VCS VERIFICATION REPORT

Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand

MONITORING PERIOD:

6 APRIL 2007 TO 14 APRIL 2009

REPORT Nº2011-0124

REVISION NO. 01

Project Title	Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand
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Summary:

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions reported for the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" for the period 6 April 2007 to 14 April 2009, to review and determine the monitored reductions in GHG emissions that have occurred as a result of the project activity. The project has previously been registered by the CDM Executive Board under CDM Ref 1993 and the current monintoring period covers the period pre-CDM registration.

The verification was performed on the basis of VCSA Programme Guidelines & Standard, version 3.2 for projects participanting in more than one GHG programme, as well as criteria given to provide for consistent project operations, monitoring and reporting. The verification was conducted by means of document review, follow-up interviews and site inspection, and the resolution of outstanding issues.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (version 2.3.1) of 07 September 2012 are fairly stated. The GHG emission reductions were calcualted correctly on the basis of approved methodologies AM0013 (version 4) and AMS-I.C (version 12) and the revised monitoring plan dated 3 January 2011, approved on 3 June 2011 and the registered CDM-PDD of 30 March 2009.

Hence, DNV Climate Change Services AS (DNV) is able to certify that the emission reductions from the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" during the period amount to 156 316 tonnes CO_2 equivalent.

DNV does not assume any responsibility towards the issuance and utilization of the 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 DNV and the engagement conditions detailed in this report. DNV cannot be held liable by any party for decisions made or not made based on this report.

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1 INTRODUCTION

Siam Quality Starch Co., Ltd has commissioned DNV Climate Change Services AS (DNV) to carry out the verification and certification of emission reductions reported for the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" (the project) in the period 6 April 2007 to 14 April 2009. This report contains the findings from the validation and verification and includes a validation statement for the project and verification statement for the verified carbon units.

1.1 Objective

Verification is the periodic independent review and ex-post determination by an accredited verification body of the monitored reductions in GHG emissions that have occurred as a result of the registered VCS project activity during a defined verification period.

A verification statement is the written assurance by a verification body 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 provide a verification statement of the emission reductions reported for the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" for the period 6 April 2007 to 14 April 2009.

1.2 Scope and Criteria

The scope of the verification is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emissions reduction data is free from material misstatement.
- To verify that reported GHG emissions data is sufficiently supported by evidence.

The criteria of the verification are:

- VCS Program Guide version 3.3 / 62/,
- VCS Standard version 3.2 and other relevant requirements defined by VCSA / 61/,
- The approved methodologies AM0013 (version 04) / 53/ and AMS-I.C (version 12) / 54/.

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

1.3 Level of assurance

The verification report expresses a conclusion with a reasonable level of assurance about whether the reported GHG emissions reduction data is free from material misstatement. DNV applied a materiality threshold of 5% with respect to omission or misstatements concerning reported quantities as per VCS standard.

1.4 Summary Description of the Project

The project activity at the location of 15°24'21.59 "N, 101°37'24.96"E, involves the installation of an anaerobic wastewater treatment facility with methane capture at Siam Quality Starch Company Limited (SQS) in Chaiyaphum Province, in the North Eastern region of Thailand.

The project activity involves the capture and utilization of methane from starch processing effluent at a starch processing facility, which manufacturers both Native and Modified Strach. This is achieved with the installation of a anaerobic digestion system called the Covered In-Ground Anaerobic Reactor (CIGAR) system, to replace existing open anaerobic lagoons. After sludge removal, the effluent is then channeled to the existing open lagoons for further treatment, before being sent for land application in eucalyptus plantation that is surrounding the lagoons on-site. The sludge that is removed will be collected by local farmers for land application purposes as fertilizer.

Biogas captured is combusted for thermal energy as fuel for burners that produce heater air for the starch plant drying process, thereby reducing the dependency on the bunker oil in the project scenario. In the thermal energy generation system, the recovered biogas from digester was fed into two dual fuel burners (2 x 5 234 kW) installed at factory 1 and two others (2 x 5 234 kW) installed at factory 2. Biogas not combusted for thermal generation is sent for combustion in an open flare. The two existing burners rated at 5 234 kW in Factory 1 was retrofitted with “Ray” dual fuel burners to allow co-firing of bunker oil and biogas collected from the CIGAR system, resulting in the configuration of two 5 234 kW rated dueal fuel burners in Factory 1. The two existing burners with the same capacity of 3 300 kW in the adjacent Factory 2 would be completely replaced with two new burners with rated capacity of 5 234 kW, which would also allow the co-firing of bunker oil and biogas collected from the CIGAR system,

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

“Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand” has been registered as a CDM project activity (UNFCCC Reference Number: 1993). Therefore, DNV only performed validation for the project on those additional requirements by VCSA. This validation was completed as part of the current VCU verification.

2.1 Validation Process

2.1.1 Method and Criteria

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the validation conclusion.

The following sections outline each step in more detail.

The criteria of the verification are:

- VCS Program Guide version 3.3 / 62/,
- VCS Standard version 3.2 and other relevant requirements defined by VCSA / 61/,
- The approved methodologies AM0013 (version 04) / 53/ and AMS-I.C (version 12) / 54/.

The validation shall ensure that reported emission reductions are generated by a project that has been able to demonstrate its compliance with the VCSA requirements.

2.1.2 Document Review

The documentation was reviewed in combination with the verification activity for the project. Refer to details in Section 3.2.

2.1.3 Interviews

The interviews were performed in combination with the verification activity for the project. Refer to details in Section 3.3 / 63/-/ 75/.

2.1.4 Site Inspections

The site inspection was performed in combination with the verification activity for the project. Refer to details in Section 3.4.

2.1.5 Resolution of Any Material Discrepancy

This activity was performed in combination with the verification activity for the project. Refer to details in Section 3.5.

2.2 Validation Findings

2.2.1 Gap Validation

As the project has been validated under the CDM, only the cover page and sections 1.2, 1.3, 1.5, 1.6, 1.7, 1.9, 1.10, 1.12.1, 1.12.2, 1.12.3, 1.12.4 and 1.13 of the *VCS Project Description Template* shall be completed. DNV has undertaken a validation of same, as detailed below.

Cover page

DNV verified relevant information provided in the registered CDM-PDD / 5/.

Project title: Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand

Version: 2.3.1

Date of issue: 07 September 2012

Prepared By: Carbon Partners Asiatica

Contact: Suite 1402 World Commerce Centre, 11 Canton Road, Tsim Sha Tsui, Kowloon, Hong Kong, Tel: (852)-3101-0131, Kyoko Tochikawa: kyoko.tochikawa@cp-asiatica.com

1.2: Sectoral Scope and Project Type

According to the "VCS Sectoral Scopes" / 60/, the project is applicable under the sectoral scope 1 'Energy (renewable)' and scope 13 'Waste Handling and Disposal'. The project is a wastewater treatment project with biogas utilisation for heat generation.

1.3: Project Proponent

Project Parties:	Thailand (Host)
Project participants:	Siam Quality Starch Co., Ltd. (Thailand)

1.5: Project Start Date

The project started commissioning since 26 June 2006. However, the start of crediting period of the project under VCS program starts from 6 April 2007, which is two years prior to the completion of the project validation under CDM on 6 April 2009. Although there was a gap of more than 2 years from the commissioning of the project and the completion of the CDM validation in August 2008, Section 3.1.5 of the Registration and Issuance Process, v3.1 document of VCS version 3 allows for such project as the CDM validation contract was signed before 19 November 2008.

The VCS monitoring period starts from 6 April 2007 and ends on 14 April 2009, a day prior to the CDM registration date of the Project.

1.6: Project Crediting Period

The project crediting period for VCU issuance is from 6 April 2007 to 14 April 2009.

1.7: Project Scale and Estimated GHG Emission Reductions or Removals

Project	Yes
Mega-project	NA

Years	Estimated GHG emission reductions or removals (tCO_2e)
6 April 2007 – 5 April 2008	81 199
6 April 2008 – 5 April 2009	74 202
6 April 2009 – 14 April 2009	915
Total estimated ERs	156 316

1.9: Project Location

The geographic coordinate of the project site is situated as: GPS coordinate 15°24'21.59"N, 101°37'24.96"E

The project is located at 222 Moo 10, Suranarai Road, Kokroengrom, Bumnet-Narong, Chaiyaphum Province, Thailand.

1.10: Conditions Prior to Project Initiation

As a new covered lagoon system replacing the existing open lagoon to treat wastewater released from the starch production plant, the proposed project will reduce the amount of methane released to the atmosphere by capturing the methane, will generate GHG emission reductions by avoiding CH_4 emissions through utilising the biogas in the dual fuel burner system or flaring, which in turns reduces CO_2 emission through avoidance of bunker oil combustion. Operation of this project can reduce GHG emissions. It is confirmed that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

1.12.1: Proof of Title

Evidence of proof of title has been demonstrated via documentation proving ownership of the biogas plant by the project owner / 7/ and the starch processing business owner, Siam Quality Starch Co., Ltd. It has been confirmed that the project owner will not apply for other VERs (VER+, GS etc.) and that all credits are transferred to the buyer.

1.12.2: Emissions Trading Programs and Other Binding Limits

The proposed project is not included in an emissions trading program, and does not take place in a jurisdiction or sector in which binding limits are established on GHG emissions. The proposed project does not reduce GHG emissions from activities that participate in an emissions trading program, so this clause is not applicable.

1.12.3: Participation under Other GHG Programs

The proposed project has been registered as a CDM project (Ref 1993) on 15 April 2009. Only GHG emission reductions achieved from 6 April 2007 to 14 April 2009 will be considered as VCUs.

1.12.4: Other Forms of Environmental Credit

The project is located in Thailand and is developed and operated by Siam Quality Starch Co., Ltd. There is no other environmental credit (for example renewable energy certificate) which has or will be produced by or obtained for the project.

1.13: Additional Information Relevant to the Project

Eligibility Criteria

The project is not a grouped project, so this clause is not applicable.

Leakage Management

As per AM0013 (version 04) / 53/ and AMS-I.C (version 12) / 54/, no leakage is associated with the project activity.

Commercially Sensitive Information

The daily monitored records are considered commercially sensitive operational information and have been excluded from the public version of the VCU spreadsheet. The public version shows only the monthly aggregated data.

Further Information

As a methane capture and utilization project, the project activity will provide fuel for heat generation using renewable resources (i.e. biogas) recovered from open anaerobic lagoons and will generate GHG emission reductions by avoiding CO_2 emissions from heat generation of fossil fuel fired burners and CH_4 emissions from the anaerobic decay of the organic wastewater. Operation of this project does not lead to GHG emissions. It is confirmed that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

2.2.2 Methodology Deviations

The validation process has assessed all factors and issues that constitute the basis for emission reductions from the project according to the applicable CDM methodologies AM0013 (version 04) / 53/ and AMS-I.C (version 12) / 54/.
There were two deviations on monitoring plan for the VCS period, which was (a) the calculated biogas produced and collected in the digester from 6 April 2007 to 14 April 2009 in the VCS monitoring period and b) the missing electricity meter for measuring the electricity consumption in the decanter system. The same deviations were identified in the CER period, and have been approved by the CDM Executive Board via the submissions I-DEV No. 0319 / 8/ and I-DEV No. 0406 / 9/, respectively.
As the nature of the two deviations found in both periods are project specific, the same deviation found in the VCS monitoring period has been dealt with in the same way as the CDM monitoring period proposed and accepted by the CDM Executive Board / 8// 9/, DNV confirms that this is in line with the requirements of the VCS.

2.2.3 New Project Activity Instances

The project was not a grouped project, hence this clause is not applicable.

2.3 Validation Conclusion

DNV is able to confirm the project is in compliance with the VCS requirements for validation.

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification was performed through means of the following three phases in accordance with the requirement of the registered CDM-PDD / 5/, the applied methodologies / 53// 54/, and the VCS Standard version 3.2 / 61/ and other relevant VCS requirements / 60// 62/.

- A desk review of the monitoring report and all support documents.
- Follow-up interviews with project stakeholders and site inspection.
- The resolution of outstanding issues and the issuance of the verification report and statement.

The following sections outline each step in more detail.

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. These include:

- The emission reduction calculations and the relevant data records.
- The calibration and maintenance records for the monitoring instruments.
- The management systems to support the project operation and monitoring.

Verification team

Role	***Last Name***	***First Name***	***Country***	***Type of involvement***						
				Desk review	Site visit	Reporting	Supervision of work	Technical review	TA 13.1 competence	TA 1.1 competence
Team leader (Verifier) Team Leader (TL) since February 2012	Wong	Simon Yon Sing	Malaysia	✓	✓	✓	✓		✓	✓
Verifier Team Leader (TL) prior to February 2012	Ramachandran	Ramesh	India	✓	✓	✓			✓	
Technical reviewer	Chandrashekara	Kumaraswamy	India					✓		

Person with technical competence assisting the technical reviewer	Prabhu	Ravi Kumar	India						✓ ✓	

Duration of verification

Preparations:	*04 January 2010 to 10 January 2010*
On-site verification:	*11 and 12 January 2010*
Reporting, calculation checks and QA/QC:	*04 January 2010 to 25 September 2012*

3.2 Document Review

The verification process includes the desk review of the VER/VCU monitoring report, version 1 dated 1 December 2009, an updated version 2.3.1 dated 07 September 2012 / 1/; the raw data comprising the daily records aggregated as part of the continuous recording / 10/, the calibration certificates / 15// 16/, / 18/-/ 21/, / 25// 27/-/ 30/, / 37/, / 39/-/ 42/, / 44/-/ 47/ and equipment specifications / 17// 23// 24// 26// 31/ / 35// 48/ and the monthly emission reduction calculation spread sheets / 2/ and grid emission factor spreadsheet / 3/ were assessed as a part of the verification. The approved CDM baselines and monitoring methodologies AM0013 (version 4) / 53/ and AMS-I.C (version 12) / 54/ were also assessed. This follows summarization of desk review and findings of on-site assessment (i.e. CARs, CLs, and FARs, refer to the Appendix A of this report). Upon successful closing of those findings raised, the final verification report is prepared based on the updated VER/VCU MR (version 2.3.1 dated 07 September 2012) / 1/.

In addition, the registered CDM-PDD of 30 March 2009 / 5/, the validation report of 6 April 2009 / 6/ and in particular the revised monitoring plan approved on 3 June 2011/ 4/ was also assessed.

3.3 Interviews

On 11 and 12 January 2010, Mr Ramesh Ramachandran and Mr Simon Wong Yon Sing from DNV performed a site visit at Siam Quality Starch Company Limited (SQS) in Chaiyaphum Province, in the North Eastern region of Thailand. During this visit, DNV verified the actual implementation of the project and confirmed that the project is implemented and operated as described in the monitoring report and the registered CDM-PDD. This included confirming the operational stages of the project with physical and documented evidence.

See detail requirement in the below Section 3.4

3.4 Site Inspections

The on-site assessment involves:

- Assessment of the implementation and operation of the proposed CDM project activity as per the registered CDM-PDD;
- Review of information flows for generating, aggregating and reporting the monitoring parameters;
- Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the monitoring plan in the CDM-PDD;

- A cross-check between information provided in the monitoring report and data from other sources such as plant log books, inventories, purchase records or similar data sources;
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the CDM-PDD and the selected methodology;
- Review of calculations and assumptions made in determining the GHG data and emission reductions;
- Identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

The analysis of documentation, interviews and site visit allowed the assessment of the following processes and assumptions (including QA/QC related issues):

3.5 Resolution of Any Material Discrepancy

A corrective action request (CAR) is issued, where:

i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
ii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
iii. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

There were five corrective action requests (CAR) and two clarification requests (CL) for the current monitoring period. The monitoring report version 2.3.1 dated 07 September 2012 / 1/ has been submitted as a consequence of addressing the CARs and CLs identified during site visit verification findings. The responses supported by evidences and independent references have been verified and closed satisfactorily by DNV (refer to Appendix A).

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

As part of the site visit DNV was able to confirm that the project implementation is in accordance with the project description contained in registered CDM-PDD of 30 March 2009 / 5/, and that the monitoring has been carried out in accordance with the monitoring plan contained in the revised approved CDM-PDD dated 3 January 2011 and approved on 3 June 2011 by the CDM Executive Board/ 4/.

The purpose of the project is to mitigate GHG emissions by replacing the existing open anaerobic lagoon system from which methane was freely emitted into the atmosphere, with the installation and operation of an anaerobic digestion and methane recovery system. There is no other source of biogas for the purpose of the project activity apart from the biogas that has been recovered from the Covered In-Ground Anaerobic Reactor (CIGAR) system. The treated effluent from the anaerobic wastewater treatment system

is being diverted to a series of anaerobic lagoons before being recycled or being use for land irrigation at the surrounding eucalyptus plantation. In addition, DNV was able to verify for this monitoring period that the sludge removed is sent to the farmers for land application.

This is the first and only VCS validation and verification thus no forward action request (FAR) was identified.

4.1.1 Compliance of monitoring with monitoring plan

DNV verified that the monitoring has been carried out in accordance with the revised monitoring plan of the CDM-PDD approved on 3 June 2011 by the CDM Executive Board / 4/. The registered CDM-PDD / 5/ has been revised on the monitoring plan with the following changes i) measurement campaign for burner stack gas flow rate and methane fraction ii) calibration interval for electricity meter, iii) alternative method to calculate electricity consumption, iv) conversion of biogas flow from volumetric basis to mass basis, v) to leave the flexibility in the measurement of biogas flows ($Q_{biogas\_total,y}$, $Q_{biogas\_burner,y}$/$Q_{biogas\_flare,y}$) and methane content in biogas (W_{CH4}) to be measured either in wet or dry basis; the changes in the monitoring plan has been approved by CDM Executive Board on 3 June 2011 / 4/.

All parameters stated in the validated monitoring plan are monitored and reported appropriately. The monitoring report lists each parameter required by the monitoring plan and the information flow (i.e. from data generation, aggregation, to recording, calculation and reporting) for these parameters is provided in the monitoring report. The information flow for the each parameter in further verified in the following sections.

4.1.2 Compliance of monitoring plan with monitoring methodology

DNV is able to confirm that the revised monitoring plan dated 3 January 2011 approved on 3 June 2011 / 4/ is in accordance with the approved methodologies applied by the project activity, i.e. AM0013 (version 4) / 53/ and AMS-I.C (version 12) / 54/. In addition the following deviations were submitted and approved by CDM-EB:

a) Calculated biogas produced and collected in the digester from 15 April 2009 to 1 July 2009, whereby the request for deviation was approved in the I-DEV No. 0319 / 8/;

b) Calculated electricity generation measured by the electricity meter for the decanter facility from 15 April 2009 to 30 November 2009, whereby the request for deviation was approved in the I-DEV No. 0406 / 9/.

The deviation No. 0319 does not affect the calculation of emission reductions, where the monitoring plan in the registered CDM-PDD requires this meter for the purpose of cross checking its reading with the sum of the readings from biogas flow to the burner and flare meters.

The following table is related to the parameter stipulated in the monitoring plan/ methodology:

	Assessment/ Observation	**Assessment/ Observation**
Data / Parameter: (as in monitoring plan):	**$F_{digester}$ / $F_{dig\_out,m}$** Flow rate of wastewater fed in to /	**Regulations and incentives relevant to wastewater**

	discharge out of the digester	Thai regulations and/or incentives relevant to wastewater that may impact the baseline
Measuring frequency:	Continuously	Renewal of crediting period
Reporting frequency:	Every shift (8 hours), 3 shifts a day	Renewal of crediting period
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous measurement but do not define the recording frequency.	Yes, for conservativeness purposes DNV has checked via follow-up interviews with the local authorities / 66/ during the first CDM monitoring period, that there were no Thai regulations and incentives relevant to wastewater treatment that may impact the baseline defined during validation.
Type of monitoring equipment:	Siemens magnetic flow meter (S/N: 7ME633000817N465). Both parameters (($F_{digester}$ / $F_{dig\_out,m}$) are measured by the same meter as the digester is kept in hydraulic balance.	Qualitative as per the methodology / 53/.
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The accuracy of the meter used is ±2.5%, which was checked via the manufacturer's specification / 24/. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.	Not applicable.
Calibration frequency /interval:	12 months	Not applicable.
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good	The calibration interval of the approved revised monitoring plan refers to appropriate industry/ international standards. Since there are no industry or international standards, SQS has employed their internally defined calibration interval of 12 months	Not applicable.

monitoring practise?	which is derived from their standard practise of calibrating the same type of meters in their core business of starch processing / 22/. Thus, the selected frequency represent good monitoring practise.	
Company performing the calibration:	The flow meter is internally calibrated by SQS with calibrated standard weights using SQS internal procedure for calibration of magnetic flow meter (Doc. No. 26-03-M) / 22/, in accordance with ISO 9001. The standard weights is calibrated by NEC Corporation (Thailand) Ltd. / 21/	Not applicable.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibration confirms proper functioning of the magnetic flow meter.	Not applicable.
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	No. The calibrations of the magnetic flow meter were only performed on 18 August 2008 which is valid until 17 August 2009 and the subsequent calibration was performed on 16 July 2009 which is valid until 15 July 2010 / 20/. In addition, the calibrated standard weights were valid for the calibrations performed on the magnetic flow meter as they were calibrated on 21 March 2008 and 21 January 2009. The magnetic flow meter was not calibrated from the start of the VER period of 6 April 2007 to 17 August 2008. The delayed calibration on 18 August 2008 shows the meter has an error of -1.7%, well within its accuracy	Not applicable.

	range at ±2.5%. A maximum permissible error of 2.5% was deducted to the measured values. This is justified as the delayed calibration shows that the accuracy of the magnetic flow meter is still within the permissible error for the meter. This is conservative and consistent with CDM-EB 52 Annex 60 / 55/.	
If applicable, has the reported data been cross-checked with other available data?	The reported wastewater flow quantity in the VER monitoring period was crosschecked with the amount of starch processed in the production line and found to be in direct correlation with the wastewater flow patterns / 11/.	Not applicable.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	Not applicable.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	Not applicable.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable.	Not applicable.

	Assessment/ Observation	**Assessment/ Observation**	**Assessment/ Observation**
Data / Parameter: (as in monitoring plan):	**OP_m** Number of operation days in month	**T_2** Ambient Temperature	**$D_{lagoon,project}$** Depth of open lagoons
Measuring frequency:	Daily	Daily	Daily
Reporting frequency:	Daily	Every shift (8 hours), 3 shifts a day	Every shift (8 hours), 3 shifts a day
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require daily monitoring and recording of operation days.	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require daily monitoring and recording of ambient temperature.	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require daily monitoring and recording of the seven (7) open lagoons depth.
Type of monitoring equipment:	Based on bio-digester operation	Shengzhan Mercury thermometers (S/N: UN-1 and S/N: UN-02)	On-site marker in each lagoon
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan nor is applicable for this parameter.	There is no accuracy indicated in the approved revised monitoring plan. The accuracy defined by the manufacturer is ±3℃ / 17/, which is reasonable for the monitoring of this parameter and represent good monitoring practise.	There is no accuracy indicated in the approved revised monitoring plan for this parameter. The methodology requires the depth of the open lagoon system to be above 1 meter, thus the application of on-site markers for the 7 open lagoons represent good monitoring practise.
Calibration frequency /interval:	Not applicable	12 months	Not applicable
Is the calibration interval in line with the	Not applicable	There is no calibration indicated in the approved	There is no calibration indicated in the approved

monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?		revised monitoring plan. As the thermometer is not subjected to harsh conditions, an annual calibration represent good monitoring practise.	revised monitoring plan. Since the markers were fixed at each pond and only indicates the depth, there is no requirement to calibrate these markers.
Company performing the calibration:	Not applicable	The thermometer is internally calibrated by SQS with master liquid-in-glass-thermometer using SQS internal procedure for calibration of temperature meter (Doc. No. 38-07-M), in accordance with ISO 9001 / 12/. The master liquid-in-glass-thermometer is calibrated by Technology Promotion Association (Thailand-Japan) / 16/.	Not applicable
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Not applicable	Yes. The calibration confirmed proper functioning of the thermometers.	Not applicable
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Not applicable	No. The calibrations of both thermometers were only performed on 23 August 2007. The thermometer (S/N: UN-02) were calibrated on 20 August 2008, 19 February 2009 and 20 August 2009 / 15/. In addition, the calibrated master liquid in glass was valid for the calibrations performed	Not applicable

		on 13 May 2006, 15 May 2007, 9 April 2008 and 30 March 2009 / 16/. The thermometer (S/N: UN-01) was not calibrated from 6 April 2007 to 22 August 2007 / 15/. The delayed calibration on 23 August 2007 shows the meter has an error of +0.5℃, well within its accuracy range at ±3℃ / 17/. A maximum permissible error of 3℃ was deducted to the measured values. This is justified as the delayed calibration revealed that the accuracy of the magnetic flow meter is still within the permissible error for the meter. This is conservative and consistent with CDM-EB 52 Annex 60 / 55/.	
If applicable, has the reported data been cross-checked with other available data?	Not applicable	Yes, as per the approved revised monitoring plan, the recorded data was checked against local weather data from an official source / 52/.	Not applicable
How were the values in the monitoring report verified?	Not applicable	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/	Not applicable
Does the data management (from monitoring equipment	Yes, as SQS is accredited with ISO 9001, the same data	Yes, as SQS is accredited with ISO 9001, the same data	Yes, as SQS is accredited with ISO 9001, the same data

to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable	Not applicable	Not applicable

	Assessment/ Observation	**Assessment/ Observation**
Data / Parameter: (as in monitoring plan):	**$COD_{conc\_in,baseline,m}$** COD concentration of effluent entering the lagoons in the baseline	**$COD_{conc\_dig\_out,m}$** COD concentration of effluent out of biodigester to lagoons
Measuring frequency:	Every shift (8 hours), 3 shifts a day	Every shift (8 hours), 3 shifts a day
Reporting frequency:	Every shift (8 hours), 3 shifts a day	Every shift (8 hours), 3 shifts a day
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan requires at least once a day measurement and recording, while AM0013 methodology / 53/ require at least monthly measurement of COD, the daily measurement and recording is in compliance with the	Yes, the approved revised monitoring plan requires at least once a day measurement and recording, while AM0013 methodology / 53/ require at least monthly measurement of COD, the daily measurement and recording is in compliance with the

	revised monitoring plan and conservative compared to AM0013 methodology / 53/.	revised monitoring plan and conservative compared to AM0013 methodology / 53/.
Type of monitoring equipment:	Open Reflux Method, i.e. reflux apparatus, conical flask, hot plate COD, weight scale, volumetric pipette and reagents / 14/	Open Reflux Method, i.e. reflux apparatus, conical flask, hot plate COD, weight scale, volumetric pipette and reagents / 14/
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The Sartorius CP 224S (S/N: 17111269) weight has a measurement range of 0-220 grams, while the Precisa/205 A (S/N: 58288) weight has a measurement range of 0-205 grams, which are both reasonable for the purpose of testing COD using the open reflux method / 14/.	There is no accuracy indicated in the approved revised monitoring plan. The Sartorius CP 224S (S/N: 17111269) weight has a measurement range of 0-220 grams, while the Precisa/205 A (S/N: 58288) weight has a measurement range of 0-205 grams, which are both reasonable for the purpose of testing COD using the open reflux method / 14/.
Calibration frequency /interval:	Monthly for the weighing scales	Monthly for the weighing scales
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	There is no calibration requirement identified in the approved revised monitoring plan, SQS has adopted the calibration interval of once a month according to SQS internal procedure for calibration of weighing scales for the COD testing (Doc. No. 38-07-M) / 12/, in accordance with ISO 9001. Thus, the selected frequency represent good monitoring practise.	There is no calibration requirement identified in the approved revised monitoring plan, SQS has adopted the calibration interval of once a month according to SQS internal procedure for calibration of weighing scales for the COD testing (Doc. No. 38-07-M) / 12/, in accordance with ISO 9001. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	SQS calibrating the weighing scales, while Standard weights (S/N: M1443) calibrated by Technology Promotion Association (Thailand – Japan) / 46/.	SQS calibrating the weighing scales, while Standard weights (S/N: M1443) calibrated by Technology Promotion Association (Thailand – Japan) / 46/.
Did calibration confirm proper functioning of monitoring	Yes.	Yes.

equipment? (Yes / No):		
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Yes, calibrations were performed throughout the VCS monitoring period for the weighing scales (S/N: 17111269 / 44/ and 58288 / 45/).	Yes, calibrations were performed throughout the VCS monitoring period for the weighing scales (S/N: 17111269 / 44/ and 58288 / 45/).
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the technician log sheets available in SQS internal laboratory / 10/.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable	Not applicable

	Assessment/ Observation	**Assessment/ Observation**

Data / Parameter: (as in monitoring plan):	**$Q_{sludge,m}$/ $Q_{sludge,y}$** Amount of sludge generated and removed in month / year	**$COD_{conc\_sludge,m}$** COD concentration of sludge removed in month
Measuring frequency:	When sludge is removed.	When sludge is removed.
Reporting frequency:	When sludge is removed.	When sludge is removed.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan requires measurement and recording when sludge is removed.	Yes, the approved revised monitoring plan requires measurement and recording when sludge is removed.
Type of monitoring equipment:	Mettler Toledo (Scale 8142) Weight scales **Scale 1**: S/N 00240926 **Scale 2**: S/N 00241276 FE **Scale 3**: S/N 5454117-5KF **Scale 4**: S/N 5453962-5KF	Open Reflux Method, i.e. reflux apparatus, conical flask, hot plate COD, weight scale, volumetric pipette and reagents / 14/.
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The accuracy for the truck scales employed for the purpose of monitoring both SQS's production lines raw and processed products and the sludge removed and sent for land application is a maximum of ±30kg at the highest measurement range of 40 000 to 1000 000 kg / 39// 40// 41// 42/, which is reasonable for the monitoring of this parameter and represent good monitoring practise	There is no accuracy indicated in the approved revised monitoring plan. The Sartorius CP 224S (S/N: 17111269) weight has a measurement range of 0-220 grams / 44/, while the Precisa/205 A (S/N: 58288) weight has a measurement range of 0-205 grams / 45/, which are both reasonable for the purpose of testing COD using the open reflux method / 14/.
Calibration frequency /interval:	24 months / 43/	Monthly for the weighing scales
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not	There is no calibration interval identified in the approved revised monitoring plan, the CDM-PDD refers to relevant industry and	There is no calibration requirement identified in the approved revised monitoring plan, SQS has adopted the calibration

specify the frequency of calibration, does the selected frequency represent good monitoring practise?	international standards. DNV verified that the National Weights and Measures Act 1999 has been adopted in the verification.	interval of once a month according to SQS internal procedure for calibration of weighing scales for the COD testing (Doc. No. 38-07-M), in accordance with ISO 9001 / 12/. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	Weights and Measures Office (District 2-6 Nakorn Ratchasima)	SQS calibrating the weighing scales, while Standard weights (S/N: M1443) calibrated by Technology Promotion Association (Thailand – Japan)
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes. The calibration confirmed the proper functioning of the weight scales.	Yes.
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Yes, all truck scales are valid for the whole reporting period. **Scale 1**: S/N 00240926 was calibrated on 7 February 2007 and is valid until 6 February 2009, and subsequent calibration on 28 April 2008 and is valid until 27 April 2010 / 39/. **Scale 2**: S/N 00241276 FE was calibrated on 8 February 2007 and is valid until 7 February 2009, and subsequent calibration on 28 April 2008 and is valid until 27 April 2010, and subsequent calibration on 2 December 2008 and is valid until 1 December 2010 / 40/. **Scale 3**: S/N 5454117-5KF was calibrated on 7 February 2007 and is valid until 6 February 2009, and subsequent calibration on 28 April 2008 and is valid until 27 April 2010 / 41/.	Yes, calibrations were performed throughout the VCS monitoring period for the weighing scales (S/N: 17111269 / 44/ and 58288 / 45/).

	Scale 4: S/N 5453962-5KF was calibrated on 7 February 2007 and is valid until 6 February 2009, and subsequent calibration on 28 April 2008 and is valid until 27 April 2010 / 42/.	
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the log sheets available in SQS office / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the log sheets available in SQS office / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable	Not applicable

	Assessment/ Observation	**Assessment/ Observation**
Data / Parameter: (as in monitoring plan):	**$COD_{sludge,y}$** Chemical Oxygen Demand of the	**NC** Nitrogen content of sludge

	sludge used for land application	
Measuring frequency:	When sludge is removed.	When sludge is removed.
Reporting frequency:	When sludge is removed.	When sludge is removed.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan requires measurement and recording when sludge removal occurs.	Yes, the approved revised monitoring plan requires measurement and recording when sludge removal occurs.
Type of monitoring equipment:	Open Reflux Method, i.e. reflux apparatus, conical flask, hot plate COD, weight scale, volumetric pipette and reagents / 14/	Kjeldahl method
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The Sartorius CP 224S (S/N: 17111269) weight has a measurement range of 0-220 grams / 44/, while the Precisa/205 A (S/N: 58288) weight has a measurement range of 0-205 grams / 45/, which are both reasonable for the purpose of testing COD using the open reflux method / 14/.	There is no accuracy indicated in the approved revised monitoring plan. The Sartorius CP 224S (S/N: 17111269) weight has a measurement range of 0-220 grams / 44/, while the Precisa/205 A (S/N: 58288) weight has a measurement range of 0-205 grams / 45/, which are both reasonable for the purpose of testing nitrogen content using the Kjeldahl method / 13/.
Calibration frequency /interval:	Monthly for the weighing scales	Monthly for the weighing scales
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	There is no calibration requirement identified in the approved revised monitoring plan, SQS has adopted the calibration interval of once a month according to SQS internal procedure for calibration of weighing scales for the COD testing (Doc. No. 38-07-M) / 12/, in accordance with ISO 9001. Thus, the selected frequency represent good monitoring practise.	There is no calibration requirement identified in the approved revised monitoring plan, SQS has adopted the calibration interval of once a month according to SQS internal procedure for calibration of weighing scales for the COD testing (Doc. No. 38-07-M) / 12/, in accordance with ISO 9001. Thus, the selected frequency represent good monitoring practise.

Company performing the calibration:	SQS calibrating the weighing scales, while Standard weights (S/N: M1443) calibrated by Technology Promotion Association (Thailand – Japan) / 46/	SQS calibrating the weighing scales, while Standard weights (S/N: M1443) calibrated by Technology Promotion Association (Thailand – Japan) / 46/
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes.	Yes.
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Yes, calibrations were performed throughout the VCS monitoring period for the weighing scales (S/N: 17111269 / 44/ and 58288 / 45/).	Yes, calibrations were performed throughout the VCS monitoring period for the weighing scales (S/N: 17111269 / 44/ and 58288 / 45/).
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheets available in SQS internal laboratory / 10/.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically	Not applicable	Not applicable

possible been applied or has a request for deviation been approved?		

	Assessment/ Observation	**Assessment/ Observation**
Data / Parameter: (as in monitoring plan):	$Q_{elec\_cons,y}$ Quantity of electricity consumed due to the project activity in year y	$Q_{fuel\_cons,y}$ Quantity of fuel oil consumed due to the project activity in year y
Measuring frequency:	Continuously	Continuously
Reporting frequency:	Every shift (8 hours), 3 shifts a day	Every shift (8 hours), 3 shifts a day
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous monitoring of the electricity consumed.	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous monitoring of the bunker oil (i.e. fuel oil) consumed.
Type of monitoring equipment:	Mitsubishi MH96H electricity meter (S/N: 9279973)	Not applicable as no bunker oil (i.e. fuel oil) is required for the operation of the project activity.
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The accuracy of the meter used is ±2.0%, which was checked via the manufacturer's specification / 48/. The monitoring equipment represents good monitoring practise as it has a reasonably high accuracy.	Not applicable.
Calibration frequency /interval:	12 months	Not applicable.
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of	The calibration interval defined in the approved revised monitoring plan is either a frequency defined by the Provincial Electricity Authority (PEA) or 12 months,	Not applicable.

calibration, does the selected frequency represent good monitoring practise?	whichever is earlier. Thus in the absence of the standard from PEA, SQS has adopted 12 months interval.	
Company performing the calibration:	Meter Division, Provincial Electricity Authority (PEA)	Not applicable.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibration confirms proper functioning of the electricity meter.	Not applicable.
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	No. The calibration was only performed on 15 March 2010 / 47/, outside the VCS monitoring period. The delayed calibration shows the meter has an error of 0.31%, well within its accuracy range at ±2%. A maximum permissible error of 2% was included to increase the measured values for Project Emission Calculation throughout the VER monitoring period from 6 April 2007 to 14 April 2009. This is justified as the delayed calibration revealed that the accuracy of the electricity meter is still within the permissible error for the meter. This is conservative and consistent with CDM-EB 52 Annex 60 / 55/.	Not applicable.
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	Not applicable as there is no as no bunker oil (i.e. fuel oil) consumption.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	Not applicable as there is as no bunker oil (i.e. fuel oil) consumption.

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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	The meter measuring the project ancillaries' consumption was available at the time of project commissioning. Nevertheless the meter to measure the electricity consumption for the decanter system was not available until April 2009. Thus an alternative emission reduction calculation was calculated as per method proposed in I-DEV-0406 / 9/. The breakdown of the rated capacity for all items installed due to the project activity was reviewed as part of the submission of I-DEV-0406 and was found to be appropriate.	Not applicable.

	Assessment/ Observation	**Assessment/ Observation**
Data / Parameter: (as in monitoring plan):	$Q_{biogas\_total,y}$ Quantity of biogas produced and collected in the digester in year *y* (wet or dry basis) in Factory 1 and Factory 2	W_{CH4} Fraction of methane in the biogas from the digester (wet or dry basis)
Measuring frequency:	Continuously	Continuously
Reporting frequency:	Every shift (8 hours), 3 shifts a day	Every shift (8 hours), 3 shifts a day
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous measurement but did not define the recording	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require at least quarterly measuring and reporting frequency.

	frequency.	
Type of monitoring equipment:	**Factory 1:** Eldridge Products; Inc. (EPI) flow meter (S/N: 27031212) **Factory 2:** Eldridge Products; Inc. (EPI) flow meter (S/N: 27031211 and 28022001)	Anri Instruments and Control Pty. Ltd. Methane analyser (CAM-3L, S/N: LFB-020)
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The accuracy of the meters used was ±1.5%, which was checked via the manufacturer's specification / 31/. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.	There is no accuracy indicated in the approved revised monitoring plan. The accuracy of the meter used is ±2%, which was checked via the manufacturer's specification / 35/. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.
Calibration frequency /interval:	12 months	12 months
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan refers to appropriate industry/international standards. Since there is no industry or international standards, SQS has adopted the calibration interval of 12 months recommended by the equipment manufacturer EPI. Thus, the selected frequency represent good monitoring practise.	The calibration interval of the approved revised monitoring plan refers to appropriate industry/international standards for internally carried out measurement. Since there is no industry or international standards, SQS has adopted the calibration interval of 12 months according to SQS internal procedure for calibration of methane analyser (Doc. No. WI-CA-019-L; SI), in accordance with ISO 9001 / 12/. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	Eldridge Products; Inc. (EPI)	Entech Associate Co., Ltd.

Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibration confirms proper functioning of the EPI flow meters.	Yes, the calibration confirms proper functioning of the Anri methane analyser.
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	**Factory 1:** Eldridge Products; Inc. (EPI) flow meter (S/N: 27031212) was calibrated on 6 April 2007 and is valid until 5 April 2008, and the calibration performed 17 November 2008 is valid until 16 November 2009 / 27/. There was a calibration gap from 6 April 2008 to 17 November 2008. The delayed calibration on 17 November 2008 shows the meter has an error of 0.66%, well within its accuracy range of ±1.5%. A maximum permissible error of 1.5% was deducted to the measured values for baseline emission calculation from 6 April 2008 to 17 November 2008. This is justified as the delayed calibration revealed that the accuracy of the biogas flow meter is still within the permissible error for the meter. This is conservative and consistent with CDM-EB 52 Annex 60 / 55/. **Factory 2:** Eldridge Products; Inc. (EPI) flow meter (S/N: 27031211/28022001) was calibrated on 6 April 2007 and is valid until 5 April 2008 / 28/, and calibration performed on 29 March 2008 is valid until 28 March 2009 / 28/,, prior to the end of the VER monitoring period of 14 April 2009. The delayed calibration on 12 December 2009 shows the meter has an error of 0.01%, well within its accuracy range at ±1.5%. A maximum permissible error of 1.5% was deducted to the	No. The Anri methane analyser was calibrated on: • 20 April 2007 and is valid until 19 April 2008, a gap was found prior to the start of the VCS monitoring period of 6 April 2007; 4 September 2007 and is valid until 3 September 2008;18 September 2008 and is valid until 17 September 2009; • 11 February 2009 and is valid until 10 February 2010. The delayed calibration on 20 April 2007 shows the analyser has no error. Nevertheless, a maximum permissible error of ±2% was included to the measured values for Baseline (negative adjustment) and Project Emissions (positive adjustments) Calculations from 6 April to 19 April 2007. This is justified as the delayed calibration revealed that the accuracy of the methane analyser is still within the permissible error for the meter. This is conservative and consistent with CDM-EB 52 Annex 60 / 55/.

	measured values for baseline emission calculation. This is justified as the delayed calibration revealed that the accuracy of the biogas flow meter is still within the permissible error for the meter. This is conservative and consistent with EB 52 Annex 60 / 55/.	
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable.	Not applicable.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	**$Q_{biogas\_flare,y}$** Quantity of biogas sent for flaring
Measuring frequency:	Continuously
Reporting frequency:	Every shift (8 hours), 3 shifts a day
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous measurement but did not define the recording frequency.
Type of monitoring equipment:	Eldridge Products; Inc. (EPI) flow meter (S/N: 25100705/26120501)
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The accuracy of the meter used is ±1.5%, which was checked via the manufacturer's specification / 31/. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.
Calibration frequency /interval:	12 months
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan refers to appropriate industry/international standards. Since there is no industry or international standards, SQS has adopted the calibration interval of 12 months recommended by the equipment manufacturer EPI / 32/. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	Eldridge Products; Inc. (EPI) and Miracle International Technology Co., Ltd.
Did calibration confirm proper functioning of monitoring	Yes, the calibrations confirm proper functioning of the EPI flow meter.

equipment? (Yes / No):	
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Eldridge Products; Inc. (EPI) flow meter (S/N: 25100705/26120501) was calibrated on 18 November 2006 and valid until 17 November 2007, and another calibration on 29 March 2008 valid until 28 March 2009, which resulted in a calibration gap from 18 November 2007 to 28 March 2008 / 29/. A maximum permissible error of 1.5% was deducted to the measured values. This is justified as the delayed calibration on 29 March 2008 shows the meter has an error of 0.06%, well within its accuracy range at ±1.5%. This is conservative and consistent with CDM-EB 52 Annex 60 / 55/. The subsequent calibration was performed on 9 November 2009 / 30/, which resulted in a calibration gap from 29 March 2009 to the end of VCS monitoring period of 14 April 2009. A maximum permissible error of 1.5% was deducted to the measured values. This is justified as the delayed calibration on 9 November 2009 revealed that the error of the biogas flow meter is 0.11%, still within the permissible error for the meter. This is conservative and consistent with CDM-EB 52 Annex 60 / 55/.
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been	Not applicable.

approved?	

	Assessment/ Observation	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	**T_{flare}** Temperature of the exhaust gas of the flare	**Flare operation parameter** Minutes that flare is detected during the hour h
Measuring frequency:	Continuous	Continuous
Reporting frequency:	Every shift (8 hours), 3 shifts a day	Every shift (8 hours), 3 shifts a day
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous measurement but did not define the recording frequency.	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous measurement but did not define the recording frequency.
Type of monitoring equipment:	Siemens/Sitrans TH300 Type-N Thermocouple (S/N: AZB/U9006971)	(Nais) Matsushita Electric Works, Ltd (S/N: 00912)
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	There is no accuracy indicated in the approved revised monitoring plan. The accuracy of the meter used is ±3.0°C, which were checked via the manufacturer's specification / 26/. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.	There is no accuracy indicated in the approved revised monitoring plan or in the manufacturer's specification.
Calibration frequency /interval:	12 months	Not applicable
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of	The calibration interval of the approved revised monitoring plan refers to appropriate industry/international standards. Since there is no industry or	No calibration is required for the run time counter.

calibration, does the selected frequency represent good monitoring practise?	international standards, SQS has adopted the calibration interval of 12 months recommended by the Flaring Tool / 57/. Thus, the selected frequency represent good monitoring practise.	
Company performing the calibration:	Calibration Management Co., Ltd.	No calibration is required for the run time counter.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibration confirms proper functioning of the thermocouple.	No calibration is required for the run time counter.
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Siemens/Sitrans TH300 Type-N Thermocouple (S/N: AZB/U9006971) was calibrated on 3 January 2009 and is valid until 2 January 2010 / 25/. Calibration gaps were identified from 6 April 2007 to 2 January 2009. The measured values during this period were deducted with the maximum permissible error of 3^{o}C and this is justified considering the calibration showed a maximum error of +2.8^{o}C.	No calibration is required for the run time counter.
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission

reductions and are necessary QA/QC processes in place?	reductions and QA/QC processes in place.	reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable.	Not applicable.

	Assessment/ Observation	**Assessment/ Observation**
Data / Parameter: (as in monitoring plan):	**T** Temperature of the biogas	**P** Pressure of the biogas in the pipeline
Measuring frequency:	Continuous	Continuous
Reporting frequency:	Every shift (8 hours), 3 shifts a day	Every shift (8 hours), 3 shifts a day
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous measurement but did not define the recording frequency.	Yes, the approved revised monitoring plan and AM0013 methodology / 53/ require continuous measurement but did not define the recording frequency.
Type of monitoring equipment:	RTD sensor: Rosemount/68 N11 N00B030T (S/N: 0541593) Temperature transmitter: Rosemount/3144 (S/N: 0187554)	Siemens Pressure Gauge (S/N: AZB/R0100522)
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the	There is no accuracy indicated in the approved revised monitoring plan. The accuracy defined by the manufacturer is ±3℃ / 23/, which is reasonable for the monitoring of this parameter and represent good	There is no accuracy indicated in the approved revised monitoring plan. The accuracy defined by the manufacturer is ±0.5% / 38/, which is reasonable for the monitoring of this parameter and represent good

monitoring equipment, does the monitoring equipment represent good monitoring practise?	monitoring practise.	monitoring practise.
Calibration frequency /interval:	12 months	12 months
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan refers to appropriate national/international standards. Since there is no national or international standard, SQS has adopted the calibration interval of 12 months recommended by the Flaring Tool / 57/. Thus, the selected frequency represent good monitoring practise.	The calibration interval of the approved revised monitoring plan refers to appropriate national/international standards. Since there is no national or international standard, SQS has adopted the calibration interval of 12 months which is reasonable for the equipment.
Company performing the calibration:	Miracle International Technology Co., Ltd. and Calibration Management Co., Ltd.	Miracle International Technology Co., Ltd. and Calibration Management Co., Ltd.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibration confirms proper functioning of the thermocouple.	Yes, the calibration confirms proper functioning of the pressure gauge.
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Rosemount/68 N11 N00B030T (S/N: 0541593) and Rosemount/3144 (S/N: 0187554) were calibrated on 18 April 2008 and is valid until 17 April 2009 / 18/ and calibration performed 2 January 2009 valid until 1 January 2010 / 19/. Calibration gaps were found from 6 April 2007 to 17 April 2008. A maximum permissible error of 3.0% was deducted to the measured values. This is justified as the delayed calibration on 18 April 2008 / 18/ revealed that the error of the thermometer is 0.23%, still within the permissible error for the thermometer. This is conservative and consistent with	Siemens Pressure Gauge (S/N: AZB/R0100522) was calibrated on 18 April 2008 and valid until 17 April 2009 / 36/, and 30 April 2009 valid until 29 April 2010 / 37/. Calibration gaps were found from 6 April 2007 to 17 April 2008. A maximum permissible error of 0.5% was deducted to the measured values. This is justified as the delayed calibration on 18 April 2008 / 36/ revealed that the error of the pressure gauge is 0.23%, still within the permissible error for the pressure gauge. This is conservative and consistent with CMD-EB 52 Annex 60 / 55/.

	CDM-EB 52 Annex 60 / 55/.	
If applicable, has the reported data been cross-checked with other available data?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheets available in the biogas plant control room / 10/.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	Yes, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable.	Not applicable.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	W_{CH4_stack} Fraction of methane in burner stack gas
Measuring frequency:	Every quarter
Reporting frequency:	Every quarter
Is measuring and reporting frequency in	This parameter was measured by an external

accordance with the monitoring plan and monitoring methodology? (Yes / No)	laboratory on 3 occasions every quarter, i) first quarter May to July (test conducted from 10 July to 14 July 2009), ii) second quarter August to October 2009 (test conducted on 22 October 2009), and iii) third quarter November 2009 to January 2010 (test conducted on 13 December 2009)
Type of monitoring equipment:	U.S. EPA Method 18 (H/C Analyzer (HORIBA))
Is accuracy of the monitoring equipment equal or more accurate as stated in monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	The accuracy of methane content of burner stack gas monitoring equipment was not stated in the approved revised monitoring plan. Methane content of burner stack gas is analysed by third party laboratory according to U.S. EPA Method 18 (H/C Analyzer (HORIBA)).
Calibration frequency /interval:	Methane content of burner stack gas is analysed by third party laboratory according to U.S. EPA Method 18 (H/C Analyzer (HORIBA)).
Is the calibration interval in line with the monitoring plan of the monitoring plan? If the monitoring plan does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of methane content of burner stack gas monitoring equipment was not stated in the approved revised monitoring plan. Methane content of burner stack gas is analysed by third party laboratory according to U.S. EPA Method 18 (H/C Analyzer (HORIBA)).
Company performing the calibration:	Methane content of burner stack gas is analysed by a third party laboratory, Life and Environment Co., Ltd., which is accredited by Thailand's Department of Industrial Work on ISO/IEC 17025 : 2005
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	The CDM-PDD does not specify the calibration interval for methane content of burner stack gas. Methane content of burner stack gas is analysed by third party laboratory according to U.S. EPA Method 18 (H/C Analyzer (HORIBA)).
Is (are) calibration(s) valid for the whole reporting period? If the calibration does not cover the whole period please indicated how the project has revised its GHG calculations for the period that calibration was not valid.	Methane content of burner stack gas is analysed by third party laboratory according to U.S. EPA Method 18 (H/C Analyzer (HORIBA)).
If applicable, has the reported data been cross-checked with other available data?	The reported methane content of burner stack gas results was cross-checked with certificates of

	analysis during site visit.
How were the values in the monitoring report verified?	All the report methane content of burner stack gas test results were cross-checked and found to be in order. DNV can determine all data applied in the emission reduction calculation spread sheet were correct and from the original records.
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, as SQS is accredited with ISO 9001, the same data management practise were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable.

Quantity of fuel oil displaced in year y ($Q_{fuel\_oil,y}$)

This parameter is not a measured parameter but calculated based on the mass flow rate of the total biogas combusted in the burners and the heating value of methane at normal condition (c.f. Section 4.2).

Grid carbon emission factor (CEF)

This parameter is not a measured parameter but calculated based on combined margin of the emissions of the current generation mix. For *ex-post* this value is re-estimated every year, based on the information of electricity generation in Thailand. The emission factor of electricity generation has been calculated by "Tool to calculate the emission factor for an electricity system" (Version 02.2.0) / 59/.

Consideration about EF_{grid}, $OM_{,y}$: The simple Operating Margin (OM) emission factor calculation method is selected based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system and EF_{OM} for 2007, 2008 and 2009 were calculated. The NCV for the different fuel types were sourced from national available data. The emission factors for the different fuel types (coal, natural gas, lignite residual fuel oil) are following the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in 2006 IPCC Guidelines on National GHG Inventories / 51/. Consequently the Operating Margin Emission Factor is determined to be 0.6232 tCO_2e/MWh for the year 2007, 0.6177 tCO_2e/MWh for the year 2008, and 0.6034 tCO_2e/MWh for the year 2009.

Consideration about EF_{grid}, $BM_{,y}$: The Build Margin (BM) for 2007, 2008 and 2009 were calculated as the data vintage for year (y) in which the project generation occurs in this monitoring period (between

2007 to 2009). BM emission factor was calculated for the set of power plants that comprises the larger annual generation among i) 5 most recent power units, ii) the units that comprise at least 20% of the system generation excluding CDM. Project proponent has chosen the latter approach as it yields the larger generation. The BM is calculated as the generation-weighted average emission factor of the sample group m and arrived to be 0.5516 tCO_2e/MWh for the year 2007, 0.5585 tCO_2e/MWh for the year 2008, and 0.5477 tCO_2e/MWh for the year 2009.

Calculation of EF_{grid}, $CM_{,y}$: The weights W_{OM} and W_{BM} were selected as 0.5 and 0.5 respectively which resulted in the combined margin of 0.5874 tCO_2e/MWh for the year 2007, 0.5881 tCO_2e/MWh for the year 2008, and 0.5756 tCO_2e/MWh for the year 2009. All the data used in calculation of grid emission factor is sourced from the website of Electricity Generating Authority of Thailand / 49/.

Amount of burner stack gas in year y ($Q_{burner\_stack,y}$)

As described in the validation opinion of the revision of monitoring plan approved on 3 June 2011, the project participants firstly conducted a measurement campaign by commissioning an independent laboratory using the U.S.EPA Method 18 (H/C Analyzer (HORIBA)) to measure stack gas flow, temperature and pressure for each of the four (4) burners. The stack gas flow monitored as part of this measurement campaign was divided by the monitored amount of biogas feed flow into the burner to obtain the Nm^3 stack gas / Nm^3 feed biogas ratio. Significantly, during the measurement campaigns, the bunker oil feed stream was shut off, thereby allowing for the derivation of a feed: stack ratio that is independent of the bunker oil feed stream. The calculation method used to derive this ratio, including the application of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" / 56/, was cross checked and found appropriate by DNV.

Furthermore, an additional conservativeness measure have been taken into account by applying the Subsidiary Body for Scientific and Technological Advice (SBSTA) conservativeness factor / 58/ for uncertainty in the calculations, which is a measure adopted in some CDM methodologies such as AMS-III.H. Several uncertainty factors were adopted in the study, the most conservative factor available in the study of 1.37 is applied / 58/. As this is a conservativeness factor, this value will be fixed throughout the crediting period.

The resultant stack gas: biogas ratio will therefore be the product of the maximum measured stack gas: biogas ratio obtained in the periodical measurement campaign and the conservativeness factor, which in this period yields the followings results / 50/:

- Test performed on 25 July 2007 shows a ratio of 63 Nm^3 stack gas / Nm^3 feed biogas, which will be applied for the months in 2007;
- Test performed on 25 July 2007 shows a ratio of 34 Nm^3 stack gas / Nm^3 feed biogas, which will be applied for the months in 2007;
- Test performed on 6 February, 15 July, 21 October and 22-23 December 2008 shows a ratio of 40 Nm^3 stack gas / Nm^3 feed biogas, which will be applied for the months in 2008;
- Test performed on 30 March, 10-14 July 2009 shows a ratio of 40 Nm^3 stack gas / Nm^3 feed biogas, which will be applied for the months in 2009.

4.2 Accuracy of GHG Emission Reduction or Removal Calculations

GHG emission reductions or removal calculations were correctly calculated using applicable formulae and considerations of the baseline and monitoring methodologies AM0013 (version 4) / 53/ and AMS-I.C (version 12) / 54/.

4.2.1 Baseline emissions

As per AM0013 (version 4) / 53/, the baseline emission (BE) from the lagoon will be based on the lower figure of the following two $BE_{lagoon,y}$ results computed in the following manner: (i) baseline methane emission less the physical leakage, hereafter referred as '$BE_{lagoon,theoretical,y}$' and (ii) actual methane captured and flared/used for energy generation, hereafter referred as '$BE_{lagoon,monitored,y}$'.

$BE_{lagoon,monitored,y}$ is calculated via the actual monitored amount of biogas fed to the burners in Factory 1 and 2, and the flare system. As the flows are monitored in volumetric flow rate, a conversion is needed to mass flow rate. The conversion for this monitoring period was done in accordance to the approved revised monitoring plan using the 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' / 56/. The total $BE_{lagoon,monitored,y}$ was calculated as 159 027 tCO_2e.

$BE_{lagoon,theoretical,y}$ is calculated via the monitored COD and amount of wastewater entering the anaerobic digester, the monitored temperature which is used to calculate the anaerobic degradation factor due to temperature (f_t), the COD in the baseline calculated via the monitored COD entering the anaerobic digester and the adjustment factor (0.992) calculated determined during validation, and the subsequent methane correction factor (MCF) for each month and the COD available for conversion. As per the requirement of the methodology, the $BE_{lagoon,theoretical,y}$ has to take into account the Project Emissions from digester physical leakage '$PE_{\_Phy\_Leakage,m}$' which was calculated via the monitored amount of biogas combusted, with the physical leakage default value defined in AM0013 version 4 as 0.15 / 53/. The total $BE_{lagoon,theoretical,y}$ was calculated as 211 857 tCO_2e. Thus, the lower of two values has been selected for $BE_{lagoon,y}$ which is 159 027 tCO_2e.

$BE_{fuel\_oil,y}$ was calculated using the mass flow rate of the total biogas combusted in the burners and the heating value of methane at normal condition, which is the IPCC default value of 50.4 Tj/Gg or 0.03609 MJ/Nm^3CH_4. The baseline emission from the combustion of fuel oil or bunker oil '$BE_{fuel\_oil,y}$' that is displaced have been capped according to the average of historical 3 years consumption which was validated as 140.6 TJ/year, which is equivalent to 10 615 tCO_2/year. For this monitoring period the energy displaced by the biogas captured and combusted is 378 TJ or 186 TJ/year, which is equivalent to 28 546 tCO_2, with has exceed the capped limit. Thus, the claimable amount due to capped limit at 140.6 TJ/year is 21 395 tCO_2.

4.2.2 Project emissions

Project emissions (PE) are due to stack emissions in the burners and flare '$PE_{stack,y}$', physical leakages from anaerobic digester '$PE_{phys\_leakage,y}$', emissions in the secondary treatment open lagoon system '$PE_{lagoon,y}$', land application of sludge 'PE_{sludge_y}' and consumption of energy due to the project activity '$PE_{energy\_cons,y}$'.

'$PE_{stack,y}$' – The stack emission were appropriately determined as a function between the methane fed to the burners and the combustion efficiencies of the burners (ratio of stack gas to biogas feed rate measure) measured during the measuring campaign, whereby the methane flow to the burners have taken into account the approach in the approved I-DEV No. 0319. In addition, the emission for incomplete combustion of methane at the flare was taken into account at 50% as per the flaring tool / 57/. The '$PE_{stack,y}$' was calculated to be 3 867 tCO_2e.

'$PE_{phys\_leakage,y}$' – was appropriately determined to be zero as per AM0013 (version 4) / 53/ which states "when actual methane capture and flared/used for energy generation is selected as the baseline emission, physical leakage from anaerobic digester for estimating emission reductions shall be taken as zero".

'$PE_{lagoon,y}$' - was appropriately determined via the monitored COD and amount of wastewater leaving the anaerobic digester, the monitored temperature which is used to calculate the anaerobic degradation factor due to temperature (f_t), the COD in the baseline calculated via the monitored COD entering the anaerobic digester and the adjustment factor (0.992) calculated determined during validation, and the subsequent methane correction factor (MCF) for each month. The default value for the GWP_{CH4} (21 tCO_2e/tCH_4) and maximum methane producing capacity (Bo, 0.21) were similarly applied. The '$PE_{lagoon,y}$' was calculated to be 18 421 tCO_2e.

'PE_{sludge_y}'- was appropriately determined via the monitored COD and Nitrogen Content of the sludge removed and the amount of sludge removed and sent to the farmers, monitored via truck scales. The 'PE_{sludge_y}' was calculated to be 28 tCO_2e.

'$PE_{energy\_cons,m}$'- was appropriately determined via the electricity meter monitoring the electricity consumption for the biogas facility. During the site visit, DNV observed that the project activity involves a decanter facility for the sludge, however no equipment were available to monitor the electricity consumption. Thus as per an approved deviation request I-DEV 0406, electricity consumption for ancillary decanter facilities was calculated and taken into account to the entire VCU monitoring period. In addition, there were no bunker oil (i.e. fuel oil) consumption for the operation of the project activity, thus this is equal to zero. Thus, the '$PE_{energy\_cons,m}$' was calculated to be 1 789 tCO_2e.

4.2.2 Leakage

DNV was able to verify the analysis and calculation of the emission reductions in the monitoring report, and confirm that the calculations are complete and transparent. According to the methodologies AM0013 (version 4) / 53/ and AMS-I.C (version 12) / 54/, no leakage is taken into account if the equipment is not transferred from another activity. Thus, there is no leakage for the project activity.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

According to the applied methodology, the emission reductions (ER) should be calculated as:

$ER_y = BE_y - PE_y - LE_y$

Parameter	$BE_{lagoon,y}$ (tCO_2e/yr)	$BE_{Fuel\_oil,y}$ (tCO_2e/yr)	PE_y (tCO_2e/year)	ER_y (tCO_2e/yr)
2007 (6 April 2007 – 31 December 2007)	54 479	9 653	10 635	53 497
2008 (1 January 2008 – 31 December 2008)	79 152	9 609	10 237	78 524

2009 (1 January 2009 – 14 April 2009)	25 396	2 132	3 233	24 295
Total period (6 April 2007– 14 April 2009)				**156 316**

The biogas flared and combusted in burners, electricity consumption and emission reductions claimed for the proposed period were as shown in the following table and also could be found in the ER calculation spread sheet.

VCS monitoring period		**Emission reductions by project activity (tCO_2e)**			
Start date	End date	BE	PE	Leakage	ER
6 April 2007	14 April 2009	180 421	24 105	0	156 316

The claimed total emission reductions ER_y is 156 316 tCO_2e reported for the period 6 April 2007 to 14 April 2009. This is lower to the estimated value (equivalent to 740 days) in the approved revised CDM-PDD of 191 766 tCO_2e.

4.4 Management and Operational System

The project is operated and managed by Siam Quality Starch Co., Ltd. (SQS) who is the project proponent. The site has establish a data measurement and recording protocol for all relevant data needed, based on the monitoring plan outlined, and taking into account the QA/QC comments in section B.7.1 of the revised CDM-PDD.

SQS is ISO 9001 certified and has a well-defined management system in order to ensure a successful operation of the project and the credibility and verifiability of the ERs achieve. The organizational structure, responsibilities, competencies, non-conformance handling, internal audits and management review for the project was found to be adequate. The quality of monitoring equipment was checked via it's specification and is assured through calibration, and the quality of the monthly emission reduction calculation spread sheets assured through cross checking of readings between the raw data recorded on-site and the results submitted for verification.

The management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan.

5 VERIFICATION CONCLUSION

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions that have been reported for the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" (CDM Registration No. 1993) for the period 6 April 2007 to 14 April 2009.

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project.

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

DNV conducted the verification on the basis of the approved methodologies AM0013 (07 September 2012*) and AMS-I.C (version 12), the monitoring plan contained in the revised monitoring plan approved on 3 June 2011 the monitoring report (version 2.3.1) dated 07 September 2012. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.*

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

In our opinion the GHG emissions reductions of the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" (CDM Project ID No 1993) for the period 6 April 2007 to 14 April 2009 are fairly stated in the monitoring report (version 2.3.1) dated 07 September 2012.

The GHG emission reductions were calculated correctly on the basis of the approved methodology AM0013 (07 September 2012*) and AMS-I.C (version 12) and the revised monitoring plan approved on 3 June 2011.*

DNV Climate Change Services AS is able to certify that the emission reductions from the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" during the period 6 April 2007 to 14 April 2009 amount to 156 316 tonnes of CO_2 equivalent, detailed as below.

Reporting period: 6 April 2007 to 14 April 2009

Verified GHG emission reductions or removals in the above reporting period:

GHG Emission Reductions or Removals	tCO_2e
Baseline Emissions	180 421
Project Emissions	24 105
Leakage	0
Net GHG emission reductions or removals	156 316

DNV does not assume any responsibility towards the issuance and utilization of the 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 DNV and the engagement conditions detailed in this report. DNV cannot be held liable by any party for decisions made or not made based on this report.

6 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the periodic verification conclusions, and are usually further checked through interviews with key personnel.

/ 1/ Carbon Asiatica: Monitoring Report for "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" (UNFCC Ref 1993), version 1 dated 1 December 2009 for publication and version 2.3.1 dated 07 September 2012 submitted for request for issuance

/ 2/ Carbon Asiatica: Excel spreadsheet with emissions reductions calculations for "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand", titled: *2009.12.24 SQS CER calcs - CONFIDENTIAL (for DNV eyes only).xls* submitted with the MR published, and final version *2012.09.06 SQS VERs calcs.xls*

/ 3/ Carbon Asiatica: Excel spreadsheet with grid emission factor calculations for "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand", titled: *2012.06.12 Thai Grid Emission Factor 2007-2009.xls,* submitted for request for issuance

/ 4/ Approved revised monitoring plan for "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand", dated 3 January 2011 and approved on 3 June 2011

/ 5/ Project Design Document for "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand", version 1.3 of 30 March 2009

/ 6/ Validation Report for "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand", SGS report of 6 April 2009 (CDM. VAL. 1337)

/ 7/ Factory operating license for the biogas generation operated by Siam Quality Starch Co., Ltd., issued by Department of Industrial Works, Ministry of Industry renewed every 3 years and valid until 31 December 2014

/ 8/ Request for deviation: I-DEV0319: Request for deviation for missing total biogas meter for a period of 2.5 months approved by EB on 16 September 2010

/ 9/ Request for deviation: I-DEV0406: Request for deviation for missing electricity meter, measuring the electricity consumption for the ancillary decanter facility approved by EB on 3 May 2011

/ 10/ Siam Quality Starch Co., Ltd. (SQS): Operating log book for the monitoring of the CDM and VCS monitoring parameters, sample collected on-site covering the period April 2007 to November 2009

/ 11/ Siam Quality Starch Co., Ltd. (SQS): Native and modified starch production records in Factory 1 and Factory 2 of SQS for the year 2006, 2007, 2008 and 2009

/ 12/ Siam Quality Starch Co., Ltd. (SQS): Work Instructions Equipment Calibration Plan following the ISO 9001 standards (14 January 2009)

/ 13/ Siam Quality Starch Co., Ltd. (SQS): Work Instructions for SQS laboratory for Standard Nitrogen Testing Procedure using Total Kjeldahl Nitrogen (TKN)

/ 14/ Siam Quality Starch Co., Ltd. (SQS): Work Instructions for SQS laboratory for Standard COD using Published Study 'Standard Method for water and wastewater' 16th edition, 1985

/ 15/ Calibration report issued for Shengzhan Thermometer by Siam Quality Starch Co., Ltd.:

S/N: UN-01 calibrated on 23 August 2007 (Calibration is valid from 23 August 2007 to 22

August 2008)

S/N: UN-02 calibrated on 20 August 2008 (Calibration is valid from 20 August 2008 to 19 August 2009)

S/N: UN-02 calibrated on 19 February 2009 (Calibration is valid from 19 February 2009 to 18 February 2010)

S/N: UN-02 calibrated on 20 August 2009 (Calibration is valid from 19 August 2009 to 18 August 2009)

/ 16/ Calibration cerificates issued for the Master Liquid-in-Glass Thermometer by Technology Promotion Association (Thailand-Japan), calibration services and environmental analysis department:

Certificate No. 061389 - S/N: 1963 calibrated on 13 May 2006 (Calibration is valid from 13 May 2006 to 12 May 2007)

Certificate No. 071523 - S/N: 1963 calibrated on 15 May 2007 (Calibration is valid from 15 May 2007 to 14 May 2008)

Certificate No. 081418 - S/N: 1963 calibrated on 9 April 2008 (Calibration is valid from 9 April 2008 to 8 April 2009)

Certificate No. 091368 - S/N: 1963 calibrated on 30 March 2009 (Calibration is valid from 30 March 2009 to 29 March 2010)

/ 17/ Equipment specification for Shengzhan Thermometer stating the accuracy is ±3^{o}C with measurement range of 0 to 100^{o}C (no date)

/ 18/ Calibration certificate issued for Rosemount Thermometer by Miracle International Technology Co., Ltd.:

S/N: 0541593/0187554 (sensor and transmitter respectively) calibrated on 18 April 2008 (Calibration is valid from 18 April 2008 to 17 April 2009)

/ 19/ Calibration certificate issued for Rosemount Thermometer by Calibration Management Co., Ltd.:

S/N: 0541593/0187554 (sensor and transmitter respectively) calibrated on 2 January 2009 (Calibration is valid from 2 January 2009 to 1 January 2010)

/ 20/ Calibration certificate issued for Siemens (MAG 6000) magnetic flow meter by Siam Quality Starch Co., Ltd.:

S/N: 7ME633000817N465 calibrated on 18 August 2008 (Calibration is valid from 18 August 2008 to 17 August 2009) and 16 July 2009 (Calibration is valid from 16 July 2009 to 15 July 2010)

/ 21/ Calibration certificate issued for standard weights calibrated by NEC Corporation (Thailand) Ltd. calibrated on 21 January 2009 (Calibration is valid from 21 January 2009 to 31 March 2010)

/ 22/ Siam Quality Starch Co., Ltd. (SQS): Work Instructions Equipment Calibration Plan following the ISO 9001 standards (14 January 2009)

/ 23/ Equipment specification for Rosemount Series 68 Platinum RTD Thermometer stating the accuracy is ±3^{o}C with measurement range of -50 to 400^{o}C (no date)

/ 24/ Equipment specification for Siemens (MAG 6000) magnetic flow meter http://www.lesman.com/unleashd/catalog/transmit/sitransfm_mag50006000_manED5.pdf

/ 25/ Calibration certificate issued for Siemens Thermometer by Calibration Management Co., Ltd.:

S/N: AZB/U9006971 calibrated on 3 January 2009 (Calibration is valid from 3 January 2009 to 2 January 2010)

/ 26/ Equipment specification for Siemens SITRANS TH300 Thermometer stating the accuracy is $\pm 3^{o}C$ with measurement range of -200 to 1 300^{o}C (no date)

/ 27/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter by EPI's calibration department:

S/N: 27031212 calibrated on 6 April 2007 (Calibration is valid from 6 April 2007 to 5 April 2008)

S/N: 27031212 calibrated on 17 November 2008 (Calibration is valid from 17 November 2008 to 16 November 2009)

/ 28/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter by EPI's calibration department:

S/N: 27031211/28022001 calibrated on 6 April 2007 (Calibration is valid from 6 April 2007 to 5 April 2008)

S/N: 27031211/28022001 calibrated on 29 March 2008 (Calibration is valid from 29 March 2008 to 28 March 2009)

/ 29/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter by EPI's calibration department:

S/N: 25100705/26120501 calibrated on 18 November 2006 (Calibration is valid from 18 November 2006 to 17 November 2007)

S/N: 25100705/26120501 calibrated on 29 March 2008 (Calibration is valid from 29 March 2008 to 28 March 2009)

/ 30/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter by Miracle International Technology Co., Ltd.:

S/N: 25100705/26120501 calibrated on 20 November 2009 (Calibration is valid from 20 November 2009 to 19 November 2010)

/ 31/ Eldridge Products Inc. (EPI) specification for series 8000MP meters: ±1.5% of reading, Measurement range is 0-2400 NCMH (no date)

/ 32/ Eldridge Products Inc. (EPI) recommendation to conduct annual calibration for series 8000MP meters (no date)

/ 33/ Calibration certificate issued for (CAM-3L) online methane analyzer by Anri Instruments & Controls Pty. Ltd.:

S/N: LFB-020 calibrated on 20 April 2007 (Calibration is valid from 20 April 2007 to 19 April 2008)

/ 34/ Calibration certificate issued for (CAM-3L) online methane analyzer by Entech Associate Co. Ltd.:

S/N: LFB-020 calibrated on 4 September 2007 (Calibration is valid from 4 September 2007 to 3 September 2008)

S/N: LFB-020 calibrated on 18 September 2008 (Calibration is valid from 18 September 2008 to 17 September 2009)

S/N: LFB-020 calibrated on 11 February 2009 (Calibration is valid from 11 February 2009 to10 February 2010)

/ 35/ Anri Instruments & Controls Pty. Ltd. specification for CAM-3L methane analyzer: ±2% of reading, Measurement range is 0-100% for CH_4 reading (no date)

/ 36/ Calibration certificate and report issued for Siemens Sitrans P Series Transmitter for Pressure and Absolute Pressure by Miracle International Technology Co., Ltd.:

S/N: AZB/R0100522 calibrated on 18 April 2008 (Calibration is valid from 18 April 2008 to 17 April 2009)

/ 37/ Calibration certificate and report issued for Siemens Sitrans P Series Transmitter for Pressure and Absolute Pressure by Calibration Management Co., Ltd.:

S/N: AZB/R0100522 calibrated on 30 April 2009 (Calibration is valid from 30 April 2009 to 29 April 2010)

/ 38/ Siemens Sitrans P Series Transmitter for Pressure and Absolute Pressure specifications, accuracy is 0.25% and measurement range is 0-1 bar (pressure gauge)

/ 39/ Calibration certificate and report issued for Mettler Toledo Truck Scale by Weights and Measures Office from the Department of Internal Trade:

S/N: 00240926 calibrated on 8 February 2007 (Calibration is valid from 8 February 2007 to 7 February 2009)

S/N: 00240926 calibrated on 28 April 2008 (Calibration is valid from 28 April 2008 to 27 April 2010)

/ 40/ Calibration certificate and report issued for Mettler Toledo Truck Scale by Weights and Measures Office from the Department of Internal Trade:

S/N: 00241276 FE calibrated on 8 February 2007 (Calibration is valid from 8 February 2007 to 7 February 2009)

S/N: 00241276 FE calibrated on 28 April 2008 (Calibration is valid from 28 April 2008 to 27 April 2010)

S/N: 00241276 FE calibrated on 2 December 2008 (Calibration is valid from 2 December 2008 to 1 December 2010)

/ 41/ Calibration certificate and report issued for Mettler Toledo Truck Scale by Weights and Measures Office from the Department of Internal Trade:

S/N: 5454117-5KF calibrated on 8 February 2007 (Calibration is valid from 8 February 2007 to 7 February 2009)

S/N: 5454117-5KF calibrated on 28 April 2008 (Calibration is valid from 28 April 2008 to 27 April 2010)

/ 42/ Calibration certificate and report issued for Mettler Toledo Truck Scale by Weights and Measures Office from the Department of Internal Trade:

S/N: 5453962-5KF calibrated on 8 February 2007 (Calibration is valid from 8 February 2007 to 7 February 2009)

S/N: 5453962-5KF calibrated on 28 April 2008 (Calibration is valid from 28 April 2008 to 27 April 2010)

/ 43/ Calibration interval of once every 2 years for Mettler Toledo Truck Scale recommended by Weights and Measures Office from the Department of Internal Trade

/ 44/ Calibration report issued for Sartorious CP 224S weight scale by Siam Quality Starch Co., Ltd.:

S/N: 17111269 calibrated on 3 January 2007, 2 February 2007, 1 March 2007, 29 April 2007, 28 May 2007, 26 June 2007, 24 July 2007, 21 August 2007, 20 September 2007, 17 October 2007, 15 November 2007, 13 December 2007, 2 January 2008, 1 February 2008, 29 March 2008, 26 April 2008, 24 May 2008, 22 June 2008, 21 July 2008, 19 August 2008, 15 September 2008,. 12 October 2008, 11 November 2008, 8 December 2008, 5 January 2009, 4 February 2009, 3 March 2009, 2 April 2009.

/ 45/ Calibration report issued for Precisa weight scale by Siam Quality Starch Co., Ltd.:

S/N: 58288 calibrated on 3 January 2007, 2 February 2007, 1 March 2007, 29 April 2007, 28 May 2007, 26 June 2007, 24 July 2007, 21 August 2007, 20 September 2007, 17 October 2007, 15 November 2007, 13 December 2007, 2 January 2008, 1 February 2008, 29 March 2008, 26 April 2008, 24 May 2008, 22 June 2008, 21 July 2008, 19 August 2008, 15 September 2008,. 12 October 2008, 11 November 2008, 8 December 2008, 5 January 2009, 4 February 2009, 3 March 2009, 2 April 2009.

/ 46/ Calibration report issued for Mettler Toledo Standard Weights by Technology Promotion Association (Thailand-Japan), calibration services and environmental analysis department:

S/N: M1443 calibrated on 23 May 2006 (Calibration is valid from 23 May 2006 to 22 May 2007)

S/N: M1443 calibrated on 4 April 2007 (Calibration is valid from 4 April 2007 to 3 April 2008)

S/N: M1443 calibrated on 20 March 2009 (Calibration is valid from 20 March 2009 to 19 March 2010)

/ 47/ Calibration report issued for Mitsubishi Electric MH96H electricity meter by Kingdom of Thailand's Provincial Electricity Authority (PEA):

S/N: 9279973 calibrated on 15 March 2010 (no calibration interval defined by PEA, however the minimum interval is once yearly as per the revised monitoring plan)

/ 48/ Mitsubishi Electric MH96H electricity meter accuracy of Accuracy is class 2 IEC-60521, which is ±2% (no date)

/ 49/ "Electricity report 2007", "Electricity report 2008" and "Electricity report 2009" published by the Electricity Generating Authority of Thailand (EGAT), http://www.egat.co.th/en/

/ 50/ Life & Environment Co., Ltd: Test performed on 25 July 2007, 6 February, 15 July, 21 October and 22-23 December 2008 and 30 March, 10-14 July 2009.

/ 51/ Intergovernmental Panel on Climate Change: *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 - Energy*, 2006

/ 52/ Thai Meteorological Department: http://www.tmd.go.th/en/

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

/ 53/ CDM Executive Board: AM0013 *Avoided methane emissions from organic waste-water treatment,* version 4, dated 22 December 2006

/ 54/ CDM Executive Board: AMS-I.C: *Thermal energy for the user with or without electricity,* version 12, dated 10 August 2007

/ 55/ CDM Executive Board: *Guidelines for assessing compliance with the calibration frequency requirements* EB 52 Annex 60, dated 12 February 2010

/ 56/ CDM Executive Board: *Tool to determine the mass flow of a greenhouse gas in a gaseous stream*, version 01.

/ 57/ CDM Executive Board: *Tool to determine project emissions from flaring gases containing methane*, version 1, EB 28 Annex 13

/ 58/ Calculation of Average, Uncertainty Range, and Reliability of Regional Climate Changes from AOGCM Simulations via the ‘‘Reliability Ensemble Averaging’’ (REA) Method: http://unfccc.int/resource/docs/2003/sbsta/10a02.pdf

/ 59/ CDM Executive Board: *Tool to calculate the emission factor for an electricity system*, Version 02.2.0 of 3 June 2011

/ 60/ Verified Carbon Standard – VCS Sectoral Scopes, http://v-c-s.org/node/448

/ 61/ Verified Carbon Standard – VCS Standard: VCS version 3.2, dated 1 February 2012.

/ 62/ Verified Carbon Standard – VCS Program Guide: version 3.3, dated 1 May 2012.

Persons interviewed during the initial verification, or persons who contributed with other information that are not included in the documents listed above.

/ 63/ Kyoko Tochikawa, Carbon Partners Asiatica

/ 64/ Rudh Korsakul, Carbon Partners Asiatica

/ 65/ Prasit Vaiyavatjamai, Carbon Partners Asiatica

/ 66/ Charnyut Wichettapong, Chaiyaphum Provincial Office for the Ministry of Industry

/ 67/ Wirat Wosri, Siam Quality Starch Co., Ltd. (SQS)

/ 68/ Boontham Pantumas, Siam Quality Starch Co., Ltd. (SQS)

/ 69/ Daunchay Phomchatturat, Siam Quality Starch Co., Ltd. (SQS)

/ 70/ Thanatcha Krattapong, Siam Quality Starch Co., Ltd. (SQS)

/ 71/ Netchanok Pansuwan, Siam Quality Starch Co., Ltd. (SQS)

/ 72/ Penthip Jatunawarat, Siam Quality Starch Co., Ltd. (SQS)

/ 73/ Gordon Reynolds, Siam Quality Starch Co., Ltd. (SQS)

/ 74/ Sampart Rerkchavee, Siam Quality Starch Co., Ltd. (SQS)

/ 75/ Pluemjit Buasri, Siam Quality Starch Co., Ltd. (SQS)

APPENDIX A

CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS

Corrective action requests

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 1	Decanter facility was not included as part of the project activity in the registered monitoring plan. In the actual project implementation, the subsequent treatment step from the anaerobic lagoons involves a sludge separation and decanter system prior to land application. The decanter system component and parameters associated with the *ex-post* monitoring and calculations needs to be included in the registered monitoring plan. The methodology also requires the measurement of the flow rate of sludge generated.	The PP wishes to clarify that the project emissions relating to the ancillary decanter system, which is a part of the wastewater treatment system, is already included in the monitoring plan. The PP agrees that sludge removal contributes to: a) emission from sludge and b) emission from parasitic consumption of electricity. For a), sludge removal, this is already included in the monitoring plan. To elaborate: • Under the registered monitoring plan, the quantity of sludge removed from the system ($Q_{sludge,y}$) and COD of the sludge ($COD_{sludge,y}$) are to be monitored. • In accordance with Equation 13 of the registered CDM-PDD, the above monitored values are used to compute the emissions from sludge. The resultant emissions reported in the Monitoring Report V1.0 is 3tCO_2e. For $Q_{sludge,y}$, the PP has adhered to the provisions of the registered monitoring plan which stipulates that the quantity of sludge will be monitored either via weight or flow. There is therefore no need to change the measurement method of sludge. For b) emission from parasitic electricity, please	The PP has considered the parameters related to sludge removed from decanter $Q_{sludge,y}$ and $COD_{sludge,y}$ and these are monitored in the monitoring period, whereby in the month of October and November 2009 these sludge removed were measured on their COD and Nitrogen content along with the weights. The project emission related to sludge removal are included in the emission reduction calculation and monitoring plan. In addition, the approach to apply the calculation alternative in the methodology to calculate the electricity consumption in the decanter facility during the period when the meter was not yet installed was found to be conservative and has been approved by the CDM Executive Board. **CAR 1 is closed.**

		see response in CAR5.	
CAR 2	The biogas mass flow rate was measured in wet basis and subsequently converted to dry basis using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", while the CH_4 content was measuring on dry basis. The conversion of wet basis to dry basis was not identified in the registered CDM-PDD, this need to be clarified further.	The PP has decided to file a request for revision of monitoring plan to reflect the fact that the method in the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is used to convert from wet basis to dry basis. The request was approved on 3 June 2011.	The approach to allow flexibility in measuring dry or wet basis has been approved by the CDM Executive Board in the revised monitoring plan. **CAR 2 is closed.**
CAR 3	As per the methodology and registered monitoring plan, the project proponent is required to monitor the total biogas output through a flow meter from the biogas digester. This flow meter was only installed in July 2009.	The PP has decided to file a request for deviation for the period up to July 2009. The request DEV0319 was approved on 16 September 2011 and the spreadsheet and MR revised accordingly.	The deviation request to apply the alternative calculation in the absence of the total meter from the biogas digester was found to be conservative and has been approved by the CDM Executive Board. **CAR 3 is closed.**
CAR 4	In the methodology and the registered monitoring plan the project proponent is required to continuously measure the flow rate of the biogas burner stack gases. However in actual situation the stack gas was calculated based on product of the weighted average combustion efficiency of burners which was performed every quarterly by an external entity and the amount of CH_4 fed to burners which are monitored continuously.	The PP has decided to file a request for revision of monitoring plan to use an empirically-derived stack gas / Nm^3 feed biogas factor obtained from an annual 20-hour measurement campaign. The request was approved on 3 June 2011 and the spreadsheet and MR revised accordingly.	The approach to use measurement campaign by third party laboratory instead of direct measurement by the project entity on the parameter "flow rate of the biogas burner stack gases" has been approved by the CDM Executive Board in the revised monitoring plan. **CAR 4 is closed.**

CAR 5	It was verified that the electricity meter measuring the project facility consumption was not formally calibrated from the commissioning of the biogas facility. This is not in accordance to the methodology and registered monitoring plan where it is required that the electricity meter to be calibrated to appropriate industry standards. The electricity meter installed in the control room also does not measure the electricity consumption of the decanter system installed in 2009. This needs to be further clarified.	Upon enquiry with the Provincial Electricity Authority (PEA), it has been clarified that PEA does not require SQS to carry out the calibration of its internal electricity meters. In other words, industry standard is there is no requirement for calibration. It is noted however that the electricity meters are considered accurate and in good condition, based on the comparison between: (i) The total of SQS's readings of four internal meters, consisting of: the biogas plant, factory 1, factory 2 and CMF+RO. (ii) The PEA invoice for the entire factory that is generated based on the PEA-owned, PEA-calibrated meter. The comparison sheet submitted during the site visit show that the error of the meters are very small, with the error for the sum of four SQS meters and the PEA-calibrated total meter averaging 0.99% over a 23-month comparison period ([120,583,019kWh – 119,395,200kWh] /119,395,200kWh). The error for the biogas facility meter alone is therefore considered much smaller than the 0.99% error for four meters.	The approach to apply the calculation alternative in the methodology to calculate the electricity consumption during the period when the meter was not yet installed was found to be conservative and has been approved by the CDM Executive Board. In addition, the approach to revise the calibration interval for the electricity meter installed in the project boundary measuring the electricity consumption due to the project activity has been approved by the CDM Executive Board in the revised monitoring plan. **CAR 5 is closed.**

Clarification requests

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 1	As per the registered monitoring plan, the product of the measured flow rate and the measured COD load should be double checked against the factory's starch production records. This was found lacking in the monitoring report.	The comparison between the factory's starch production versus the product of measured flow rate and the measured COD load has been added to Section 4.2 in the revised MR.	OK, the crosschecking of the measured COD load against the factory's starch production records have been verified via evidences supplied and the comparison has been included in the monitoring report. **CL 1 is closed.**
CL 2	Magnetic feed flow meter calibration was performed internally. The project proponent is required to demonstrate that the calibration was conducted in accordance to appropriate industry/international standards.	In terms of the readings, large variations were observed in the individual and total meter flow rates during the initial period after installation (June to July 2009, when the meters were recalibrated). After this initial period, the variation between the two sets of meters stabilized, with the average total fluctuation being only 1.3%, well within the permissible error of the five meters (1 meter x +/-2% + 4 meters x +/-1%). For the period between 1 June 2009 to 10 August 2009, when the readings are considered relatively unstable (i.e. beyond the permissible error), the PP suggests to deal with this by taking the lowest of the two readings, which is represented by the total meters.	OK, since there are no industry or international standards, SQS has employed their internally defined calibration interval of 12 months which is derived from their standard practise of calibrating the same type of meters in their core business of starch processing. The flow meter is internally calibrated by SQS with calibrated standard weights using SQS internal procedure for calibration of magnetic flow meter (Doc. No. 26-03-M), in accordance with ISO 9001.The standard weights are calibrated by NEC Corporation (Thailand) Ltd.The yearly calibration is considered reasonable as the flow meter is not subjected to harsh conditions and is fixed at one location throughout the monitoring period. **CL 2 is closed.**

CL 3	Existing calibration frequencies for the biogas flow meters, methane analyzer, COD and Nitrogen Content analysis apparatus, temperature and pressure meters and weight scales needs to be demonstrated to be in-line with the appropriate national/ international standards.	The internal calibration as described during the site visit is conducted in accordance with ISO9001 Quality Assurance systems. Details of the calibration method were submitted in a separate 2-page document, on 23/01/2010.	Ok, DNV has accepted the calibration interval for the biogas flow meters which are based on the manufacturer's calibration Similarly, the methane analyser is following the calibration interval of 12 months as there was no industry or manufacturer's recommended standard. The COD and nitrogen content analysis is once every month which is reasonable as they are not subjected to harsh conditions and is only used in the laboratory throughout the monitoring period. **CL 3 is closed.**