VERIFICATION / CERTIFICATION REPORT

SIAM QUALITY STARCH WASTEWATER TREATMENT AND ENERGY GENERATION PROJECT IN CHAIYAPHUM, THAILAND

(UNFCCC Registration Ref. No. 1993)

Monitoring Period:
15 April 2009 to 30 November 2009

REPORT NO. 2010-0124

REVISION NO. 01

DET NORSKE VERITAS

VERIFICATION / CERTIFICATION REPORT

Date of first issue: 13 July 2012	Project No.: PRJC-201802-2009-CCS-MYS
Approved by Ole A. Flagstad	Organisational unit: DNV KEMA Energy & Sustainability Accredited Climate Change Services
Client: Siam Quality Starch Co., Ltd	Client ref.: Mr Sumate Srivarakiat

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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" (UNFCCC Registration Ref. No. 1993) for the period 15 April 2009 to 30 November 2009.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (Version 2.2) of 12 June 2012 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodologies AM0013 (version 04) and AMS-I.C (version 12) and the revised monitoring plan dated 3 January 2011, approved on 3 June 2011 and the registered PDD of 30 March 2009.

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" in Thailand during the period 15 April 2009 to 30 November 2009 amount to 36 384 tonnes of CO_2 equivalent.

Report No.: 2010-0124	Subject Group: Environment	
Report title: Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand		
Work carried out by: Ramesh Ramachandran, Simon Wong Yon-Sing		
Work verified by: Felipe Lacerda Antunes, Feng Zhao		
Date of this revision: 13 July 2012	Rev. No.: 01	Number of pages: 42

Indexing terms

Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area Verification Market Sector Process Industry

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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH_4	Methane
CIGAR	Covered In-Ground Anaerobic Reactor
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HRT	Hydraulic Retention Time
IPCC	Intergovernmental Panel on Climate Change
MCF	Methane Correction Factor
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
NCG	Non Condensable Gases
P&ID	Process and Instrumentation Diagram
QMS	Quality Management System
SQS	Siam Quality Starch Co., Ltd
UNFCCC	United Nations Framework Convention for Climate Change

1 INTRODUCTION

Siam Quality Starch Co., Ltd has commissioned DNV Climate Change Services AS (DNV) to carry out the verification and certification of the emission reductions reported for the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" (the project) in the period 15 April 2009 to 30 November 2009. This report contains the findings from the verification and a certification statement for the certified emission reductions.

1.1 Objective

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

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

The objective of this verification was to verify and certify the emission reductions reported for the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" for the period 15 April 2009 to 30 November 2009.

1.2 Scope

The scope of the verification is:

- To ensure that the project activity has been implemented and operated as per the registered PDD and that all physical features of the project are in place.
- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan and the approved methodology.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.
- To evaluate the data recorded and stored as per the monitoring methodology.

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

1.3 Description of the project activity

Project Parties:	*Thailand (Host) and Japan (Annex I Party)*
Title of project activity:	*Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand*
UNFCCC registration No:	*1993*

Baseline and monitoring methodology	*AM0013 (version 04) and AMS-I.C (version 12)*
Project participants:	*Siam Quality Starch Co., Ltd. (Thailand) and Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. (Japan)*
Location of the project activity:	*222 Moo 100, Suranarai Road, Kokroengrom, Bumnet-Narong, Chaiyaphum Province, Thailand*
Project's crediting period:	*15 April 2009 – 14 April 2019 (fixed)*
Period verified in this verification:	*15 April 2009 to 30 November 2009*

The project activity at the location of 15°24'20"N, 101°37'35"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.

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 fuel 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.

1.4 Methodology for determining emission reductions

The verification of emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project according to AM0013 (version 4) / 66/ and AMS-I.C (version 12) / 67/.

As per AM0013 (version 4) / 66/, 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 '$BE_{lagoon,monitored,y}$'. The baseline emission from the combustion of fuel 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 / 5/, which is equivalent to 10 615 tCO_2/year.

As per AM0013 (version 4) / 66/, the project emissions (PE) are due to stack emissions in the burners and flare '$PE_{stack,m}$', physical leakages from anaerobic digester '$PE_{phys\_leakage,m}$', emissions in the secondary treatment open lagoon system '$PE_{lagoon,m}$', land application of sludge 'PE_{sludge_m}' and consumption of energy due to the project activity '$PE_{energy\_cons,m}$'.

As per AM0013 (version 4) / 66/ and AMS-I.C (version 12) / 67/, no leakage is associated with the project activity. The final reported emission reductions (ER) were determined as the difference between baseline emissions and project emissions and leakage *(ER = BE – PE).*

The main parameters monitored are wastewater volume untreated and treated, chemical oxygen demand (COD) of treated and untreated wastewater, biogas sent for combustion in burners and flare, amount of sludge removed and sent for land application, auxiliary electricity consumption, flare temperature and operating parameters, and fraction of methane in the burner stack gas and anaerobic digester outlet.

Parameters set *ex-ante* in the validation are / 5/:

- Global warming potential for methane, 21
- Global warming potential for nitrous oxide, 310
- Oxidation factor for fuel oil, 1
- CO_2 emission factor for thermal energy generation using fuel oil, 77.4 tCO_2/TJ
- Methane producing capacity of the wastewater, 0.21 $kgCH_4/kgCOD$
- Rate of physical leakage from digester, 0.15
- Methane Correction Factor for sludge, 0.05
- COD concentration of final effluent in the baseline, 0.12 $kgCOD/m^3$
- Fraction of anaerobic degradation as a function of depth, 0.5
- Maximum quantity of fuel oil consumed in year y in the absence of project activity, 140.6 TJ
- Density of methane, 0.716 kg/m^3
- Net Calorific Value of methane, 50.4 TJ/Gg

Although the CO_2 emission factor for thermal energy generation using fuel oil was validated and fixed *ex-ante* at 77.4 tCO_2/TJ in the registered PDD, for conservativeness purpose the lower value of 75.5 tCO_2/TJ (Table 2.2 , Chapter 1, Volume 2 of 2006 IPCC Guidelines) was applied in the *ex-post* baseline emission calculation / 64/.

2 METHODOLOGY

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

a) Amount of wastewater entering and leaving the wastewater treatment system / 2// 9/;

b) Chemical oxygen demand (COD) of the untreated and treated wastewater / 2// 9/;

c) Chemical oxygen demand (COD) and Nitrogen Content (NC) of the sludge / 2// 12/;

d) Flow rate of biogas to the burners and flaring unit / 2// 10/;

e) Percentage of CH_4 in biogas collected from the digester and at burner stack gas / 2// 9/;

f) Power consumptions in the wastewater treatment facility and the decanter system / 2// 14/;

g) Flare operation parameter (time counter and temperature) / 2// 9/;

h) *Ex-post* updated grid emission factor of the electricity consumption calculated using combined margin factor method (based on 2009 data) / 3/.

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	Antunes	Felipe	Brazil					✓	✓	
Person with technical competence assisting the technical reviewer	Zhao	Feng	China							✓

Duration of verification

Monitoring report publication: *04 January 2010*

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 13 July 2012*

2.1 Review of documentation

The monitoring report Version 1 dated 1 December 2009 published for web-hosting and the latest Version 2.2 dated 12 June 2012 / 1/; the raw data comprising the daily records aggregated as part of the continuous recording / 9// 10// 11// 12// 13// 14/, the calibration certificates and equipment specifications / 21/-/ 62/ and the monthly emission reduction calculation spread sheets / 2/ and grid emission factor spreadsheet / 3/ were assessed as a part of the verification. In addition, the registered CDM-PDD of 30 March 2009 / 5/ in particular the revised monitoring plan approved on 3 June 2011/ 4/, the approved CDM baselines and monitoring methodologies AM0013 (version 4) / 66/ and AMS-I.C (version 12) / 67/ and, the validation report of 6 April 2009 / 8/ were also assessed.

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project as follows:

a) Measured COD of the wastewater entering and leaving the digester system analysed every shift (3 shifts in 24 hours) and aggregated daily conducted by internal laboratory from 15 April 2009 to 30 November 2009 / 9/;

b) Measured ambient temperature and depths of open lagoons / 9// 13/;

c) Measured COD and Nitrogen Content (NC) of the sludge / 12/;

d) Measured flow of the wastewater entering the digester system measured by the flow meter / 9/.

e) Measured every shift (3 shifts in 24 hours) and consolidated daily flow averages of biogas flow to the 4 biogas dual fuel burners and flare prior to combustion from 15 April 2009 to 30 November 2009 / 9/;

f) 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 / 6/ and the measured biogas produced and collected in the digester from 1 July 2009 to 30 November 2009 / 9/;

g) Measured every shift (3 shifts in 24 hours) and consolidated monthly flow averages of methane content of the biogas flow from 15 April 2009 to 30 November 2009 / 9/;

h) Measured electricity consumption measured with electricity meter for the biogas facility from 15 April 2009 to 30 November 2009 / 14/;

i) Calculated electricity consumption 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 / 7/;

j) Calculated amount of burner stack gas and methane fraction of stack gas from 15 April 2009 to 30 November 2009 via a measurement campaign conducted on 10-14 July 2009, 22 October 2009 and 13 December 2009 as proposed and approved by CDM Executive Board in the revised monitoring plan / 4/;

k) Data vintages and calculations to determine grid emission factor applicable at the commencement of the verification / 3/.

2.2 Site visit

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 / 1/ and the registered CDM-PDD/ 5/. This included confirming the operational stages of the project with physical and documented evidence.

The calibration records for biogas flow meters installed for monitoring the biogas collected from the anaerobic digester and sent to the biogas burners in Factory 1 and 2 and flare / 32// 33// 34// 35// 38// 39// 40// 41// 43/ and methane analyser / 48/ were checked and found appropriate. Maximum permissible error has been applied to the respective measured values during the gap and was found to be correct.

The verification team through on-site confirms that the total biogas generation from the digester was not measured from 15 April 2009 to 1 July 2009; rather it was calculated from the combined monitored biogas flow to the flaring system and burners. In addition, the electricity consumption at the decanter system was not monitored for the current monitoring period. These deviations were submitted to the CDM-EB and approved in the deviation forms I-DEV No. 0319 / 6/ and I-DEV No. 0406 / 7/. In addition, the impracticalities in directly measuring the amount of burner stack gas have led to the revision of monitoring plan which provides a measurement campaign along with the following changes i) calibration interval for electricity meter, ii) alternative method to calculate electricity consumption, iii) conversion of biogas flow from volumetric basis to mass basis, iv) 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/.

The people interviewed during audit are listed in the reference section of this project / 72/- / 84/.

2.3 Reporting of findings

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 CDM requirements have been met.

There were seven corrective action requests (CAR) and nine clarification requests (CL) for the current monitoring period. The monitoring report Version 2.2 dated 12 June 2012 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).

3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" for the period 15 April 2009 to 30 November 2009.

3.1 Remaining issues, CARs, FARs from previous validation / verification

This is the first verification and there are thus no forward action requests (FAR) from the previous verification. No forward action request (FAR) from the validation stage was identified in the validation report dated 6 April 2009 / 8/.

3.2 Project implementation

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 PDD of 30 March 2009 / 5/.

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 verification team performed the first verification of the CDM project activity "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand" and confirms that all facilities and components of the project activity are installed as envisaged in the PDD, and the monitoring plan was revised and approved by the CDM-EB on 3 June 2011 / 4/.

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.

3.3 Information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD

The emissions reductions reported in this monitoring period are 36 384 tonnes of CO_2 equivalents for the 203 days where the biogas plant is in operation in the monitoring period from 15 April 2009 to 30 November 2009 (i.e. 237 days). The yearly expected emission reductions (derived from 330 operation days) in the registered and approved revised PDD are 98 372 tonnes of CO_2 equivalents, which corresponds to the emission reductions of 60 513 tonnes of CO_2 equivalents in 203 operation days. Hence, the reported emission reductions are lower (39.77%) than the expected. The variation is due to the following reasons:

- This lower *ex-post* value is contributed by the lower volume of wastewater (24.4% reduction from *ex-ante*) and as well as lower COD removal efficiency (80% reduction from *ex-ante* compared to 73.3% in project scenario). As the thermal generation from biogas combustion is based on the biogas availability in the system, which in turn is based on volume wastewater and COD, hence the emission reductions claimed in this

monitoring period is lower than anticipated in the registered PDD and it is considered to be reasonable by DNV.

3.4 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) / 66/ and AMS-I.C (version 12) / 67/. 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 / 6/;

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 / 7/;

3.5 Compliance of monitoring with the monitoring plan

The monitoring has been carried out in accordance with the revised monitoring plan approved on 3 June 2011 / 4/. The registered 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.

3.5.1 Monitoring parameters

According to the monitoring plan of the approved revised PDD / 4/, there are 27 parameters to be monitored:

- Flow rate of wastewater fed in to / discharge out of the digester;
- Thai regulations and/or incentives relevant to wastewater that may impact the baseline;
- Number of operation days in month;
- Ambient Temperature;
- Depth of open lagoons;
- COD concentration of effluent entering the lagoons in the baseline;
- COD concentration of effluent out of biodigester to lagoons;
- Amount of sludge generated and removed in month / year;

- COD concentration of sludge removed in month;
- Chemical Oxygen Demand of the sludge used for land application;
- Nitrogen content of sludge;
- Quantity of fuel oil displaced in year y (via calculation);
- Quantity of electricity consumed due to the project activity in year y;
- Quantity of fuel oil consumed due to the project activity in year y;
- Quantity of biogas produced and collected in the digester in year y (wet or dry basis);
- Fraction of methane in the biogas from the digester (wet or dry basis) ;
- Quantity of biogas sent for flaring to burners (1 and 2) in Factory 1;
- Quantity of biogas sent for flaring to burners (1 and 2) in Factory 2;
- Quantity of biogas sent for flaring;
- Temperature of the exhaust gas of the flare;
- Minutes that flare is detected during the hour h;
- Temperature of the biogas;
- Pressure of the biogas in the pipeline;
- Grid carbon emission factor (via calculation);
- Amount of burner stack gas in year y;
- Fraction of methane in burner stack gas;

The following tables are related to the parameters in the monitoring plan / methodology:

	Assessment/ Observation	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	**$F_{digester}$ / $F_{dig\_out,m}$** Flow rate of wastewater fed in to / discharge out of the digester	**Regulations and incentives relevant to wastewater** 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 / 4/ and AM0013 methodology / 66/ 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 / 75/ during the first 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) / 46/. Both parameters ($F_{digester}$ / $F_{dig\_out,m}$) are measured by the same meter as	Qualitative as per the methodology / 66/.

	the digester is kept in hydraulic balance.	
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD 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 / 4/. The accuracy of the meter used is ±2.5%, which was checked via the manufacturer's specification / 28/. 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 PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan / 4/ 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 which is derived from their standard practise of calibrating the same type of meters in their core business of starch processing / 16/. Thus, the selected frequency represent good monitoring practise.	Not applicable.
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), in accordance with ISO 9001 / 16/. The standard weights is calibrated by NEC Corporation (Thailand) Ltd.	Not applicable.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibration / 46/ confirms proper functioning of the magnetic flow meter.	Not applicable.
Is(are) calibration(s) valid for the whole reporting period?	Yes, calibrations were performed on the magnetic flow meter on 18 August 2008 and 16 July 2009 / 46/. In addition, the calibrated standard weights were valid for the calibrations performed on the magnetic flow meter as they were calibrated on 21 January 2009 / 47/.	Not applicable.
If applicable, has the reported data been cross-checked with other available data?	The reported wastewater flow quantity in the monitoring period was crosschecked with the amount of starch processed in the production line / 15/ and found to be in direct correlation with the wastewater flow patterns.	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 sheet / 9/ available in the biogas plant control room.	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 of PDD):	**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 / 4/ and AM0013 methodology / 66/ require daily monitoring and recording of operation days.	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require daily monitoring and recording of ambient temperature.	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require daily monitoring and recording of the seven (7) open lagoons depth.
Type of monitoring equipment:	Based on bio-digester operation	Shengzhan Mercury thermometer (S/N: UN-02)	On-site marker in each lagoon
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD 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 / 4/ nor is applicable for this parameter.	There is no accuracy indicated in the approved revised monitoring plan / 4/. The accuracy defined by the manufacturer is $\pm 3^{O}C$ / 25/, 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 / 4/ for this parameter. The methodology requires the depth of the open lagoon system to be above 1 meter, thus the application of on-site makers 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 monitoring	Not applicable	There is no calibration indicated in the approved	There is no calibration indicated in the approved

plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?		revised monitoring plan / 4/. As the thermometer is not subjected to harsh conditions, an annual calibration represent good monitoring practise.	revised monitoring plan / 4/. Since the markers 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 / 21// 22/ 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 / 16/. The master liquid-in-glass-thermometer is calibrated by Technology Promotion Association (Thailand-Japan) / 23// 24/.	Not applicable
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Not applicable	Yes.	Not applicable
Is(are) calibration(s) valid for the whole reporting period?	Not applicable	Yes, calibrations were performed on the thermometer on 19 February 2009 / 21/ and 20 August 2009 / 22/. In addition, the calibrated master liquid in glass was valid for the calibrations performed on the on 9 April 2008 / 23/ and 30 March 2009 / 24/.	Not applicable
If applicable, has the reported data been cross-checked with other available data?	Not applicable	Yes, as per the approved revised monitoring plan / 4/, the recorded data was checked against local weather data from an official source.	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 sheet / 9/ available in the biogas plant control room.	Not applicable
Does the data management (from monitoring equipment to emission	Yes, as SQS is accredited with ISO 9001, the same data management practise	Yes, as SQS is accredited with ISO 9001, the same data management practise	Yes, as SQS is accredited with ISO 9001, the same data management practise

reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	were applied in ensuring correct transfer of data and reporting of emission reductions and QA/QC processes in place.	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 of PDD):	**$COD_{conc\_in,baseline,m}$** 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 / 4/ requires at least once a day measurement and recording, while AM0013 methodology / 66/ 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 / 66/.	Yes, the approved revised monitoring plan requires / 4/ at least once a day measurement and recording, while AM0013 methodology / 66/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 / 66/.
Type of monitoring equipment:	Open Reflux Method, i.e. reflux apparatus, conical flask, hot plate COD, weight scale, volumetric pipette and reagents	Open Reflux Method, i.e. reflux apparatus, conical flask, hot plate COD, weight scale, volumetric pipette and reagents
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD 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 / 4/. 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.	There is no accuracy indicated in the approved revised monitoring plan / 4/. 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.
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 PDD? If the PDD 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 / 4/, 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), 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 / 4/, 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), in accordance with ISO 9001. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	SQS calibrating the weighing scales / 59// 60/, while Standard weights (S/N: M1443) calibrated by Technology Promotion Association (Thailand – Japan) / 58/	SQS calibrating the weighing scales / 59// 60/, while Standard weights (S/N: M1443) calibrated by Technology Promotion Association (Thailand – Japan) / 58/
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes.	Yes.
Is(are) calibration(s) valid for the whole reporting period?	Yes, calibrations were performed throughout the current monitoring period for the weighing scales (S/N: 17111269 and 58288) scales / 59// 60/	Yes, calibration were performed throughout the current monitoring period for the weighing scales (S/N: 17111269 and 58288) scales / 59// 60/
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 sheet / 9/ available in SQS internal laboratory.	The values in the monitoring report / 1// 2/ were cross verified via the technician log sheet / 9/ available in SQS internal laboratory.
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 sheet / 9// 12/ available in SQS internal laboratory.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheet / 9// 12/ available in SQS internal laboratory.
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 of PDD):	**$Q_{sludge,m}$/ $Q_{sludge,y}$** Amount of sludge generated and	**$COD_{conc\_sludge,m}$** COD concentration of sludge

	removed in month / year	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 / 4/ requires measurement and recording when sludge is removed.	Yes, the approved revised monitoring plan / 4/ requires measurement and recording when sludge is removed.
Type of monitoring equipment:	Mettler Toledo 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 reagentes
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD 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 / 4/. 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, 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 / 4/. 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.
Calibration frequency /interval:	24 months	Monthly for the weighing scales
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	There is no calibration interval identified in the approved revised monitoring plan / 4/, the PDD refers to relevant industry and international standards. DNV verified that the National Weights and Measures Act 1999 / 57/ has been adopted in the verification.	There is no calibration requirement identified in the approved revised monitoring plan / 4/, 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), in accordance with ISO 9001. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	Weights and Measures Office (District 2-6 Nakorn Ratchasima) / 53// 54// 55// 56/	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.	Yes.
Is(are) calibration(s) valid for the whole reporting period?	Yes, all truck scales are valid for the whole reporting period. **Scale 1**: S/N 00240926 was calibrated on 28 April 2008 and is valid until 27 April 2010) / 53/ **Scale 2**: S/N 00241276 FE was calibrated on 2 December 2008 and is	Yes, calibration were performed throughout the current monitoring period for the weighing scales (S/N: 17111269 and 58288) scales / 59// 60/

	valid until 1 December 2010 / 54/ **Scale 3**: S/N 5454117-5KF was calibrated on 28 April 2008 and is valid until 27 April 2010 / 55/ **Scale 4**: S/N 5453962-5KF was calibrated on 28 April 2008 and is valid until 27 April 2010 / 56/	
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 / 11/ available in SQS office.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheet / 9// 12/ available in SQS internal laboratory.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the log sheets / 11/ available in SQS office.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheet / 9// 12/ available in SQS internal laboratory.
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 of PDD):	**$COD_{sludge,y}$** Chemical Oxygen Demand of the sludge used for land application	**NC** Nitrogen content of sludge
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 / 4/ requires measurement and recording when sludge removal occurs.	Yes, the approved revised monitoring plan / 4/ 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	Kjeldahl method
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring	There is no accuracy indicated in the approved revised monitoring plan / 4/. The Sartorius CP 224S (S/N: 17111269) weight has a measurement range of 0-220 grams, while the	There is no accuracy indicated in the approved revised monitoring plan / 4/. The Sartorius CP 224S (S/N: 17111269) weight has a measurement range of 0-220 grams, while the

equipment represent good monitoring practise?	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.	Precisa/205 A (S/N: 58288) weight has a measurement range of 0-205 grams, which are both reasonable for the purpose of testing nitrogen content using the Kjeldahl method
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 PDD? If the PDD 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 / 4/, 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), 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 / 4/, 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), 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)	Sample via Kjeldahl method
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes.	Sample via Kjeldahl method
Is(are) calibration(s) valid for the whole reporting period?	Yes, calibration were performed throughout the current monitoring period for the weighing scales (S/N: 17111269 and 58288) scales / 59// 60/	Sample via Kjeldahl method
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 sheet / 9// 12/ available in SQS internal laboratory.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheet / 9// 12/ available in SQS internal laboratory.
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 sheet / 9// 12/ available in SQS internal laboratory.	The values in the monitoring report / 1// 2/ were cross verified via the lab technician log sheet / 9// 12/ available in SQS internal laboratory.
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 of PDD):	**$Q_{elec\_cons,y}$** 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 / 4/ and AM0013 methodology / 66/ require continuous monitoring of the electricity consumed.	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require continuous monitoring of the fuel oil consumed.
Type of monitoring equipment:	Mitsubishi MH96H electricity meter (S/N: 9279973)	Not applicable as no fuel oil is required for the operation of the project activity.
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD 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 / 4/. The accuracy of the meter used is $\pm$2.0%, which was checked via the manufacturer's specification / 62/. 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 PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval defined in the approved revised monitoring plan is either a frequency defined by the Provincial Electricity Authority (PEA) or 12 months, whichever is earlier. Thus in the absence of the standard from PEA, SQS has adopted 12 months interval / 61/.	Not applicable.
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?	No. The calibration was only performed on 15 March 2010 / 61/, outside the current monitoring period. The delayed calibration shows the meter has an accuracy of $\pm$0.31%, well within its accuracy range at $\pm$2% / 62/. A maximum permissible error of 2% was included to the measured values for Project Emission Calculation / 2/. This is justified as the delayed calibration revealed that the accuracy of the electricity meter is still within	Not applicable.

	the permissible error for the meter / 62/. This is conservative and consistent with EB 52 Annex 60 / 68/.	
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 sheet / 14/ available in the biogas plant control room.	Not applicable as there is no 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 sheet / 14/ available in the biogas plant control room.	Not applicable as there is no 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 alternative emission reduction calculation was calculated as per as per I-DEV-0406 / 7/. 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 of PDD):	**$Q_{biogas\_total,y}$** Quantity of biogas produced and collected in the digester in year *y* (wet or dry basis) Factory 1 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 / 4/ and AM0013 methodology / 66/ require continuous measurement but did not define the recording frequency.	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require at least quarterly measuring and reporting 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	There is no accuracy indicated in the	There is no accuracy indicated in the

equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	approved revised monitoring plan / 4/. The accuracy of the meter used is ±1.5% / 36/, which were checked via the manufacturer's specification. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.	approved revised monitoring plan / 4/. The accuracy of the meter used is ±2%, which was checked via the manufacturer's specification / 49/. 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 PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan / 4/ 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 / 37/. Thus, the selected frequency represent good monitoring practise.	The calibration interval of the approved revised monitoring plan / 4/ 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 / 16/. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	Eldridge Products; Inc. (EPI) / 32// 33/	Entech Associate Co., Ltd. / 48/
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?	**Factory 1:** Eldridge Products; Inc. (EPI) flow meter (S/N: 27031212) was calibrated on 17 November 2008 and valid until 16 November 2009 / 31/, prior to the end of current monitoring period of 30 November 2009. Nevertheless, as there were no readings recorded for this meter after 1 July 2009, no adjustment is required for the readings recorded. **Factory 2:** Eldridge Products; Inc. (EPI) flow meter (S/N: 27031211/8022001) was calibrated on 29 March 2008 and valid until 28 March 2009 / 32/, prior to the start of the current monitoring period of 15 April 2009. The delayed calibration on 12 December 2009 / 33/ shows the meter has an error of 0.01%, well within its accuracy range at ±1.5% / 36/. A maximum permissible error of	Yes, Anri methane analyser was calibrated on 11 February 2009 and valid until 10 February 2010 / 48/.

	1.5% was deducted to the measured values / 2/. 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 / 68/.	
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 sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
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 of PDD):	**$Q_{biogas\_burner,y}$** Quantity of biogas sent for flaring to burners (1 and 2) in Factory 1	**$Q_{biogas\_burner,y}$** Quantity of biogas sent for flaring to burners (1 and 2) in Factory 2
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 / 4/ and AM0013 methodology / 66/ require continuous measurement but did not define the recording frequency.	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require continuous measurement but did not define the recording frequency.
Type of monitoring equipment:	**Burner 1**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09110106) **Burner 2**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09110005)	**Burner 1**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09109904) **Burner 2**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09110207)
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the	There is no accuracy indicated in the approved revised monitoring plan / 4/. The accuracy of the meter used is	There is no accuracy indicated in the approved revised monitoring plan / 4/. The accuracy of the meter used is

accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	±1.0% / 42/, which were checked via the manufacturer's specification. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.	±1.0% / 42/, which were checked via the manufacturer's specification. 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 PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan / 4/ 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 which is reasonable considering the other flow meter used for the same purpose employs 12 months calibration interval as well / 16/. Thus, the selected frequency represent good monitoring practise.	The calibration interval of the approved revised monitoring plan / 4/ 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 which is reasonable considering the other flow meter used for the same purpose employs 12 months calibration interval as well / 16/. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	The flow meters are calibrated by the manufacturer, Alia Group Inc. / 38// 39/.	The flow meters are calibrated by the manufacturer, Alia Group Inc. / 40// 41/
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibration confirms proper functioning of the Alia Group Inc. flow meters / 38// 39/.	Yes, the calibration confirms proper functioning of the Alia Group Inc. flow meters.
Is(are) calibration(s) valid for the whole reporting period?	**Burner 1**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09110106) was calibrated on 1 April 2009 and valid until 31 March 2010 / 38/. **Burner 2**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09110005) was calibrated on 1 April 2009 and valid until 31 March 2010 / 39/.	**Burner 1**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09109904) was calibrated on 1 April 2009 and valid until 31 March 2010 / 40/. **Burner 2**: Alia Group Inc. AVF7000 vortex flow meter (S/N: 09110207) was calibrated on 1 April 2009 and valid until 31 March 2010 / 41/.
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 sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
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	Not applicable.	Not applicable.

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?		

	Assessment/ Observation	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	$\mathbf{Q_{biogas\_flare,y}}$ Quantity of biogas sent for flaring	$\mathbf{Q_{biogas\ digester,y}}$ Quantity of biogas from the digester 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 / 4/ and AM0013 methodology / 66/ require continuous measurement but did not define the recording frequency.	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require continuous measurement but did not define the recording frequency.
Type of monitoring equipment:	Eldridge Products; Inc. (EPI) flow meter (S/N: 25100705/26120501)	Fluid Components International LLC (FCI) ST51 flow meter (S/N: 306094)
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD 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 / 4/. The accuracy of the meter used is ±1.5% / 36/, which were checked via the manufacturer's specification / 36/. 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 / 4/. The accuracy of the meter used is ±2.0%, which was checked via the manufacturer's specification / 44/. The monitoring equipment represent good monitoring practise as it has a reasonably high accuracy.
Calibration frequency /interval:	12 months	18 months
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan / 4/ 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 / 37/. Thus, the selected frequency represent good monitoring practise.	The calibration interval of the approved revised monitoring plan / 4/ refers to appropriate industry/international standards. Since there is no industry or international standards, SQS has adopted the calibration interval of 18 months recommended by the equipment manufacturer FCI / 45/. Thus, the selected frequency represent good monitoring practise.
Company performing the calibration:	Eldridge Products; Inc. (EPI) / 35/ and Miracle International Technology Co., Ltd. / 34/	Fluid Components International LLC (FCI) / 43/
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the calibrations confirm proper functioning of the EPI flow meter.	Yes, the calibration confirms proper functioning of the FCI flow meter.
Is(are) calibration(s) valid for the whole reporting period?	Eldridge Products; Inc. (EPI) flow meter (S/N: 25100705/26120501)	Fluid Components International LLC (FCI) ST51 flow meter (S/N: 306094)

	was calibrated on 9 November 2009 and valid until 8 November 2010 / 35/, which resulted in a calibration gap from 15 April 2009 to 8 November 2009. The delayed calibration on 9 November 2009 shows the meter has an error of 0.14% / 34/, well within its accuracy range at ±1.5% / 36/. A maximum permissible error of 1.5% was deducted to the measured values / 2/. 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 / 68/.	was calibrated on 22 June 2009 / 43/, prior to its installation and commissioning on 1 July 2009
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 sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
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.	The alternative emission reduction calculation was calculated as per as per I-DEV-0319 / 6/

	Assessment/ Observation	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	**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, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require continuous measurement	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ require continuous measurement

(Yes / No)	but did not define the recording frequency.	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 as stated in the PDD? If the PDD 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 / 4/. The accuracy of the meter used is $\pm$3.0^{o}C / 30/, which were checked via the manufacturer's specification. 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 / 4/ 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 PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan / 4/ 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 Flaring Tool. Thus, the selected frequency represent good monitoring practise.	No calibration is required for the run time counter.
Company performing the calibration:	Calibration Management Co., Ltd. / 29/	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?	Siemens/Sitrans TH300 Type-N Thermocouple (S/N: AZB/U9006971) was calibrated on 3 January 2009 and is valid until 2 January 2010 / 29/.	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 sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
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	Not applicable.	Not applicable.

monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?		

	Assessment/ Observation	Assessment/ Observation
Data / Parameter: (as in monitoring plan of PDD):	**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 / 4/ and AM0013 methodology / 66/ require continuous measurement but did not define the recording frequency.	Yes, the approved revised monitoring plan / 4/ and AM0013 methodology / 66/ 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 as stated in the PDD? If the PDD 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 / 4/. The accuracy defined by the manufacturer is $\pm 3^{o}$C / 27/, 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 / 4/. The accuracy defined by the manufacturer is $\pm$0.5%, which is reasonable for the monitoring of this parameter and represent good monitoring practise.
Calibration frequency /interval:	12 months	12 months
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval of the approved revised monitoring plan / 4/ 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. Thus, the selected frequency represent good monitoring practise.	The calibration interval of the approved revised monitoring plan / 4/ 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:	Calibration Management Co., Ltd. / 26/	Calibration Management Co., Ltd. / 50// 51/
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 thermocouple.
Is(are) calibration(s) valid for the whole reporting period?	Rosemount/68 N11 N00B030T (S/N: 0541593) and Rosemount/3144 (S/N: 0187554) were calibrated on 2 January 2009 and is valid until 1 January 2010 / 26/.	Siemens Pressure Gauge (S/N: AZB/R0100522) was calibrated on 18 April 2008 and valid until 17 April 2009 / 50/, and 30 April 2009 valid until 29 April 2010 / 51/. Nevertheless, the emission reduction

		calculations do not refer to this parameter thus no adjustment was made for the recorded data.
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 sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
How were the values in the monitoring report verified?	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.	The values in the monitoring report / 1// 2/ were cross verified via the operator log sheet / 9/ available in the biogas plant control room.
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 of PDD):	***Fraction of methane in burner stack gas (W_{CH4_stack})***
Measuring frequency:	Every quarter
Reporting frequency:	Every quarter
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	This parameter was measured by an external 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) / 19/
Type of monitoring equipment:	U.S. EPA Method 18 (H/C Analyzer (HORIBA))
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment	The accuracy of methane content of burner stack gas monitoring equipment was not stated in the approved revised monitoring plan / 4/. Methane content of burner stack gas is analysed

represent good monitoring practise?	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 PDD? If the PDD 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 / 4/. 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. / 19/, 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 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?	Methane content of burner stack gas is analysed by third party laboratory according to U.S. EPA Method 18 (H/C Analyzer (HORIBA)) / 19/.
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 / 19/ 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	Not applicable.

request for deviation been approved?	

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 3.6)

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) / 71/.

Consideration about EF_{grid}, OM_y: The simple 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 2009 is calculated. The NCV for the different fuel types were sourced from national available data / 63/. 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 / 64/. Consequently the Operating Margin Emission Factor is determined to be 0.6034 tCO_2/MWh / 3/.

Consideration about EF_{grid}, BM_y: The Build Margin (BM) for 2009 was calculated as the data vintage for year (y) in which the project generation occurs in this monitoring period. 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 / 63/. 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 0.5477 tCO_2/MWh / 3/.

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 0.5756 tCO_2e/MWh. All the data used in calculation of grid emission factor is sourced from the website of Thailand Greenhouse Gas Management Organization (TGO). At the time of publication of the monitoring report, the data for 2009 was not made available by TGO. Nevertheless according to EB 51 Paragraph 89, the latest data available during the verification shall be incorporated into the calculation of grid emission factor. Thus, the emission factor calculated for the year 2009 has been applied in this monitoring period.

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 / 4/, 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 for 1 hour over 5 days (i.e. total of 20 hours' worth of operation) / 19/. The stack gas

flow monitored as part of this measurement campaign was divided by the monitored amount of biogas feed flow into the burner during this 20 hours period to obtain the maximum measured 29.2 Nm^3 stack gas / Nm^3 feed biogas ratio. Significantly, during this testing period, the fuel oil feed stream was shut off, thereby allowing for the derivation of a feed: stack ratio that is independent of the fuel 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", was cross checked and found appropriate by DNV / 69/.
Furthermore, an additional conservativeness measure have been taken into account by applying the Subsidiary Body for Scientific and Technological Advice (SBSTA) conservativeness factory for uncertainty in the calculations / 70/, 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 / 70/. 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 the first verification period yields a ratio of 40 Nm^3 stack gas / Nm^3 feed biogas.

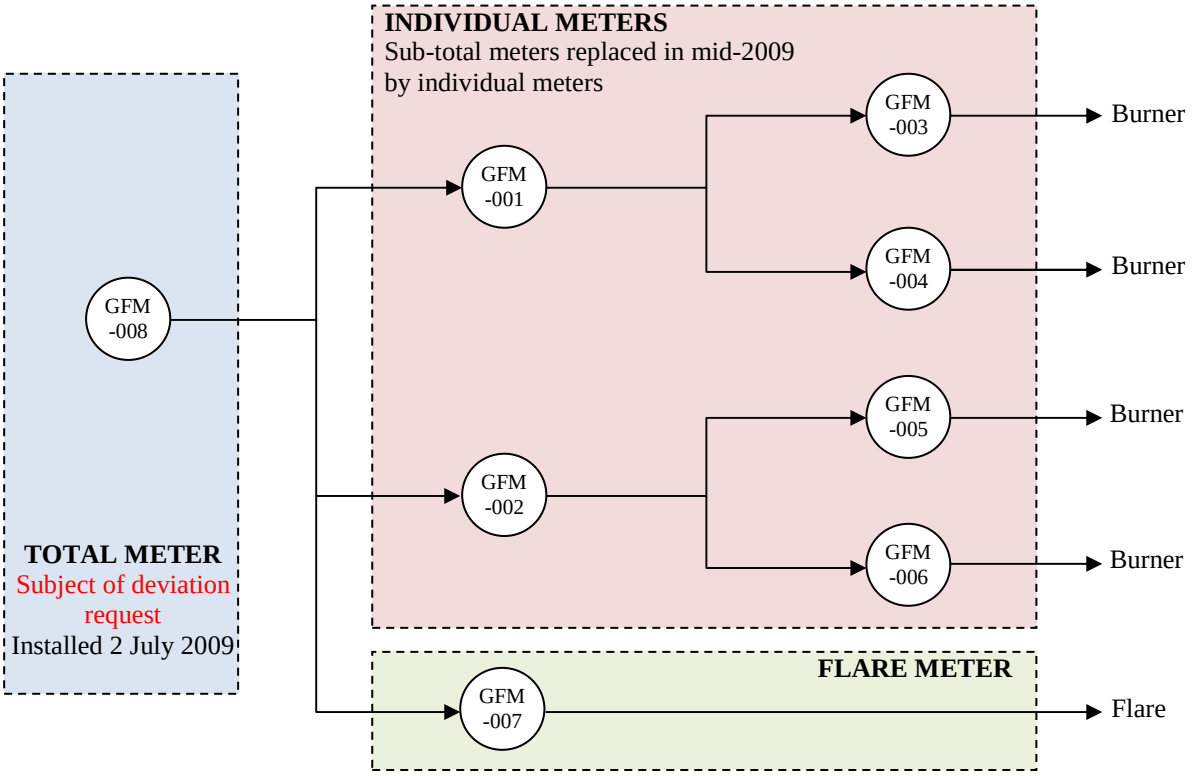
3.6 Assessment of data and calculation of emission reductions

GHG emission reductions were correctly calculated using applicable formulae and considerations of the baseline and monitoring methodologies AM0013 (version 4) / 66/ and AMS-I.C (version 12) / 67/.

3.6.1 Baseline emissions

As per AM0013 (version 4) / 66/, 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 per approved deviation request, I-DEV0319 / 6/, the deviation periods and the resolutions are as follow: 12 May 2009 to 31 May 2009 where the biogas flow during this period will be based on the actual measurement of the meters GFM001, 002 and 007 which were installed and properly calibrated. For the readings of GFM-002 and GFM-007 that were falling in the period(s) that calibration of equipment was delayed from calibration frequency requirement, they were rectified in as per instruction provided in EB 52 Annex 60 / 68/. From 1 June 2009 to 1 July 2009, the meters GFM001, 002, 003, 004, 005, 006 and 007 were installed. The emission reductions have taken the lowest of the readings from the "Total of two sub-total meters (GFM-001 and GFM-002)" and the "Total of the four individual meters (GFM-003 to GFM-006) for baseline emission calculation and highest reading for the project emission calculation. In the period 2 July 2009 to 10 August 2009, the meters GFM003, 004, 005, 006,007 and 008 were installed. The emission reductions have taken the lowest of the readings from the "Total meter (GFM-008)" and the "Total of the four individual meters (GFM-003 and GFM-006) for baseline emission calculation and the highest reading for project emission calculation.



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' / 69/. The total $BE_{lagoon,monitored,y}$ was calculated as 36 981 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 / 66/, 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 / 66/. The total $BE_{lagoon,theoretical,y}$ was calculated as 46 530 tCO_2e.

Thus, the lower of two values has been selected for $BE_{lagoon,y}$ which is 36 981 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 '$BE_{fuel\_oil,y}$' that is displaced have been capped according to the average of historical 3 years

consumption which was validated as 140.6 TJ/year / 5/, which is equivalent to 10 615 tCO_2/year. For this monitoring period the energy displaced by the biogas captured and combusted is 89 TJ, well below the capped limit.

3.6.2 Project emissions

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

'$PE_{stack,m}$' – The stack emission were appropriately determined as a function between the methane fed to the burners and the combustion efficiencies of the burners 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 / 6/. In addition, the emission for incomplete combustion of methane at the flare was taken into account at 50% as per the flaring tool. The '$PE_{stack,m}$' was calculated to be 153 tCO_2e.

'$PE_{phys\_leakage,m}$' – was appropriately determined to be zero as per AM0013 (version 4) / 66/ 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".

'$PE_{lagoon,m}$' - 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 '$PE_{lagoon,m}$' was calculated to be 6 630 tCO_2e.

'PE_{sludge_m}'- 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_m}' was calculated to be 4 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 / 7/, electricity consumption for ancillary decanter facilities was calculated and taken into account to. In addition, there were no fuel oil consumption for the operation of the project activity, thus this is equal to zero. The '$PE_{energy\_cons,m}$' was calculated to be 508 tCO_2e.

3.6.3 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) / 66/ and AMS-I.C (version 12) / 67/, no leakage is taken into account if the equipment is not transferred from another activity. Thus, there is no leakage for the project activity.

3.6.4 Emission reductions:

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

$ER_y = BE_y - PE_y - LE_y$

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 / 2/.

CDM monitoring period		Emission reductions by project activity (tCO_2e)			
Start date	End date	BE	PE	Leakage	ER
15 April 2009	30 November 2009	43 679	7 295	0	36 384

The claimed total emission reductions ER_y is 36 384 tCO_2e reported for the period 15 April 2009 to 30 November 2009. This is lower to the estimated value in the approved revised PDD of 60 513 tCO_2e (c.f. Section 3.3).

3.7 Quality of evidence to determine emission reductions

The calibration records for biogas flow meters installed for monitoring the biogas collected from the anaerobic digester and sent to the biogas burners in Factory 1 and 2 and flare / 32// 33// 34// 35// 38// 39// 40// 41// 43/ and methane analyser / 48/ were checked and found appropriate. Maximum permissible error has been applied to the respective measured values during the gap and was found to be consistent with EB 52 Annex 60 / 68/.

The data presented in the monitoring report were assessed by reviewing in detail project documentation, interviews with representatives of Carbon Partners Asiatica and Siam Quality Starch Co., Ltd. (SQS) collection of monitoring data, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of the reported monitoring results and verify the correct application of the approved monitoring methodology. All necessary documentation is collected, referenced and aggregated and is easily accessible in excel format.

3.8 Management system and quality assurance

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 PDD / 5/.

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 organisational 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 / 21/-/ 62/, and the quality of the monthly emission reduction calculation spread sheets / 2/ assured through cross checking of readings between the raw data recorded on-site / 9// 10// 11// 12// 13// 14/ and the results submitted for verification / 2/.

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.

4 CERTIFICATION STATEMENT

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" (UNFCCC Registration Reference No. 1993) for the period 15 April 2009 to 30 November 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 PDD.

DNV conducted the verification on the basis of the monitoring methodologies AM0013 (version 04) and AMS-I.C (version 12) and, the revised monitoring plan approved on 3 June 2011, the Project Design Document of 30 March 2009 and the monitoring report (Version 2.2) dated 12 June 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" (UNFCCC Registration Ref. No. 1993) for the period 15 April 2009 to 30 November 2009 are fairly stated in the monitoring report (Version 2.2) dated 12 June 2012.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodologies AM0013 (version 04) 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 15 April 2009 to 30 November 2009 amount to 36 384 tonnes of CO_2 equivalent.

Kuala Lumpur and Oslo, 13 July 2012

Simon Wong

Simon Wong Yon-Sing
Verifier
DNV Kuala Lumpur, Malaysia

Ole A Flagstad

Ole A. Flagstad
Approver,
DNV Climate Change Services AS

5 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 2.2 dated 12 June 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 *3. SQS CERs calcs (final)* and *4. SQS CERs calcs (final clean).xls* submitted for request for issuance

/ 3/ Carbon Asiatica: Excel spreadsheet with grid emission factor calculations for Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand, titled: *5. Thai Grid Emission Factor 2007-2009* 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/ 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

/ 7/ 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

/ 8/ Validation Report for "Siam Quality Starch Wastewater Treatment and Energy Generation Project in Chaiyaphum, Thailand", SGS report of 6 April 2009 (CDM. VAL. 1337)

/ 9/ Siam Quality Starch Co., Ltd. (SQS): Daily log sheets recording the biogas flow rate to the flare and 4 biogas burners, ambient temperature, flare operating hours, the COD and flow rate of effluent entering the digester and COD of effluent leaving the digester for the year 2009

/ 10/ Siam Quality Starch Co., Ltd. (SQS): Individual log sheets recording the biogas flow rate to the flare and 4 biogas burners for the year 2009

/ 11/ Siam Quality Starch Co., Ltd. (SQS): Weighing record of sludge generated in the decanter system for the year 2009

/ 12/ Siam Quality Starch Co., Ltd. (SQS): Log sheets of COD and Nitrogen content of the sludge for the year 2009

/ 13/ Siam Quality Starch Co., Ltd. (SQS): Log sheets for the daily recordings of the depths of the open lagoon for the year 2009

/ 14/ Siam Quality Starch Co., Ltd. (SQS): Log sheet for the electricity consumption of the project activity and the electricity invoices for SQS plant for the year 2009

/ 15/ 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

/ 16/ Siam Quality Starch Co., Ltd. (SQS): Work Instructions Equipment Calibration Plan following the ISO 9001 standards (14 January 2009)

/ 17/ Siam Quality Starch Co., Ltd. (SQS): Work Instructions for SQS laboratory for Standard Nitrogen Testing Procedure using Total Kjeldahl Nitrogen (TKN)

/ 18/ 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

/ 19/ Testing results on stack gas flow rate and CH_4 content of stack gas at burner stack, monitored by and analyzed by Life and Environment Co., Ltd. using the U.S. EPA Method 18 (HORIBA) on 10-14 July 2009, 22 October 2009 and 13 December 2009

/ 20/ Siam Quality Starch Co., Ltd. (SQS): Testing results on sludge nitrogen content using the Total Kjeldahl Nitrogen (TKN) method dated 10 October 2009 and 3 November 2009

/ 21/ Calibration report issued for Shengzhan Thermometer by Siam Quality Starch Co., Ltd.:

S/N: UN02 calibrated on 19 February 2009 (Calibration is valid from 19 February 2009 to 18 February 2010)

/ 22/ Calibration report issued for Shengzhan Thermometer by Siam Quality Starch Co., Ltd.:

S/N: UN02 calibrated on 20 August 2009 (Calibration is valid from 20 August 2009 to 18 August 2010)

/ 23/ Calibration report issued for the Master Liquid-in-Glass Thermometer by Technology Promotion Association (Thailand-Japan), calibration services and environmental analysis department:

S/N: 1963 calibrated on 9 April 2008 (Calibration is valid from 9 April 2008 to 8 April 2009).

/ 24/ Calibration report issued for the Master Liquid-in-Glass Thermometer by Technology Promotion Association (Thailand-Japan), calibration services and environmental analysis department:

S/N: 1963 calibrated on 30 March 2009 (Calibration is valid from 30 March 2009 to 29 March 2010)

/ 25/ Equipment specification for Shengzhan Thermometer stating the accuracy is $\pm 3^{o}C$ with measurement range of 0 to $100^{o}C$ (no date)

/ 26/ 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)

/ 27/ Equipment specification for Rosemount Series 68 Platinum RTD Thermometer stating the accuracy is $\pm 3^{o}$C with measurement range of -50 to 400^{o}C (no date)

/ 28/ Equipment specification for Siemens (MAG 6000) magnetic flow meter http://www.lesman.com/unleashd/catalog/transmit/sitransfm_mag50006000_manED5.pdf

/ 29/ Calibration certificate issued for Siemens Thermometer by Calibration Management Co., Ltd.:

S/N: AZB/U90006971 calibrated on 3 January 2009 (Calibration is valid from 3 January 2009 to 2 January 2010)

/ 30/ 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)

/ 31/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter by EPI's calibration department:

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

/ 32/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter by EPI's calibration department:

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

/ 33/ Calibration certificate issued by Miracle International Technology Co., Ltd.:

S/N: 27031211/28022001 calibrated on 12 December 2009 (Calibration is valid from 12 December 2009 to 11 December 2010)

/ 34/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter issued by Miracle International Technology Co., Ltd.:

S/N: 25100705/26120501 calibrated on 9 November 2009 (Calibration is valid from 9 November 2009 to 8 November 2010)

/ 35/ Calibration certificate issued for Eldridge Products, Inc. (EPI) thermal gas mass flow meter by EPI's calibration department:

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

/ 36/ Eldridge Products Inc. (EPI) specification for series 8000MP meters: $\pm 1.5\%$ of reading, Measurement range is 0-2400 NCMH (no date)

/ 37/ Eldridge Products Inc. (EPI) recommendation to conduct annual calibration for series 8000MP meters (no date)

/ 38/ Calibration certificate issued for Alia Group Inc. vortex flow meter by Alia Group Inc's calibration department:

S/N: 09110106 calibrated on 1 April 2009 (Calibration is valid from 1 April 2009 to 31 March 2010)

/ 39/ Calibration certificate issued for Alia Group Inc. vortex flow meter by Alia Group Inc's

calibration department:

S/N: 09110005 calibrated on 1 April 2009 (Calibration is valid from 1 April 2009 to 31 March 2010)

/ 40/ Calibration certificate issued for Alia Group Inc. vortex flow meter by Alia Group Inc's calibration department:

S/N: 09109904 calibrated on 1 April 2009 (Calibration is valid from 1 April 2009 to 31 March 2010)

/ 41/ Calibration certificate issued for Alia Group Inc. vortex flow meter by Alia Group Inc's calibration department:

S/N: 09110207 calibrated on 1 April 2009 (Calibration is valid from 1 April 2009 to 31 March 2010)

/ 42/ Alia Group Inc. specification for AVF7000 series vortex flow meter: ±1% of reading, Measurement range is 0-1000 NCMH (no date)

/ 43/ Calibration certificate issued for Fluid Components International LLC (FCI) flow meter by FCI's calibration department:

S/N: 306094 calibrated on 22 June 2009 (Calibration is valid from 22 June 2009 to 31 March 2010)

/ 44/ Fluid Components International LLC (FCI) specification for ST51 series mass flow meter: ±2% of reading, Measurement range is 0.3 to 400 SFPS

/ 45/ Fluid Components International LLC (FCI) calibration interval of 18 months specification in the manual (no date)

/ 46/ 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)

/ 47/ 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)

/ 48/ Calibration certificate issued for Anri Instruments & Controls Pty. Ltd. (CAM-3L) online methane analyzer by Entech Services:

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

/ 49/ 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)

/ 50/ 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)

/ 51/ 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)

/ 52/ Siemens Sitrans P Series Transmitter for Pressure and Absolute Pressure specifications, accuracy is 0.25% and measurement range is 0-1 bar (pressure gauge)

/ 53/ 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 28 April 2008 (Calibration is valid from 28 April 2008 to 27 April 2010)

/ 54/ 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 2 December 2008 (Calibration is valid from 2 December 2008 to 1 December 2010)

/ 55/ 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 28 April 2008 (Calibration is valid from 28 April 2008 to 27 April 2010)

/ 56/ 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 28 April 2008 (Calibration is valid from 28 April 2008 to 27 April 2010)

/ 57/ Calibration interval of once every 2 years for Mettler Toledo Truck Scale recommended by Weights and Measures Office from the Department of Internal Trade.

/ 58/ 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 March 2009 (Calibration is valid from 20 March 2009 to 19 March 2010)

/ 59/ Calibration report issued for Precisa weight scale by Siam Quality Starch Co., Ltd.:

S/N: 58288 calibrated on 10 April 2009, 8 May 2009, 6 June 2009, 2 July 2009, 30 July 2009, 28 August 2009, 25 September 2009, 20 October 2009 and 13 November 2009 (Calibration is valid from 15 April 2009 to 30 November 2009)

/ 60/ Calibration report issued for Sartorious CP 224S weight scale by Siam Quality Starch Co., Ltd.:

S/N: 17111269 calibrated on 10 April 2009, 8 May 2009, 6 June 2009, 2 July 2009, 30 July 2009, 28 August 2009, 25 September 2009, 20 October 2009 and 13 November 2009 (Calibration is valid from 15 April 2009 to 30 November 2009)

/ 61/ 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)

/ 62/ Mitsubishi Electric MH96H electricity meter accuracy of Accuracy is class 2 IEC

60521, which is ± 2% (no date)

/ 63/ *"Summary Report The Study of emission factor for Electricity Generation in Thailand 2010"* published by the Thailand Greenhouse Gas Management Organization (Public Organization) http://www.tgo.or.th/english/download/publication/GEF/2010/GEFReport_EN.pdf

/ 64/ Intergovernmental Panel on Climate Change: *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 - Energy*, 2006

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

/ 65/ CDM Executive Board: Validation and Verification Manual. Version 01.2, EB 55 Annex 1, dated 30 July 2010

/ 66/ CDM Executive Board: AM0013 "Avoided methane emissions from organic waste-water treatment" version 4, dated 22 December 2006

/ 67/ CDM Executive Board: AMS-I.C: "Thermal energy for the user with or without electricity" version 12, dated 10 August 2007

/ 68/ CDM Executive Board: 'Guidelines for assessing compliance with the calibration frequency requirements' EB 52 Annex 60, dated 12 February 2010

/ 69/ CDM Executive Board: 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream', version 01.

/ 70/ 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

/ 71/ CDM Executive Board: *Tool to calculate the emission factor for an electricity system*, Version 02.2.0 of 3 June 2011

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

/ 72/ Kyoko Tochikawa, Carbon Partners Asiatica

/ 73/ Rudh Korsakul, Carbon Partners Asiatica

/ 74/ Prasit Vaiyavatjamai, Carbon Partners Asiatica

/ 75/ Charnyut Wichettapong, Chaiyaphum Provincial Office for the Ministry of Industry

/ 76/ Wirat Wosri, Siam Quality Starch Co., Ltd. (SQS)

/ 77/ Boontham Pantumas, Siam Quality Starch Co., Ltd. (SQS)

/ 78/ Daunchay Phomchatturat, Siam Quality Starch Co., Ltd. (SQS)

/ 79/ Thanatcha Krattapong, Siam Quality Starch Co., Ltd. (SQS)

/ 80/ Netchanok Pansuwan, Siam Quality Starch Co., Ltd. (SQS)

/ 81/ Penthip Jatunawarat, Siam Quality Starch Co., Ltd. (SQS)

/ 82/ Gordon Reynolds, Siam Quality Starch Co., Ltd. (SQS)

/ 83/ Sampart Rerkchavee, Siam Quality Starch Co., Ltd. (SQS)

/ 84/ Pluemjit Buasri, Siam Quality Starch Co., Ltd. (SQS)

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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 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.	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/ 7/. **CAR 1 is closed.**

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
		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 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 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 / 4/. **CAR 2 is closed.**

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
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 / 6/. **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 / 4/. **CAR 4 is closed.**

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
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/ 7/. 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 / 4/. **CAR 5 is closed.**

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
		The total electricity consumption is therefore 80.5x8x38=24,472kWh, adding approximately 12tCO_2 to the project emissions. SQS plans to install a separate meter for the decanter system, due to the distance from the biogas system. For the missing meter for the decanter system, the PP has decided to file a request for deviation to calculate the electricity consumption based on the rated capacity of the energy-consuming equipment. The request I-DEV0406 was approved on 03 May 2011.	

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 6	Calibration gaps were identified for the following monitoring equipment: a) Eldridge Products; Inc. (EPI) flow meter S/N: 25100705/26120501; b) Eldridge Products; Inc. S/N: 27031211/8022001; c) MH96H electricity meter (S/N: 9279973)	The delayed calibration has been dealt with according to EB52 Annex 60 – *Guidelines for assessing compliance with the calibration frequency requirements*. The sheet entitled "Corrected Values – EB52 ANNEX60" has been added to the spreadsheet and the MR revised accordingly.	a) Eldridge Products; Inc. (EPI) flow meter (S/N: 25100705/26120501) was calibrated on 9 November 2009 and valid until 8 November 2010 / 35/, which resulted in a calibration gap from 15 April 2009 to 8 November 2009. The delayed calibration on 9 November 2009 shows the meter has an error of 0.14% / 34/, well within its accuracy range at $\pm$1.5% / 36/. A maximum permissible error of 1.5% was deducted to the measured values / 2/. 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 / 68/. b) Eldridge Products; Inc. (EPI) flow meter (S/N: 27031211/8022001) was calibrated on 29 March 2008 and valid until 28 March 2009 / 32/, prior to the start of the current monitoring period of 15 April 2009. The delayed calibration on 12 December 2009 / 33/ shows the meter has an error of 0.01%, well within its accuracy range at $\pm$1.5% / 36/. A maximum permissible error of 1.5% was deducted to the measured values / 2/. 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 / 68/.

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
			c) A maximum permissible error of 2% was included to the measured values for Project Emission Calculation / 2/. The delayed calibration shows the meter has an accuracy of ±0.31%, well within its accuracy range at ±2% / 62/. This is justified as the delayed calibration revealed that the accuracy of the electricity meter is still within the permissible error for the meter / 62/. This is conservative and consistent with EB 52 Annex 60 / 68/. **CAR 6 is closed.**

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 7	It is unclear to why the grid emission factor applied in the published MR is calculated from data collected in 2005 to 2007, when the project generation occurs in 2009.	At the time of submission of the monitoring report to the DOE, the latest available data was for 2005 to 2007. This was verified by the DOE and in accordance with EB51 paragraph 89. Subsequent to the submission, on 29 June 2011, data for year (y), i.e. 2009, became publicly available. Also in accordance with EB51 paragraph 89, due to more recent data becoming available during verification, the MR was revised to reflect the data for year (y).	The emission factor of electricity generation has been calculated by "Tool to calculate the emission factor for an electricity system" (Version 02.2.0) / 71/. **Consideration about EF_{grid}, $OM_{,y}$**: The simple 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 2009 is calculated. The Operating Margin Emission Factor is determined to be 0.6034 tCO_2/MWh / 3/. **Consideration about EF_{grid}, $BM_{,y}$**: The Build Margin (BM) for 2009 was calculated as the data vintage for year (y) in which the project generation occurs in this monitoring period. BM emission factor was calculated as 0.5477 tCO_2/MWh / 3/. **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 0.5756 tCO_2e/MWh. All the data used in calculation of grid emission factor is sourced from the website of Thailand Greenhouse Gas Management Organization (TGO).

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
			At the time of publication of the monitoring report, the data for 2009 was not made available by TGO. Nevertheless according to EB 51 Paragraph 89, the latest data available during the verification shall be incorporated into the calculation of grid emission factor. Thus, the emission factor calculated for the year 2009 has been applied in this monitoring period. **CAR 7 is closed**.

Clarification requests

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 1	The information of the project status i.e. including the biogas production and deviation or emergencies occurred during the verification period and all associated requirements as per the "Guidance on completeness check of request for issuance", Annex 68 of EB 48 should be reflected in the monitoring report.	As pointed out, the following items will be added to the monitoring report: • Status of project implementation • A description of QA/QC procedures • Comparison of the actual versus expected CERs. It is noted no "significant increase" has occurred.	OK, the content required as per the "Guidance on completeness check of request for issuance", Annex 68 of EB 48 has been reflected in the revised monitoring report. **CL 1 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 2	The adjustment factor of 0.992 has been used in the emission calculations of the baseline emission due to open lagoon in the monitoring report. However, this value which is an *ex-ante* value has not been mentioned in the registered monitoring plan.	The PP wishes to explain that this is derived from the following two validated figures: • COD that enters the lagoon =15 kg/m^3, which was validated by the validating DOE based on a 1-year historical record. While Table 10 and Section B.7.1. of the registered PDD which mentions the 15 kg/m^3 does not mention that is based on historical records, Table 7 (for the investment analysis) mentions the same number for the same parameter, stating it is based on historical records. The same records submitted to the validating DOE were submitted to DNV during the site visit, which shows a 1-year record of 15.023 kg/m^3. • COD that leaves the lagoon with the effluent = 0.12 kg/m^3, validated and mentioned under Section B.6.2. The above two figures show that while the calculated figure of AD=0.992 is not explicitly mentioned in the PDD, the underlying input values necessary to calculate AD was validated and mentioned in the registered PDD.	OK, DNV has checked that the input parameters to calculate the adjustment factor was validated during validation, thus the application of this adjustment factor are justified and appropriate. **CL 2 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 3	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 3 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 4	The total biogas production from the operation log records was reviewed through 3 means. a) Combined flow meter b) Meters located at Factory 1 and 2, c) Individual meters located at the burners of Factory 1 and 2. It was found that the total readings are variant with each other with the combined meters reading showing much lower than the individual meters. This needs to be further clarified.	The methodology AM0013 version 4 requires two sets of meters. They are the total meter which is represented by a) above, and the meters that measure the flow to the burners (and flare), which could be represented by either b) the 2 sub-total meters or c) the 4 individual meters above – i.e. either b) or c) alone are fully compliant. The PP wishes to clarify that individual meters were newly installed for the purpose of the CDM, and it is its intention to no longer use the sub-total meters. Two main reasons for this replacement were: (i) The sub-total meters were getting relatively old, having been installed in 2006, raising concern about *possible* deterioration in accuracy (it is noted calibration has been carried out regularly); and (ii) Unlike the new individual meters, which can be calibrated locally, the old meters need to be shipped to the U.S. for calibration. The PP was concerned about its ability to strictly adhere to the calibration requirements required by the CDM. Therefore, for the purpose of the CER calculation, the PP believes it is appropriate to use the individual meter results from June 2009 onwards.	The approach to apply the alternative calculation in the absence of the total meter from the biogas digester and also the differences of monitored values in the total and individual flow meters was found to be conservative and has been approved by the CDM Executive Board / 6/. **CL 4 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
		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.	
CL 5	Confirmation and sources needs to be provided for the methane heating value, density of methane and emission factor of fuel oil.	• **Methane heating value and density**. It is proposed that the default NCV value of biogas methane, 50.4 TJ/Gg and the density of methane, 0.7168 kg/Nm^3 is used for the methane heating value. It is noted that the resultant value, 36.13 MJ/Nm^3CH_4, is very similar to the value cited in the registered PDD, 36.3 MJ/Nm^3CH_4,. used in the original calculations. • **Emission factor of fuel oil**. While the emission factor originally used is consistent with the registered PDD, the PP suggests to change it to 75.5t CO_2/TJ, which is the latest prevailing default factor.	OK, the methane heating value, density of methane and emission factor of fuel oil have been checked and found to be defaults from IPCCC 2006. Although the CO_2 emission factor for thermal energy generation using fuel oil was validated and fixed *ex-ante* at 77.4 tCO_2/TJ in the registered PDD, for conservativeness purpose the lower value of 75.5 tCO_2/TJ (Table 2.2 , Chapter 1, Volume 2 of 2006 IPCC Guidelines) was applied in the baseline emission calculation / 64/. **CL 5 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 6	Further clarification is needed on the following: a) It is unclear to which option has been selected under Step 2 of the Tool to calculate the emission factor for an electricity system ; b) It is unclear to which option has been selected to determine the operating margin emission factor, Step 3 of the Tool; c) It is unclear to which option has been selected to determine the build margin emission factor, Step 4 of the Tool;	As per Table 14 of the registered PDD, AMS-I.D is used to compute the grid emission factor. The prevailing methodology at the time of submission was AMS-I.D. Version 12. In accordance with paragraph 9 of the said methodology, either a combined margin or weighted average emission factor is to be used. The PP has opted to use the combined margin emission factor, and has relied on the most updated information available for the Thai grid system to determine this emission factor.	DNV checked Grid Emission Factor of Thai National Grid is calculated following "Tool to calculate the emission factor for an electricity system" version 02.2.1". All data used to calculate the emissions factor is publically provided by Thailand Greenhouse Gas Management Organization (TGO) (Public Organization) for year 2009 where the data generation occurs in this monitoring period/ 63/. The operating margin was calculated at 0.6034 tCO_2/MWh while the build margin was calculated at 0.5477 tCO_2/MWh, resulting in combined margin of 0.5756 tCO_2/MWh. **CL 6 is closed.**
CL 7	It was identified through the operational records that the flaring occurred twice (12^{th} and 13^{th}) in the month of May 2009 and the temperature of the flare measured on 12 May was measured to be $630^{o}C$. Further clarification is needed on the omission of the project emissions due to flaring on 13 May 2009 in the emission reduction spreadsheet.	This has been corrected in the revised calculation, resulting in a 0.6tCO_2 increase in CERs (~1.6tCO_2 increase in baseline emissions, and ~0.9tCO_2 increase in project emissions) for the monitoring period.	OK, the revised calculation has taken into consideration the emissions due to open flaring, which is calculated to be 3 tCO_2e. **CL 7 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 8	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.	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, 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 / 16/. 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 / 16/. 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 8 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 9	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.	In view of the lack of an industry standard as elaborated by SQS staff during the site visit, SQS has adopted an international standard (the ISO9001 Quality Assurance system) in relation to calibration and calibration frequencies. The ISO9001 requires that: • An initial calibration period is set. The norm is 12 months, and SQS uses an initial calibration period of 12 months not just for the CDM project activity but also for its factory equipment. Exceptions to this are 18 months for the sub-total and flare meters (due to need to ship to US, to be retired partly because of this reason as elaborated in response to CL4), 24 months for weigh bridge, which is calibrated according to the Weights and Measures Act, and for the electricity meter. • Limits of accuracy are established by reference to process requirements, manufacturer's specifications or other methods approved by the ISO 9001 Quality Assurance system.	Ok, DNV has accepted the calibration interval for the biogas flow meters which are based on the manufacturer's calibration except from Alia, which does not provide such information, thus the yearly calibration interval is reasonable considering similar biogas flow meter from other manufacturers employed in the monitoring plan uses yearly calibration as well. Furthermore, the flow meters are calibrated by the manufacturer, Alia Group Inc. 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 9 is closed.**

CL ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
		After a 12 month period, the calibration period may be adjusted. If the meters are found to have deviated from the permissible error range, the calibration period is to be shortened. It is noted that the earliest review of the calibration period was January 2, 2010 (12 months from the date of earliest calibration, for the biogas temperature meter TIC-002), which falls outside of this particular CDM verification period. While there is no industry standard, SQS has over the years actively pursued international standards for QA/QC procedures, and has been the standard-setter for the modified starch industry in Thailand. It is noteworthy that this calibration system is consistent with the system adopted by European starch companies such as SQS's previous joint venture partner, AVEBE BA of the Netherlands.	

Forward action requests from previous verification

FAR ID	Forward action request	Summary of how FAR has been addressed in this reporting period	Assessment of how FAR has been addressed
FAR 1	Not applicable		

Forward action requests from this verification

FAR ID	Forward action request	Response by Project Participants	DNV's assessment of response by Project Participants
	Not applicable		

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APPENDIX B

CURRICULA VITAE OF THE VERIFICATION TEAM MEMBERS

Ramesh Ramachandran *holds a Master's Degree in Environmental Engineering and a Post Graduate Diploma in Operations Management.*
Possesses a combined experience of more than 15 years in the field of a) design and operation/maintenance of wastewater treatment (as part of working in wastewater design & equipment supply, firm), b) environmental consulting and c)production integrated environmental auditing. His experience also covers the fields of developing & designing EMS systems, resource/energy conservation, waste minimisation and cleaner production in various manufacturing process and chemical industries. In DNV he has experience of more than 5 years in validation and verification of numerous CDM projects in DNV, both in India & abroad. He has also been involved as a Lead Auditor in Management System Audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 5 years in DNV.
His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in energy generation from renewable energy sources, electrical distribution, waste handling and disposal and animal waste management.

Simon Wong Yon Sing *holds a Bachelor's Degree in Chemical Engineering with Environmental Engineering, with a year experience in the field of design and operation/maintenance of wastewater treatment as part of working in wastewater design & equipment supply services.*
His experience in designing and maintaining the wastewater treatment systems covers the fields of various manufacturing and chemical industries in Malaysia.
He has experience of more than 5 years in validation and verification of numerous CDM projects in DNV, both in Malaysia and abroad. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in "Energy Generation from Renewable Energy Sources", "Waste Handling and Disposal" and "Animal Waste Management System".

Felipe Lacerda Antunes *holds a Master's Degree in Production Engineering (Quality) and a Post Graduate Diploma in Environmental Management and Industrial Waste Management and Treatment. Possesses an International experience of more than 10 years in the field of quality and environmental auditing, working two years as the responsible of the QMS of Rede Metrológica RS and since 1999 as a QMS and EMS auditor in DNV.*
He has experience of more than 3 years in validation and verification of numerous CDM projects in DNV, both in South America & abroad. He has also been actively involved in Management System Audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 10 years in DNV.

His qualification and experience in CDM demonstrate him sufficient sectoral competence in energy generation from renewable energy sources, waste handling and disposal, and animal waste management.

Jane Feng Zhao *Holds a Bachelor Degree in electric engineering and automation . Prior to joining DNV, she has around ten years working experience in co-generation power company covering new-units on-site installation and commissioning,200MW co-generation units operation ,energy saving projects and safety assessment job.*