fuel oil and the surplus methane, if any, is flared into the atmosphere.

This verification covers the period from 01-01-2009 to 31-05-2012 (including both days).

SD Biosupply 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 emissions 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 VCS PD.

The scope of this verification covers the determination of voluntary greenhouse gas emission reductions generated by the above mentioned project. GLC conducted the verification based on the registered VCS PD ^{/3/}, validation report ^{/6/}, monitoring report ^{/4/}, ER sheet ^{/5/}, approved small scale monitoring methodologies; AMS III.H. – Methane Recovery in Wastewater Treatment, version 12 and AMS I.C. – Thermal energy production with or without electricity, version 14 and supporting documents made available to the verifiers by the project participants. The verification included:

- (i) Checking whether the design of the project is implemented and installed as planned and described in the registered VCS PD
- (ii) Checking whether the provisions of the monitoring methodologies and the monitoring plan in the VCS PD were consistently and appropriately applied
- (iii) The collection of evidence supporting the reported data
- (iv) Checking whether the installed monitoring equipment are calibrated appropriately

As a result of the verification, GLC confirms that;

- All operations of the project are implemented and installed as planned and described in the registered VCS PD.
- The monitoring system is in place and functional and is inline with the applied monitoring methodologies and the monitoring plan
- The installed equipments essential for estimating emission reductions work reliable and are calibrated appropriately.
- GHG emission reductions are calculated without significant misstatements in a conservative and appropriate manner.

The verification of reported emission reductions is based on the information made available to GLC and the engagement conditions detailed in this report. Hence, GLC cannot be held liable by any party for decisions made or not made based on this report. Also all the documents checked during on-site visit and verification process will be kept confidential and will not be disclosed without the Project Participant's consent as required by VCSA.

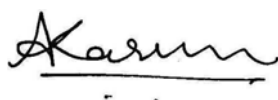
In GLC's opinion, the GHG emissions reduction for the "SD Biosupply Wastewater Treatment and Biogas Utilization Project" as reported in the Monitoring Report issued on "05-09-2012, version 04" are calculated without material misstatements in a conservative and appropriate manner. The GHG emission reductions were correctly calculated on the basis of the approved small scale methodologies; AMS III.H., version 12 and AMS I.C., version 14 and the monitoring plan contained in the validated VCS PD for the project.

Germanischer Lloyd Certification GmbH herewith confirms that the project has achieved emission reductions during the reporting period from 01-01-2009 to 31-05-2012 (including both the days) as follows:

GHG Emission Reductions or Removals	Unit	2009	2010	2011	2012	Total during the 2 nd verification period
Baseline Emissions	tCO ₂ e	43,135	29,886	33,412	14,344	120,777
Project Emissions	tCO ₂ e	8,824	5,411	5,531	2,107	21,873
Leakage	tCO ₂ e	0	0	0	0	0
Net GHG emission reductions or removals	tCO₂e	34,311	24,475	27,881	12,236	98,903

It is confirmed that the project activity has achieved total emission reduction of **98,903 tCO₂e** during the monitoring period from 01-01-2009 to 31-05-2012.

Mumbai, 2012-09-12



Verification Team Leader

ANNEX 1: ABBREVIATIONS

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB or EB	CDM Executive Board
CH ₄	Methane
CL	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
DOE	Designated Operational Entity
ER	Emission Reduction
ER sheet	Emission Reduction calculation spread sheet
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GLC	Germanischer Lloyd Certification GmbH
HFO	Heavy Fuel Oil
ISO	International Organisation for Standardization
MP	Monitoring Plan
MR	Monitoring Report
NA	Not Applicable
PD	Project Design document
PP	Project Proponent or Project Participant
QA/QC	Quality Assurance / Quality Control
SSC WG	Small Scale Working Group
t CO ₂ e	Ton of Carbon dioxide equivalent
TTSA	Thai Tapioca Starch Association
UASB	Up-flow Anaerobic Sludge Blanket
UNFCCC	United Nations Framework Convention on Climate Change

VCS	Verified Carbon Standard
VCSA	VCS Association
VCS PD	VCS Project Design document
VCU	Verified Carbon Unit
VVS	Validation & Verification Standard

ANNEX 2: REFERENCES

Reference	Author: Title, version, date of issue
/1/	CDM-EB: Clean Development Mechanism Validation and Verification Standard (Version 02.0)
/2/	VCS: VCS Version 3 Requirements Document - VCS Standard, v3.2, 01-02-2012 - VCS Program Guide, v3.3, 01-05-2012
/3/	VCS registered Project Description document for project : “SD Biosupply Wastewater Treatment and Biogas Utilization Project”, (VCS PD version 6.4 dated 19-11-2009)
/4/	Draft Monitoring Report of “SD Biosupply Wastewater Treatment and Biogas Utilization Project”, Version 1.0, 06-07-2012 Final Monitoring Report of “SD Biosupply Wastewater Treatment and Biogas Utilization Project”, Version 4.0 dated 05-09-2012
/5/	Draft Emission reduction calculation spreadsheet “SD_Biosupply_ERcal_06-07-2012.xlsx” Final Emission reduction calculation spreadsheet “SD_Biosupply_ERcal_V4.0_12-09-2012.xlsx”, version 4.0 dated 12-09-2012
/6/	SGS: Validation report for the project “SD Biosupply Wastewater Treatment and Biogas Utilization Project”, dated 19-11-2009
/7/	SGS: Verification report of the project “SD Biosupply Wastewater Treatment and Biogas Utilization Project” for the 1 st verification, dated 20-08-2010
/8/	UNFCCC: SSC_376: Clarification on the monitoring of .methane recovered, fuelled, flared or utilized. in AMS-III.H., dated 19-02-2010
/9/	UNFCCC: SSC_324: Determination of the flare efficiency for project activity involving combustion and/or flaring of recovered methane, dated 29-07-2009

Reference	Author: Title, version, date of issue
/10/	<u>Small-Scale CDM methodologies</u> CDM-EB: AMS III.H., version 12 – “Methane Recovery in Wastewater Treatment” CDM-EB: AMS I.C., version 14 – “Thermal energy production with or without electricity”
/11/	ISO 14064-3:2006; Greenhouse gases -- Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions; http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38700; (25-09-2009)
/12/	<u>Calibration Reports:</u> 1. Wastewater Flow meter (FM1): Serial Number: 6B00F2220000 Miracle International Technology Co., Ltd. (MIT): Calibration Certificate, issued on 02-10-2010 (Calibration Date : 08-09-2010) MIT: Calibration Certificate, issued on 25-03-2009 (Calibration date : 17-03-2009) Endress + Hauser: Calibration Certificate of calibration date 25-03-2008 2. Wastewater Flow meter (FM1): Serial Number: EB0011320000 Endress + Hauser: Calibration Certificate of Calibration date 15-11-2011 3. Colorimeter: Serial Number: 04109C53333 EnviScience Company Limited: Calibration Certificate, LEVS 1202417 (Calibration date: 12-06-2012) EnviScience: Calibration Certificate, LEVS 1101419 (Calibration date: 26-04-2011) EnviScience: Calibration Certificate, LEVS 1001829 (Calibration date: 19-05-2010) EnviScience: Calibration Certificate, LEVS 0903720 (Calibration date: 02-11-2009) EnviScience: Calibration Certificate, LEVS 0800947 (Calibration date: 06-05-2008) 4. Biogas flow meter of gas production (GM1): Serial Number: 6571 MIT: Calibration Certificate issued on 10-05-2011 (Calibration Date: 09-05-2011)

Reference	Author: Title, version, date of issue
	MIT: Calibration Certificate issued on 31-05-2010 (Calibration Date: 27-05-2010) MIT: Calibration Certificate issued on 07-07-2009 (Calibration Date: 24-06-2009) FOX: Calibration Certificate of calibration date 05-09-2008 5. Biogas flow meter of gas production (GM1): Serial Number: EA033E02000 Endress + Hauser: Calibration Certificate of calibration date 10-10-2011 6. Portable gas analyser: Serial Number: ARAM-0090 Draeger Safety (Thailand) Ltd.: Test Certificate with Calibration date 18-01-2012 Draeger: Test Certificate with Calibration date 08-06-2011 Draeger: Test Certificate with Calibration date 12-01-2011 Draeger: Test Certificate with Calibration date 23-06-2010 Draeger: Test Certificate with Calibration date 12-01-2010 7. Biogas flow meter to flare (GM3): Serial Number: 7544 MIT: Calibration Certificate issued on 10-05-2011 (Calibration date: 09-05-2011) MIT: Calibration Certificate issued on 31-05-2010 (Calibration date: 29-05-2010) FOX: Calibration Certificate of calibration date 26-05-2009 8. Biogas flow meter to flare (GM3): Serial Number: EJ-10209 MIT: Calibration Certificate issued on 07-07-2009 (Calibration date: 24-06-2009) 9. Biogas flow meter to boiler (GM2): Serial Number: EJ-10209 MIT: Calibration Certificate issued on 07-07-2009 (Calibration date: 24-06-2009) Endress + Hauser: Calibration Certificate of calibration date 26-02-2005 10. Biogas flow meter to boiler (GM2): Serial Number: 7328 MIT: Calibration Certificate issued on 10-05-2011 (Calibration date: 09-05-2011) MIT: Calibration Certificate issued on 31-05-2010 (Calibration date: 29-05-2010)

Reference	Author: Title, version, date of issue
	FOX: Calibration Certificate of calibration date 27-03-2009 11. Biogas flow meter to boiler (GM2): Serial Number: EA033D02000 Endress + Hauser: Calibration Certificate of calibration date 07-10-2011 12. Oil flow meter (OM1): Serial Number: TMC0157-43 MIT: Calibration Certificate issued on 12-05-2011 (Calibration date: 28-04-2011) MIT: Calibration Certificate issued on 31-05-2010 (Calibration date: 14-05-2010) MIT: Calibration Certificate issued on 18-05-2009 (Calibration date: 17-05-2009) 13. Oil flow meter (OM1): Serial Number: TMC-4-1-0068-044 MIT: Calibration Certificate issued on 12-05-2011 (Calibration date: 28-04-2011) MIT: Calibration Certificate issued on 31-05-2010 (Calibration date: 14-05-2010) MIT: Calibration Certificate issued on 18-05-2009 (Calibration date: 17-05-2009)
/13/	<u>Monitoring Equipment specifications:</u> ENDRESS + HAUSER: Technical Information of Proline Promag 10W (Electromagnetic Flow Measuring system, Flow Measurement of liquids in water or wastewater applications) - http://www.endress.com/corporate#product/10W ENDRESS + HAUSER: Technical Information of Proline t-mass 65F, 65I (Thermal Mass Flow Measuring System, Direct Mass Flow Measurement of Gases) - http://www.endress.com/corporate#product/65I HACH: DR/800 Series Colorimeters Data sheet and Specifications (http://www.hach.com/dr-890-portablecolorimeter/product-downloads?id=7640439041) FOX: Specifications of Thermal Mass Flow Meters (http://www.foxthermalinstruments.com/pdf/ft2/FT2%20Datasheet.pdf) Draeger: Specifications of gas analyzer (http://www.draeger.com/TH/th/products/gas_detection/portable/multi/cin_xam_7000.jsp?showBackButton=true) ABB: Specifications of liquid flow meters (http://www.abb.com/product/us/9AAC100398.aspx?country=DE)

Reference	Author: Title, version, date of issue
/14/	SD Biosupply Co. Ltd.: Annual calibration plan approved by the Plant Manager for 2010 SD Biosupply Co. Ltd.: Annual calibration plan approved by the Plant Manager for 2011
/15/	Endress+Hauser: Standard Operating Procedure for Calibration and Maintenance, Issue date: 25-02-2004
/16/	PAPOP: Technical and Financial Proposal for Biogas plant and Burner modification project, July 2004 PAPOP: Turnkey contract for design, construction and start up of the biogas plant, October 2004
/17/	PAPOP: Specifications of open flare
/18/	SD Biosupply Co., Ltd.: Organisation structure
/19/	SCHERRER: Specifications of Boiler-1 (http://www.boiler.de/eng/thermooilboiler/biogascombustion.html) Hitech Engineering Co., Ltd.: Specifications of VEGA thermal oil boiler i.e. Boiler-2 (http://hitech-engineering.co.th/eng/thermaloil.php)
/20/	PEA: Monthly electricity invoices for the months from January 2009 to May 2012
/21/	Daily reports and log sheets of SD Biosupply Co., Ltd. • Wastewater flow meter readings • Methane content (% CH₄) in biogas • COD measurement of wastewater • Biogas production • Biogas consumption for boilers • Biogas consumption for flare • HFO consumption in boilers

Reference	Author: Title, version, date of issue
/22/	<u>Staff training records of SD Biosupply Co., Ltd.</u> • Annual training plan • Personal training records • Training registration forms • Training evaluation forms SD Biosupply Co., Ltd.: Training procedure of methane analyser, 01-02-2010 SD Biosupply Co., Ltd.: Training course on 5S facilitator training, Production procedure, Quality procedure, Safety, Prevention/evolution and Operation of monitoring equipment, 13 January 2012
/23/	CDM-EB: Guidelines for assessing compliance with the calibration frequency requirements (EB 52, Annex 60)
/24/	CDM-EB: Tool to determine project emissions from flaring gases containing methane (EB 28, Annex 13)
/25/	CDM-EB: General Guidelines for SSC CDM methodologies, version 18 (EB 66, Annex 23)
/26/	Somdej Flour Co., Ltd.: Starch Production Summary Reports for the years 2009, 2010 and 2011 approved by the Plant Manager
/27/	SD Biosupply Co., Ltd.: Maintenance records of monitoring equipment
/28/	SD Biosupply Co., Ltd.: COD Analysis Procedure, WQC – 000 – 05
/29/	TTSA: An Article on “Application of Information Technology for Development of Eco-efficiency Toward Tapioca Starch Industry” published by Thai Tapioca Starch Association in February 2007
/30/	PAPOP: SD Biosupply Co., Ltd. Biogas Production and Utilisation Manual prepared by Papop Co., Ltd., March 2007

Reference	Author: Title, version, date of issue
/31/	UKAS Quality Management: BS EN ISO 9001:2008 Certificate for Quality Management Systems of SD Biosupply Co., Ltd., dated 18-08-2010
/32/	GLC GmbH: Germanischer Lloyd CDM Procedures
/33/	IPCC: 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book

ANNEX 3: RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS (FINDINGS' LIST)

Description of Finding CAR / CL / FAR (dd-mm-yyyy)	Project Participants Response (dd-mm-yyyy)	GLC's Assessment (dd-mm-yyyy)	Final Conclusion (OK or OPEN)
CAR 1 (31-07-2012) Onsite verification for the 2 nd verification of the project activity was carried out from 2012-07-18 to 2012-07-19. The onsite verification revealed that there are two boilers in operation; the name plate details of Boiler-1 indicate that the capacity (heat output) as 3,000,000 kCal/hr which is equivalent to 3488 kW _{th} and the manufacturing date as 25/06/2010 and that of Boiler-2 indicate the capacity as 3780 kW _{th} and the year of construction as 2012. Therefore, it is understood from the year of manufacturing that the boiler mentioned in the VCS PD were replaced with new boilers during the	12-08-2012 (1st round) The two boilers having a total capacity of 7.268 MW _{th} were installed in 2010 and 2012 replacing the old boilers. The boilers are integral part of the starch factory and the replacement does not have any impact on the project activity. The same has been included in monitoring report section 1.1.	24-08-2012 (1st round) Not OK. As per the applied methodology, AMS III.H., version 12, " <i>The project boundary is the physical, geographical site where the wastewater and sludge treatment takes place in baseline and project situation. It covers all facilities affected by the project activity including sites where the processing, transportation and application or disposal of waste products as well as biogas takes place.</i> " Therefore, the statement in the response is not clear. Besides, it has not been addressed how Para 23 of AMS I.C. version 14 is justified.	OK

monitoring period. However, the information in this regard and the impact of boilers replacement has not been discussed in the monitoring report (MR).	27-08-2012 (2nd round) The two new boilers having a total capacity of 7.268 MWth were installed in 2010 and 2012 replacing the old boilers with a capacity of 8.55 MWth. It can therefore be seen that the new boilers have a lower installed capacity than the older boilers. Therefore, there is no impact due to the installation of new boilers. Furthermore, the old boilers were replaced due to repeated leakages in the tubes, which was affecting the operation of the starch factory. Paragraph 23 of AMS-I.C version 14 is not applicable to this situation. This would have been applicable only when the old boilers would have reached end of their lifetime where they would be required to be replaced. It was demonstrated during the validation (please refer to CL10 in validation report page 62) of the project activity that the boilers had a remaining lifetime of 20 years which was in access to the operational lifetime of the project. Further, it was also mentioned in the validation report on page 62 and 26 that the boilers would be replaced immediately in case of any breakdowns. Therefore, there is no impact to the project due to boiler replacement.	30-08-2012 (2nd round) OK. From the provided evidence documents it is understood that the capacity of new boilers is less than that of old boilers. The boilers were replaced since the old boilers were having frequent problems. Besides, the boilers life time was also assessed during the validation. The validation report states, "..... A nominal life time of 20 years for boiler would ensure its operation through the lifetime of project activity which has 15 years of life." It is further stated in the validation report that the project activity is not affected by the lifetime of the boiler as the boiler would be immediately replaced in case of breakdown since it is a major equipment in starch production process. Therefore, it is confirmed that replacement of the old boilers with the new has no impact on the project activity. The CAR is, hence, closed.	
CAR 2 (31-07-2012) The calibration reports of all the monitoring equipments were verified during the document review and onsite verification. Though majority of the monitoring equipments were calibrated within the specified frequency, calibration gap for some of the meters, mentioned below, has	12-08-2012 (1st round) 1. GM-2: The gap between 2 calibrations of GM-2 is from 2005-02-26 to 2009-06-24 (4 years and 4 months). As per the 'Standard Operation Procedure for Calibration and Maintenance' of Endress+ Hauser, (see CAR#2_SOP for Calibration+ Maintenance), the calibration intervals are recommended as follows: (i) if the gas is clean and dry and the instrument	24-08-2012 (1st round) 1. OK. From the provided calibration certificate (dated 2005-02-28), it is confirmed that the initial calibration was carried out on 2005-02-26. It is also confirmed from the 'Standard Operation Procedure for Calibration and Maintenance' of Endress+ Hauser (the manufacturer of flow meter), the recommended calibration frequency for	OK

been observed: 1. GM-2 (EJ-10209) was calibrated on 2009-06-24 and there was a calibration gap from the beginning of the monitoring period to the mentioned date. 2. The recommended calibration frequency by the calibration agency for the COD meter is one year. However, there was a delay before 2010-05-19 and from 2012-04-26 to 2012-05-31. 3. The recommended calibration frequency by the manufacturer for CH₄ analyser is 6 months. However, there is a delay between the calibrations. 4. Delay in calibration of fuel oil meters before 2009-05-17 The calibration delay has not been addressed in the MR	is operating under normal ambient conditions then, re-calibrate every 5-10 years. (ii) if the same process conditions apply but the device is located outside then reduce the calibration periodicity to 3-5 years dependent on the hostility of the environment. (iii) If the gas is wet, has particles within or is corrosive then, calibration intervals should be reduced accordingly. (iv) The use of electronic verification tools, to check sensor status and electronics performance can be applied on a 1-3 year basis. If this is combined with periodic maintenance and inspection routines then the calibration intervals suggested above can be extended by a factor of two. For GM-2, the gas is already passed through the gas dryer and the H₂S scrubber, which makes sure that it is dry and has low sulphur content. The meter is protected under a shed thereby minimising damage from environmental factors. Thus as per the above procedures, the recommendation (i) (5-10 years) is applicable and 5 years re-calibration can be considered as conservative. Therefore; no calibration gap is applicable for GM-2. 2. The calibration certificate on 2009-11-02 is provided (see CAR#2_Colorimeter certificate 2009). By the way, there are still the gaps from 2009-05-05 to 2009-11-01 and 2012-04-26 to 2012-05-31. The higher error between 'the maximum permissible error' and 'the error identified in calibration test' is applied. The	gas flow meter if the gas is clean and dry is 5 – 10 years. Since the gas passes through scrubber and dryer before it is fed to boiler and the meter is located after the scrubber and dryer, the gas is considered to be clean and dry. Therefore, as the gas flow meter (GM-2) was re-calibrated in less than 5 years time period, it is accepted. 2. OK. It is confirmed that the calibration certificate of 2009-11-02 has been provided to the verification team. The previous calibration certificate 2008-05-06 has also been provided to the verification team. From the technical specifications of the colorimeter it is found that the accuracy of the equipment is 0.24%. Therefore, it is confirmed that the PPs have addressed	
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	monitored values are adjusted with $\pm 4.55\%$ and $\pm 1.05\%$ for both mentioned periods, respectively (detail of error applied is in the ER sheet). 3. There are calibration gaps during 2010-12-20 to 2011-01-11 and 2011-12-05 to 2012-01-17. The higher error between 'the maximum permissible error' and 'the error identified in calibration test' is applied. The monitored values are adjusted with $\pm 4.0\%$ and $\pm 0.9\%$ for the mentioned periods years 2010/2011 and 2011/2012, respectively (detail of the error applied is in the ER sheet). 4. Oil meters had never been calibrated before year 2009. The higher error between 'the maximum permissible error' and 'the error identified in calibration test' is applied. The accuracy of $\pm 1\%$ is applied from 2009-01-01 to 2009-05-17 for both meters (detail of the error applied is in the ER sheet). - Detail of the calibration delay is addressed in section 3.2: data and parameters monitored.	the calibration gap appropriately according to calibration guidelines of CDM-EB (EB 52, Annex 60). 3. OK. From the technical specifications of gas analyser it is found that the accuracy of the analyser is $\pm 0.9\%$. The identified error during the calibration being 4% as per the calibration report of 2011-01-12 and 0 as per the calibration report of 2012-01-18, the applied error to the measured values for the corresponding periods is appropriate. 4. OK. As per the calibration reports of 2009-05-17, the error identified during the calibration of oil flow meter-1 (OM-1) is 0.05 ml/l which is equivalent to 0.04%. The error identified for OM-2 was 3.2 ml/l which is equivalent to 0.3%. It is, therefore, considered to be appropriate to apply the maximum permissible error of the meter i.e. $\pm 1\%$. It is confirmed that the quantity of fossil fuel (HFO) fired in the boilers has been calculated conservatively in accordance with the calibration guidelines of CDM-EB (EB 52, Annex 60). This has resulted reduction in emission reduction by 270 tCO₂e. Therefore, the CAR is closed.	
CAR 3 (31-07-2012) The efficiency of the open flare has been considered as 50% in the calculation of project emissions. However, the flare parameters (such	12-08-2012 (1st round) The 50% flare efficiency was taken from Deviation 1 from the 1 st monitoring report. As the flare parameters have not been monitored, the project applies 0% flare efficiency for this	24-08-2012 (1st round) OK. As the parameters to determine flare efficiency have not been sufficiently monitored, it is considered to be appropriate to take the flare efficiency as	OK

as flame detection period) have not been monitored as described in the monitoring plan.	monitoring period as per the flaring tool. The ER sheet is revised using 0% flaring efficiency.	zero. The approach followed by the PPs is inline with the monitoring plan and also the flaring tool (EB 28, Annex 13). This action has lead to the increase in project emissions by 1315 tCO ₂ e. Therefore, the calculated emission reduction is deemed conservative. Hence, the CAR is closed.	
CAR 4 (31-07-2012) A deviation has been applied for not monitoring %CH ₄ (methane content) during 2009. However, conservativeness of the value for baseline emission calculation has not been justified. Besides, the gas analyser procured in 2010 is portable gas analyser. Therefore, %CH ₄ was measured periodically during 2010, 2011 and 2012. In the calculation of emission reduction, average value of the year has been applied which is not appropriate as per the methodology.	12-08-2012 (1st round) Deviation 3 in the MR is revised. The averaged monitored data from 2010-2012 is adjusted with 95% confidence level, the lower methane content is applied for baseline emission calculation and the higher methane content is applied for project emission calculation to be conservative. The same approach is applied for 2010, 2011 and 2012 (see details of calculation in the ER sheet) as the valued obtained from the portable gas analyser.	24-08-2012 (1st round) OK. The deviation-3 in the MR has been revised. It is confirmed that the revised description of the deviation is clear and transparent. Since the methane analyser was not available for the year 2009, the average of the measured data for 2010-2012 has been considered and the values have been taken on a conservative approach by applying 95% confidence level. Detailed calculation has been provided in the ER sheet. The design value of value of %CH ₄ (methane content) as per the technical proposal submitted by the technology supplier is 65%. It is confirmed that the %CH ₄ considered is lower than 65% for baseline emissions and higher than 65% for project emissions. The methane content has been considered conservatively for 2010, 2011 and 2012 also by applying the 95% confidence level. The approach is inline with the Para 36 of the applied methodology. Therefore, the CAR is closed.	OK

CAR 5 (31-07-2012) Monitoring data presented in the ER sheet was crosschecked with the daily log sheets during the onsite verification. Inconsistency of the data on some of the days, as highlighted in the ER sheet, has been observed.	12-08-2012 (1st round) The ER sheet is corrected and is consistent with the log sheet.	24-08-2012 (1st round) OK. The identified data has been corrected in accordance with the log sheets. Therefore, the CAR is closed.	OK
CAR 6 (31-07-2012) Section 1.1 of the MR states, “ <i>The project was implemented at SD Starch Co. Ltd.</i> ”, whereas the factory name where the project activity was implemented was found to be SOMDEJ FLOUR MILL CO., LTD. (please provide the reason for the different name in the response column and correct the name in the MR)	12-08-2012 (1st round) Section 1.1 is revised with the correct name of the starch factory “Somdej Flour Mill co., Ltd.”.	24-08-2012 (1st round) The factory name in section 1.1 of the MR has been corrected to Somdej Flour Mill co., Ltd. However, no reason for the different name has been provided.	OK
	27-08-2012 (2nd round) The name of the starch plant taken from the PD is ‘SD Starch Co., Ltd’, which is incorrect. The official name of the starch plant in this project activity is ‘Somdej Flour Mill Co., Ltd. and is corrected in the monitoring report.	30-08-2012 (2nd round) OK. The VCS PD contains the starch factory name as ‘SD Starch Co., Ltd.’ which is incorrect as confirmed by the Plant Manager. The correct name of the factory is ‘Somdej Fluor CO., Ltd.’ However this does not have any impact on the project activity or project proponent. The project proponent remains SD Biosupply Co., Ltd. Therefore, this CAR is closed.	
CAR 7 (31-07-2012) The following information has not	12-08-2012 (1st round) The mentioned points 1-4 are addressed in the	24-08-2012 (1st round) OK	OK

been provided correctly in the MR: 1. Project start date in section 1.5 2. Title and reference of the methodology in section 1.8 3. Implementation status of the project activity in section 2.1 4. Section 5 has been found missing	MR. Please see the revised MR.	1. The project start date has been mentioned as 2005-09-16 in section 1.5 of the MR which is inline with the VCS PD. 2. Title and reference of the methodologies have been correctly provided in section 1.8 of the MR. 3. Implementation status of the project activity has been detailed in section 2.1 of the MR. 4. Section 5 has been included in the MR. No additional information is applicable to be provided. Therefore, the CAR is closed.	
CAR 8 (31-07-2012) EG_{thermal, y} is a monitoring parameter as per the monitoring plan of the VCS PD. However, this parameter has not been mentioned in section 3.2 of the MR; instead Q_{starch, y} has been provided which is not clear.	12-08-2012 (1st round) Section 3.2: Data and parameter monitored is revised with the parameter EG_{thermal, y} as per the monitoring plan in the VCS PD. The deviation approach 2 is described to allow the monitoring of Q_{starch, y} instead the EG_{thermal, y}.	24-08-2012 (1st round) OK. EG_{thermal, y} has been included under monitoring parameters in section 3.2 of the MR. According to the monitoring plan, net quantity of thermal energy supplied by the dual fuel operated boiler (using biogas and HFO) needs to be determined. In order to determine this, it is required to monitor the thermal oil flow rate through boiler and temperature of the thermal oil at inlet and outlet of the boiler. Since monitoring equipment was not available to monitor hot thermal oil, the PPs have taken deviation and determined the parameter based on starch production and HFO consumption. Therefore, the CAR is closed.	OK

CAR 9 (31-07-2012) Several inconsistent statements have been observed in the description of monitoring plan in section 3.3 of the MR when compared with the actual onsite monitoring procedures.	12-08-2012 (1st round) Section 3.3 in the MR is revised to be consistent with the actual onsite monitoring procedure.	24-08-2012 (1st round) OK. All inconsistent statements in section 3.3 of the MR have been corrected. The description in the revised MR is inline with the onsite observations. Therefore, the CAR is closed.	OK
CAR 10 (31-07-2012) Estimated emission reduction as per the validated VCS PD is 18,432 tCO₂e per annum. However, the achieved emission reduction during the monitoring period is higher than the estimated value. PPs are requested to provide justification for the increase in achieved emission reduction.	12-08-2012 (1st round) The increase in emission reductions can be attributed due to increase in days of operation and wastewater generation per unit ton of starch production during the current monitoring period. In the registered VCS PDD, the days of operation per year was assumed as 240 days/year and the wastewater generation rate was assumed at 4.7m³/ton of starch. These values were taken at the time of writing the VCS PD and validated by the DOE. It should be noted that the validating DOE had raised a FAR to check days of verification during the first verification. This was checked during first verification and the FAR was closed. During this monitoring period, the raw material was abundantly available to run the starch factory for longer duration than average. Furthermore, the factory also received special order from the government, which led to increase in the overall production (See CAR#10_strach production contract with PWO ministry of commerce, this is the result from the interference of tapioca price project of the government during years 2008/2009 and 2011/2012). The wastewater generation rate during the current monitoring period ranges between 7.38-10.1 m³/t starch. It is dependent on the quality of raw material (starch content in the roots) due to variations in	24-08-2012 (1st round) OK. It is understood that the emission reduction depends on several factors such as operating days, starch production, quality of raw material, etc. The achieved emission reduction is beyond the control of PP. The justification provided for the increase in emission reduction is appropriate. Therefore, the CAR is closed.	OK

	the weather conditions and crop production. The starch factory has also done some modification in their production processes to extract more starch from Tapioca, which also results in higher wastewater generation rate. The above-mentioned factors could not be envisaged at the time of validation. It may also happen that in the future verification, the production may go down due to the factors mentioned above. It should also be noted that during the first verification, the emission reductions were close to the PD estimates. Based on the above, it can be concluded that the increase in emission reductions is not permanent but dependent on various factors, which can neither be controlled nor predicted in advance.														
CAR 11 (31-07-2012) (FAR from the validation; OBS 15) <i>“The number of operating days should be monitored and if it significantly goes above 240 days then additionality should be re-assessed at the time of verification.”</i> While the number of operating days counted based on the ER sheet being high especially in 2009, 2010 and in 2012 for the corresponding period, justification of this point is required from the project participants (PP).	12-08-2012 (1st round) In addition to the response mentioned for CAR10, further explanation is provided below for the increase in days of operation. The actual days of operation are as follows: <table><tr><th>Year</th><th>No. of operating day</th><th>As per PD</th></tr><tr><td>2009</td><td>288</td><td>240</td></tr><tr><td>2010</td><td>251</td><td>240</td></tr><tr><td>2011</td><td>242</td><td>240</td></tr></table>	Year	No. of operating day	As per PD	2009	288	240	2010	251	240	2011	242	240	24-08-2012 (1st round) Sensitivity analysis was carried out in the PDD for input parameters by varying ±10%. The increase in number of days during 2010 and 2011 is less than 10%. The number of operating days in 2012 is less than the total number of days for the corresponding period. Only in the year 2009 the number of operating days is marginally higher. The reason for the increased operating days, as understood from the discussions with PPs, is due to special order for starch production from the government. However, in no year the operating days are significantly above 240 days. Therefore, verification team is of the opinion that no re-assessment of additionality is required.	OK
Year	No. of operating day	As per PD													
2009	288	240													
2010	251	240													
2011	242	240													

	<table border="1"> <tr> <td>2012 months)</td><td>(5</td><td>120</td><td>150</td></tr> </table> During the year 2012, the days of operation are lower than PD estimates (120<150). Further, if we increase the days of operation (PD value) by 10%, it comes to 264 days of operation. The days of operation in 2009 are only 9% more than the figure of 264. In year 2010 and 2011, they are lower. The above argumentation is based on the fact that the VCD PD was registered with a +/- 10% variation in the plant parameters. Given that days of operation can potentially go up to 264, the comparison should be made with this upper limit. Compared to the upper limit of 264, only in the year 2009, the days of operation were slightly higher which can be explained based on various factors outlined in the response to CAR10. As a double check, if we only compare with 240 days of operation then the increase is 20% in 2009, 4.5% in 2010 and 0.83% in 2011. Therefore only in 2009, it could be considered significant compared to the absolute value of 240 whereas in other years the increase is less than 10%. Therefore, based on the above justification and the justification given for CAR10, the assessment of additionality is not necessary and the days of operation can be considered reasonable. It should also be noted that during the first verification, this FAR was closed by the DOE.	2012 months)	(5	120	150	Therefore, the CAR is closed.	
2012 months)	(5	120	150				

CAR 12 (31-07-2012) (FAR from the 1st verification) <i>“The following parameters and monitoring procedure shall follow the monitoring plan mentioned in the validation PD,</i> <i>1. Flame detector and and/or temperature sensor to determine the operation of open flaring system.....</i> <i>2. The monitoring equipment to quantify the thermal energy generated in the project activity – Direct measurement of flow and temperature</i> <i>3. Methane content in biogas shall be monitored and recorded as per methodology AMS III.H version 12 paragraph 36</i> <i>4. Amount of biogas utilised and flared shall be monitored as per the methodology AMS III.H version 12... and clarification from CDM small scale working group No. 376</i> <i>5. The record of sludge quantity and its application shall be direct monitoring and record</i> <i>6. Quantity of fossil fuel used in the project activity along with biogas shall be directly monitored using</i>	12-08-2012 (1st round) - The flame detector and/or temperature sensor have not been installed yet. The project applies 0% flaring efficiency as per tool to calculate the emission reductions. - The monitoring equipment to quantify the thermal energy generated in the project activity has not been installed yet. The project applies the deviated approach 2 as detailed in the MR. - Gas analyser has been applied to the project since January 2010 as detailed in section 2.1: the implementation status of the project activity, of the MR. - Gas flow meter to monitor the amount of biogas sent to flare (GM3) has been installed to the project since June 2009 as detailed in section 2.1: the implementation status of the project activity, of the MR. - There is no sludge removal in this monitoring period. - Fuel oil meters had been installed in the beginning stage of the starch plant but the amount of fuel oil consumption had never been recorded. The PP started recording the fuel oil consumption since January 2009 as detailed in section 2.1: the implementation status of the project activity, of the MR.	24-08-2012 (1st round) - The emission reduction has been calculated conservatively by assuming flare efficiency as zero due to insufficient monitoring equipment. It is accepted since it is inline with the monitoring plan - A deviation was taken by the PPs for monitoring thermal energy generated in the project activity. The deviation-2 has been sufficiently described in section 2.2 of the MR. - Portable gas analyser was used since January 2010 and 95/5 confidence level has been applied for the periodically measured values of methane content which is inline with Para 36 of AMS III.H., version 12. - The amount of biogas utilised in boilers was monitored since the beginning of the monitoring period. The amount of biogas flared was monitored since June 2009 as required by the applied methodology. - The sludge was not removed during the monitoring period. This is confirmed based on the onsite interviews with the operating team. - Quantity of fossil fuel (HFO) fired in the boilers along with the biogas was monitored using continuous flow meters during the whole monitoring period. The values presented in the ER sheet were verified with the log sheets during the on-	OK
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<i>continuous flow meters as described in the validated VCS PD."</i>		site visit. Therefore, the CAR is closed.	
CL 1 (31-07-2012) Deviations taken during the monitoring period have been presented in section 2.2 of the MR. However, deviations-1, 2 & 3 lack clarity; deviation has not been defined appropriately and the justification on conservativeness of emission reduction has not been sufficiently provided.	12-08-2012 (1st round) Section 2.2 in the MR is revised with the details of 'approach in the monitoring plan' and 'deviated approach in this monitoring period' including the explanation on the conservativeness of the approach.	24-08-2012 (1st round) OK. The deviations have been transparently explained in section 2.2 of the MR and justification on conservativeness of emission reduction has been presented. The assessment of the deviations is provided in section 4.1 of the report. Therefore, the CL is closed.	OK
CL 2 (31-07-2012) In section 3.2 of the MR it is mentioned that periodic calibrations for flow meters are ensured. It is not clear from the statement what the defined calibration frequency is. Besides, calibration frequency of biogas flow meter to flare (GM3) has not been mentioned in the section.	12-08-2012 (1st round) The table of 'data and parameters monitored' in section 3.2 of the MR is revised. The monitoring plan in the VCS PD only mentions that periodic calibrations are ensure as the monitoring equipment could be changed during the crediting periods. In this MR, the calibration interval of the monitoring equipment is revised to 'at least once in two years or as per manufacturer's recommendation'. SD Biosupply Co., Ltd generally set a calibration plan for the monitoring equipment annually as per the calibration plan documents provided to DOE onsite (attached along as a sample: CL#2_calibration plan_SD Biosupply).	24-08-2012 (1st round) OK. The calibration frequency has been clearly mentioned as 'at least once in 2 years or as per manufacturer's recommendations' which is appropriate since the plant's team has developed annual calibration plan and majority of the equipments are calibrated as per the annual calibration plan. However, the calibration is carried out during annual shut down period of the starch factory which varies based on the availability of raw material. Besides, gas analyser and colorimeter shall be calibrated once in 6 months and once in a year respectively as recommended by the suppliers. The calibration of these monitoring equipments was conducted accordingly. Therefore, the CL is closed.	OK