

Swiss Association for Quality and Management Systems (SQS)

Bernstrasse 103
P.O. Box 686
CH-3052 Zollikofen
Tel. +41 31 910 35 35
Fax. +41 31 910 35 45
headoffice@sqs.ch
www.sqs.ch

Verification Report



Enterprise

Business account: 318264
Company: **South Pole Carbon Asset Management Ltd.**
Address: Technoparkstrasse 1
8005 Zürich
Switzerland
Phone: +41 43 501 35 50
Fax: +41 43 501 35 99
E-Mail: info@southpolecarbon.com
Contact Person: Roman Schibli

Service

Audit/Assessment: VCS 3rd Verification
Audit/Assessment beginning/end: 2009/09/28 – 2010/02/09
Project name: **Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd.**
Report-No.: P28745.43
UNFCCC Scope: Waste handling and disposal
UNFCCC Methodology: AM0022 Version 4
UNFCCC Scale: Large Scale

Approved by

Date

Signature

Lead auditor/assessor:

2010/02/02



Reviewer:

2010/02/09



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1 Introduction

1.1 Objective

South Pole Carbon Asset Management Ltd. has commissioned SQS to perform a verification of the „Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd.“ project (hereafter called “the project”).

The verification objective is an independent assessment by a Designated Operational Entity (DOE) of a proposed project activity against all defined criteria set for the registration under the Voluntary Carbon Standard (VCS).

1.2 Scope

Based on the applicable requirements of the VCS modalities and procedures, the assessment shall:

- Ensure that the project activity has been implemented and operated as described in the registered PD and that all physical features (technology, project equipment, monitoring and metering equipment) of the project are in place;
- Ensure that the monitoring system is implemented and fully functional to generate voluntary carbon units (VCUs) without any double counting, and that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation in accordance with applicable VCS requirements;
- Evaluate the data recorded and stored as per the monitoring methodology.

The verification team has used a risk-based approach focusing on the identification of significant risks and reliability for the generation of VCUs.

1.3 VCS project description

The project activity consists of a wastewater treatment facility based on the Upflow Anaerobic Sludge Blanket (UASB) technology operated by Papop Co. Ltd. The wastewater input of about 3'500 m³ per day originates from the 600 TPD tapioca based starch manufacturing plant owned by General Starch Co. Ltd. and situated on the same premises as the project activity.

The wastewater is pretreated and then digested in two UASB reactors (UASB 1 and UASB 2). The generated biogas is used to produce process heat for the starch manufacturing plant. Excess biogas is flared in two flares. Two gas storage units act as buffers to the manufacturing plant boilers. No electricity is generated. The treated wastewater is discharged into the existing lagoon system which was the pre-project treatment facility before. GHG emissions are reduced by preventing methane to escape into the air and by substituting heavy fuel oil with biogas.

1.4 Level of assurance

Based on the process and the procedures conducted, SQS provides a reasonable but not absolute level of assurance that the project's greenhouse gas assertion is materially correct and a fair representation of the greenhouse gas data and information. The term *reasonable* is to be understood according to the inputs by the UNFCCC Secretariat to EB meeting 48 as well as to the definition in ISO14064-3, A.2.3.

2 Methodology

The SQS auditors apply standard auditing techniques to assess the quality of the information, including but not limited to:

(a) Desk review, involving:

- Review of the data and information presented to verify their completeness
- Review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures
- Evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions

(b) On-site assessment involving:

- Assessment of the implementation and operation of the proposed VCS project activity as per the registered PD
- Review of information flows for generating, aggregating and reporting the monitoring parameters
- Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the monitoring plan in the PD
- A cross-check between information provided in the monitoring report and data from other sources such as plant log books, inventories, purchase records or similar data sources
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PD and the selected methodology
- Review of calculations and assumptions made in determining the GHG data and emission reductions
- Identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

If, during the verification of a project activity, the auditor identifies issues related to the monitoring, implementation or operations of the proposed VCS project activity that could impair the capacity of the proposed VCS project activity to achieve emission reductions or influence the reporting of emission reductions then the auditor identifies, discuss and conclude these issues in the verification report.

The auditor shall raise a corrective action request (CAR) if one of the following occurs:

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

The auditor shall raise a clarification request (CL) if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met.

The auditor shall raise a forward action request (FAR) during verification for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

All CARs and CLs raised by the auditor during verification shall be resolved prior to submitting a request for issuance.

In order to ensure transparency, a verification protocol (Protocol VCS Verification) was customized for the project. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results from verifying the identified criteria. The verification protocol serves the following purposes:

- It organizes, details and clarifies the requirements a VCS project is expected to meet;
- It ensures a transparent verification process where the verifier will document how a particular requirement has been verified and the result of the verification.
- The verification protocol consists of two tables. The different columns in these tables are described in below Figure.

The completed verification protocol is enclosed in Appendix A to this report.

Verification Protocol Table 1: Requirement Checklist	
<i>Requirement</i>	The requirements the project must meet.
<i>Ref.</i>	Normative references
<i>MoV (Means of verification)</i>	Explains how conformance with the requirements is investigated. DR = Document Review, I = Interview, N/A = Not Applicable
<i>Comment / Cross Reference</i>	The section is used to elaborate and discuss the conformance to the requirement. May give reference to the PD or documents.
<i>Draft Concl./ Final Concl. (Draft and/or Final Conclusion)</i>	OK = conform, CAR = Corrective action request, CL = clarification request, FAR = forward action request

Verification Protocol Table 2: Summary of Requests	
<i>No.:</i>	The requests (CAR, CL, FAR) are numbered and listed in this section.
<i>Reference:</i>	Reference to the checklist question number in Table 1 where the Request is explained.
<i>Verifier Request:</i>	The section is used to elaborate and discuss the request. May give reference to the PD or documents.
<i>Project owner response:</i>	The responses given by the Client or other project participants during the communications with the verification team should be summarised in this section.
<i>Verifier conclusion:</i>	This section should summarise the verification team's responses and final conclusions. The conclusions should also be included in Table 1, under "Final Conclusion".
<i>Date:</i>	Date when request was closed.

2.1 List of interviewees and documents reviewed

The on site audit and interviews were done according to the audit program (see Appendix B) which was communicated to the project owner a few days in advance of the audit.

The following stakeholders have been interviewed during the verification (see Appendix C).

The following documents have been assessed during the verification (see Appendix D).

2.2 Verification Team

The following matrix shows the names and roles of the members of the verification team and the reviewer. The reviewer is not a member of the verification team.

Name	Country	Responsibilities								
		Lead	Desk review	On-site audit	Legal	Financial	Report	Verification team	Local expertise	Review
Felix Martin	Switzerland	X	X	X	X	X	X	X		
Rudolf Brodbeck	Switzerland		X					X		
Oliver Stankiewicz	Switzerland									X

Certificates of Competence for each verification team member are included in Appendix E to this report.

Local experts

Name	Country	Responsibilities								
		Lead	Desk review	On-site audit	Legal	Financial	Report	Verification team	Local expertise	Review
Malai Chomphuka				X	X				X	

2.3 Quality Control

The draft verification report, including the initial verification findings, underwent an internal peer review (by a member of the verification team) before being submitted to the project participants. The final verification report undergoes a review for final approval carried out by a reviewer (not a member of the verification team) before requesting registration of the project activity. The reviewer is qualified in accordance with SQS's qualification scheme for VCS validation and verification.

3 Verification Findings

3.1 Remaining issues, including any material discrepancy from previous validation

The previous verification report dates from August 22nd 2008 and verifies the period from June 1st 2007 to March 31st 2008. There are no pending issues from the last verification.

3.2 Project Implementation

The project did not undergo material changes since the last verification. The project is implemented as described in the PD and the following monitoring reports. The SCADA-screen was updated to a more clearly arranged diagram of the facility.

3.3 Completeness of Monitoring

Regarding the correct application of the monitoring methodologies the following CAR/CL had been discussed:

- The monitoring variable ID 4, wastewater organic material concentration leaving the treatment facility has been calculated instead of taking the well monitored data as foreseen in the monitoring plan (CL.9). The change regarding GHG emissions is neglectable, but for the sake of correctness the monitored data have been applied in the revised monitoring calculation.
- The installed flare does not measure the flare efficiency as required in the "tool to determine project emissions from flaring gases containing Methane" (CAR.2). As a consequence the flare efficiency is assumed zero which is a conservative approach.
- If making the balance of produced biogas (GM1 and GM2) and consumed biogas (GM3 and GM4) excess biogas results (CAR.3). It was assumed, that this has to be regarded as leaked biogas.

Having cleared all the abovementioned issues the monitoring plan is applied correctly and completely

3.4 Accuracy of Emission Reduction Calculations

In due consideration of the following issues the emission reduction calculations have been done correctly as defined in the monitoring plan and the additional tools applied:

- In the calculation sheet methane concentration was calculated in a way which could not be reproduced (CL.11).
- In the monitoring excel sheet and the monitoring report negative GHG emissions were calculated (CAR.1).

The formulas have been corrected in the revised monitoring sheet. Thus, the emission reduction calculations can be regarded as accurate.

3.5 Quality of Evidence to Determine Emission Reductions

Data is monitored and recorded with an electronic system. The data quality was assumed sufficient after corrections of typographical errors (CL.8). Missing values were discussed and assumed to be conservative (CL.9). Data was cross-checked with invoices (CL.10) and has been found correct. The quality of evidence to determine emission reductions can be concluded as sufficient.

3.6 Management and Operational System

The biogas facility is operated through BOT (build-operate-transfer) which grants a professional business. Monitoring system, laboratory, invoice system and the facility were checked on-site and judged appropriate. The management and operational system can be concluded as suitable.

4 Verification conclusion

SQS has performed the 3rd verification of the project "Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd."

SQS used the methodology AM0022 version 4 including the therein referenced tool to determine the emission reductions. Moreover, this verification was performed on the basis of VCS 2007.1, as well as further criteria given to provide consistent project operations, monitoring, and reporting (VCS program guidelines (2008), ISO 14064-2 and -3).

The (desk-)review of the PD, the monitoring report and relevant documents, the additional information gathered during the subsequent on-site audit and the satisfaction of corrective actions and clarification requests has provided SQS with sufficient evidence in order to be able to determine the fulfilment of stated criteria.

In our opinion the project is implemented as planned and described in the registered VCS PD. Installed equipment being essential for generating emission reduction and for metering the data defined in the monitoring plan runs reliably and is calibrated appropriately. The monitoring system is in place and works correctly. The project generates materially correct, complete and accurate GHG emission reductions according to the approved methodology.

Based on the information received and evaluated, SQS confirms the following statement:

Reporting period: From April 1st 2008 to August 31st 2009

Verified emission in the above reporting period:

	Apr 1 st 2008 to Dec 31 st 2008	Jan 1 st 2009 to Aug 31 st 2009	Total	
Project emissions	9'456	7'884	17'340	t CO2 equivalents
Baseline emissions	89'456	113'409	202'864	t CO2 equivalents
Emission reductions	80'000	105'525	185'525	t CO2 equivalents

Validator Signature



Mr. Felix Martin

Reviewer Signature



Mr. Oliver Stankiewicz

5 Appendix A: Verification protocol

**Swiss Association for Quality and
Management Systems (SQS)**

B e r n s t r a s s e 1 0 3
P . O . B o x 6 8 6
C H - 3 0 5 2 Z o l l i k o f e n
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F a x . + 4 1 3 1 9 1 0 3 5 4 5
h e a d o f f i c e @ s q s . c h
w w w . s q s . c h

Protocol

For verification of GHG Reduction
projects against the voluntary carbon
standard (VCS)

Enterprise

Business account:	318264
Company:	South Pole Carbon Asset Management Ltd.
Address:	Technoparkstrasse 1 8005 Zürich
Phone:	+41 43 501 35 50
Fax:	+41 43 501 35 99
E-Mail:	info@southpolecarbon.com
Contact person:	Roman Schibli

Service

Verification:	VCS 3rd verification
Verification start/end:	2009/09/28 – 2010/02/09
Project name:	Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd.
Project category:	Waste handling and disposal
Methodology:	AM0022 Version 4
Team of auditors/assessors	1. Mr. Felix Martin Lead Auditor 2. Ms. Malai Chomphuka Local Agent 3. Mr. Rudolf Brodbeck 2 nd Auditor 4. Mr. Oliver Stankiewicz Technical Review

Scope

- All 6 Kyoto Protocol GHGs
- All technologies supported by an approved VCS Program methodology, incl. AFOLU project types as set out on www.v-c-s.org
- Any approved GHG Programs
- Project category(ies) which is part of an approved GHG Program
- Project methodologies, not part of an approved GHG Program, when approved under the VCS Program through the double approval process
- Excluded from the scope are:
 - Project(s) that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction
 - Project(s) that have created another form of environmental credit (e.g. renewable energy certificates) unless they provide a letter from the program operator that the credit has not been used and has been cancelled.

Normative References

- [1] The Voluntary Carbon Standard (VCS) 2007.1 (18 November 2008)
- [2] Voluntary Carbon Standard Program Guidelines 2007.1 (18 November 2008)
- [3] ISO 14064-2:2006 – Specification with guidance at project level for quantification, monitoring and reporting of GHG emission reductions or removal enhancements
- [4] ISO 14064-3:2006 – Specification with guidance for the validation and verification of GHG assertions
- [5] ISO 14065-2:2007– Requirements for GHG validation and verification bodies for use in accreditation or other forms of recognition
- [6] GHG Protocol for Project Accounting, 2005, Chapter 7 guidance related to additionality test 1 common practice
- [7] AM0022/Version 4: Avoided Wastewater and On-site Energy Use Emissions in the Industrial Sector.
- [8] Tool to determine project emissions from flaring gases containing Methane

This validation protocol must be seen in conjunction with the Voluntary Carbon Standard (VCS) and the VCS Validation Report template.
The entries in the checklist should be adjusted and amended as appropriate to prepare for the validation of a particular projects.

* MoV = Means of Validation, DR= Document Review, I= Interview

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Date:
2010/02/09

Initials:
MAE

	Checklist	
Release: 22.09.2009		Page: 3 of 14

Table 1: Data Management System/Controls

CHECKLIST QUESTION		Ref.	MoV*	Draft Concl	Final Concl
1. Defined organisational structure, responsibilities and competencies					
1.1. Position and roles <i>Position and role of each person in the GHG data management process is clearly defined and implemented, from raw data generation to submission of the final data. Accountability of senior management must also be demonstrated.</i>			DR, I	Y	Y
Comment:	Wastewater treatment plant is a built operate transfer (BOT) project. Papop Renewable Co., Ltd. is responsible to operate the wastewater treatment plant and delivers produced energy to General Starch Co., Ltd. Papop operates and manages professionally the plant inclusive monitoring parameters.				
1.2. Responsibilities <i>Specific monitoring and reporting tasks and responsibilities are included in job descriptions or special instructions for employees.</i>			DR, I	Y	Y
Comment:	Wastewater treatment plant is a built operate transfer (BOT) project. Papop Renewable Co., Ltd. is responsible to operate the wastewater treatment plant and delivers produced energy to General Starch Co., Ltd. Papop operates and manages professionally the plant including monitoring parameters.				
1.3. Competencies needed <i>Competencies needed for each aspect of the GHG determination process are analysed. Personnel competencies are assessed and training programme implemented as required.</i>			DR, I	Y	Y
Comment:	Wastewater treatment plant is a built operate transfer (BOT) project. Papop Renewable Co., Ltd. is responsible to operate the wastewater treatment plant and delivers produced energy to General Starch Co., Ltd. Papop operates and manages professionally the plant inclusive monitoring parameters.				
2. Conformance with monitoring plan					
2.1. Reporting procedures <i>Reporting procedures should reflect the monitoring plan content. Where deviations from the monitoring plan occur, the impact of this on the data is estimated and the reasons justified.</i>			DR, I	Y	Y
Comment:	The monitoring procedures are according to the monitoring plan and in general to the methodology AM0022/v04. Table 2 provides in depth check of the methodology and necessary CAR/CL/FAR.				
2.2. Necessary Changes <i>Necessary changes to the monitoring plan are identified and changes are integrated in local procedures as necessary.</i>			DR, I	Y	Y
Comment:	No changes regarding monitoring plan are identified.				

* MoV = Means of Validation, DR= Document Review, I= Interview

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Initials: MAE

		Checklist			
Release: 22.09.2009			Page: 4 of 14		
3. Application of GHG determination methods					
3.1. Methods used <i>There are documented description of the methods used to determine GHG emissions and justification for the chosen methods. If applicable, procedures for capturing emissions from non-routine or exceptional events are in place and implemented.</i>			DR, I	Y	Y
Comment:	Methods are described and documented.				
3.2. Information/process flow <i>An information/process flow diagram, describing the entire process from raw data to reported totals is developed.</i>			DR, I	Y	Y
Comment:	Information and process flow is clearly described.				
3.3. Data transfer <i>Where data is transferred between or within systems/spreadsheets, the method of transfer (automatic/manual) is highlighted - automatic links/updates are implemented where possible. All assumptions and the references to original data sources are documented.</i>			DR, I	Y	Y
Comment:	Data transfer by exporting data from SCADA (supervisory control and data acquisition) to the excel monitoring calculation.				
3.4. Data trails <i>Requirements for documented data trails are defined and implemented and all documentation are physically available.</i>			DR, I	Y	Y
Comment:	Data trails are defined. Data is recorded with SCADA (supervisory control and data acquisition) and copied to the monitoring calculation excel-file.				
4. Identification and maintenance of key process parameters					
4.1. Identification of key parameters <i>The key physical process parameters that are critical for the determination of GHG emissions (e.g. meters, sampling methods) are identified.</i>			DR, I	Y	Y
Comment:	Parameters are according to AM0022/v04				
4.2. Calibration/maintenance <i>Appropriate calibration/maintenance requirements are determined.</i>			DR, I	CL.1.	Y
Comment:	CL.1: Calibration documents have yet to be delivered to the audit team CL.1 closed: Calibration is shown sufficiently.				

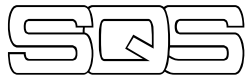
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		Checklist			
Release: 22.09.2009			Page: 5 of 14		
5. GHG Calculations					
5.1. Use of estimates and default data <i>Where estimates or default data are used, these are validated and periodically evaluated to ensure their ongoing appropriateness and accuracy, particularly following changes to circumstances, equipment etc. The validation and periodic evaluation of this is documented.</i>				DR, I	Y
Comment: Estimates and default data is up to date.					
5.2. Guidance on checks and reviews <i>Guidance is provided on when, where and how checks and reviews are to be carried out, and what evidence needs to be documented. This includes spot checks by a second person not performing the calculations over manual data transfers, changes in assumptions and the overall reliability of the calculation processes.</i>				DR, I	Y
Comment: Wastewater treatment plant is a built operate transfer (BOT) project. Papop Renewable Co., Ltd. is responsible to operate the wastewater treatment plant and delivers produced energy to General Starch Co., Ltd. Papop operates and manages professionally the plant including monitoring parameters. These are also mostly used for accounting.					
5.3. Internal verification <i>Internal verifications include the GHG data management systems, to ensure consistent application of calculation methods.</i>				DR, I	Y
Comment: Wastewater treatment plant is a built operate transfer (BOT) project. Papop Renewable Co., Ltd. is responsible to operate the wastewater treatment plant and delivers produced energy to General Starch Co., Ltd. Papop operates and manages professionally the plant including monitoring parameters. These are also mostly used for accounting.					
5.4. Internal validation <i>Data reported from internal departments should be validated visibly (by signature or electronically) by an employee who is able to assess the accuracy and completeness of the data. Supporting information on the data limitations, problems should also be included in the data trail.</i>				DR, I	n/a
Comment: Data is collected in SCADA.					
5.5. Data protection measures <i>Data protection measures for databases/spreadsheets should be in place (access restrictions and editor rights).</i>				DR, I	Y
Comment: Data is protected in line with business policy of Papop.					
5.6. IT systems <i>IT systems used for GHG monitoring and reporting should be tested and documented.</i>				DR, I	Y
Comment: IT system is in line with business policy of Papop.					

* MoV = Means of Validation, DR= Document Review, I= Interview

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Table 2: GHG calculation procedures and management control testing

Checklist 1 Monitoring Report and Calculation				
Comment	Ref.	MoV*	Draft Concl	Final Concl
CL.2: MR: Supplement formulas with units in monitoring report. CL.2 closed: Formulas are explained sufficiently.		DR	CL.2.	Y
CL.3: MR & Excel: Remove any unnecessary references/contents belonging to electricity generation from the monitoring report and excel sheet, since no electricity is generated in this project. CL.3 closed: MR is corrected.		DR	CL.3.	Y
CL.4: Page 3/4/5 of MR: Provide a list with a clear overview, which meters (incl. serial number) have been used for the period to be credited. CL.4 closed: Clear overview provided.		DR, I	CL.4.	Y
CL.5: Page 6 of MR: Provide a SCADA-screenshot with the most recent flow diagram of the plant. CL.5 closed: OK, see table 3.		DR, I	CL.5.	Y
CAR.1: Page 7/8/18 of MR, Excel-file: For $E_{CH4_lagoons}$ and $M_{lagoon_anaerobic}$ negative values are given, which is wrong. Provide correct calculations. CAR.1 closed: OK, see table 3.		DR, I	CAR.1.	Y
CL.6: Page 11 of MR: Clarify the meaning of abbreviations ABR and KWTE. CL.6 closed: OK, see table 3.		DR, I	CL.6.	Y
CL.7: Page 15/16 of MR: Provide correct table header descriptions. CL.7 closed: OK, see table 3.		DR, I	CL.7.	Y

Checklist 2 AM0022 Version 4 and tool(s)				
CHECKLIST QUESTION	Ref.	MoV*	Draft Concl	Final Concl

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AM0022 ID 1: Wastewater flows entering project treatment facility

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	CL

DR, I

CL.8.

Y

Comment:

CL.8: A very high wastewater input happened on 30 of October 2008 of 7944 m3 which resulted subsequently in a very high COD load. But the maximum possible WWT input is 7200 m3 (300 m3/h) as discussed on-site. Clarify this figure.
CL.8 closed: OK, see table 3.

AM0022 ID 2: Wastewater flows leaving project treatment facility

Data Checklist	Yes / No
Completeness	n/a
QA/QC procedures	n/a
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	n/a
Interview with personnel, if procedures understood	n/a
cross-check of data if available	n/a

DR

Y

Y

Comment:

ID 2 is equal to ID 1.

AM0022 ID 3: Wastewater organic material concentration entering the project boundary.

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	n/a

DR, I

Y

Y

Comment:

* MoV = Means of Validation, DR= Document Review, I= Interview

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AM0022 ID 4: Wastewater organic material concentration leaving the treatment facility

DR, I

CL.9.

Y

Data Checklist	Yes / No
Completeness	n
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	n/a

Comment:

Acc. to the methodology this figure should be monitored. In the monitoring report the data monitored is available, but has several gaps. The CODout (ID4) is calculated by multiplying the CODin (ID 3) with the average removal ratio in the monitoring report.

CL.9: Provide evidence, that this is a conservative assumption. Explain why gaps exist and how data of the days with gaps have an effect on emission reductions.

CL.9 closed: OK, see table 3.

AM0022 ID 5: Volume of biogas sent to facility heaters.

DR, I

CL.10.

Y

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	CL

Comment:

CL.10: Invoice document of Jan 2009 of sold biogas to GSL shall be provided to the DOE for cross-checking with the excel-calculation.

CL.10 closed: OK, see table 3.

AM0022 ID 7: Electricity generated from the biogas collected in the anaerobic treatment facility and consumed on site or sent the grid

DR

n/a

n/a

Data Checklist	Yes / No
Completeness	n/a
QA/QC procedures	n/a
Implementation & operation as in PDD	n/a
Information flows generating, aggregating, reporting	n/a
Interview with personnel, if procedures understood	n/a
cross-check of data if available	n/a

Comment:

* MoV = Means of Validation, DR= Document Review, I= Interview

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Initials:
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AM0022 ID 8: Fossil fuel volume equivalent to generate the same amount of heat generated from the biogas collected in the anaerobic treatment facility

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	n/a

DR

Y

Y

Comment:

AM0022 ID 9: Biogas sent to flares

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

DR, I

Y

Y

Comment:

AM0022 ID 10: Biogas sent to gen sets

Data Checklist	Yes / No
Completeness	n/a
QA/QC procedures	n/a
Implementation & operation as in PDD	n/a
Information flows generating, aggregating, reporting	n/a
Interview with personnel, if procedures understood	n/a
cross-check of data if available	n/a

DR

n/a

n/a

Comment:

AM0022 ID 11: Biogas methane concentration

Data Checklist	Yes / No
Completeness	CL.11.
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

DR, I

CL.11.

Y

Comment:

CL.11: Explain formula used in the Excel-file (sheet "input data", D19 and E19).
CL.11 closed: OK. Formula is corrected and now correct.

* MoV = Means of Validation, DR= Document Review, I= Interview

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AM0022 ID 12: Project emissions from flaring of the residual gas stream

Data Checklist	Yes / No
Completeness	CAR.2.
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

DR, I

CAR.2.

Y

Comment:

CAR.2: Acc. to the Tool to determine project emissions from flaring gases containing Methane the flare efficiency has to be monitored. Provide proof, that the biogas was actually flared with 50% efficiency. (page 14 of tool).
CAR.2 closed: OK, see table 3.

AM0022 ID 13: Amount of chemical oxidising agents entering system boundary

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

DR, I

Y

Y

Comment:

No chemical oxidising agents have been used.

AM0022 ID 14: Gen set combustion efficiency

Data Checklist	Yes / No
Completeness	n/a
QA/QC procedures	n/a
Implementation & operation as in PDD	n/a
Information flows generating, aggregating, reporting	n/a
Interview with personnel, if procedures understood	n/a
cross-check of data if available	n/a

DR

Y

Y

Comment:

No gen set is installed.

AM0022 ID 15: Heating system combustion efficiency

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

DR, I

Y

Y

Comment:

The parameter ID 15 is actually the "proportion of biogas destroyed by combustion". Acc. to answer given to the clarification SSC_324 from the small-scale working group (SSC WG) of the CDM executive board 100% can be used. The assumed value of 98.5% is thus a conservative choice.

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AM0022 ID 16: Flow of wastewater directly to the current water treatment system, and bypassing the new wastewater treatment facility

DR, I

n/a

n/a

Data Checklist	Yes / No
Completeness	n/a
QA/QC procedures	n/a
Implementation & operation as in PDD	n/a
Information flows generating, aggregating, reporting	n/a
Interview with personnel, if procedures understood	n/a
cross-check of data if available	n/a

Comment:

No wastewater flows directly to the current water treatment system, and bypassing the new wastewater treatment facility.

AM0022 ID 17: Loss of biogas from pipeline

DR, I

CAR.3.

Y

Data Checklist	Yes / No
Completeness	CAR.3.
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

Comment:

CAR.3: Loss of biogas from pipeline is assumed zero. But if the yearly balance of the total biogas production and amount of biogas sent to the flare and the boiler is calculated, there is a surplus of biogas produced. This surplus has to be regarded as leaked biogas. (Also during site-visit, leaks had been seen in the biogas tanks).
CAR closed: OK, see table 3.

AM0022 ID 18: Organic material removed from wastewater facility

DR, I

Y

Y

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

Comment:

CODin – CODout

AM0022 ID 19: Biogas calorific value

DR

Y

Y

Data Checklist	Yes / No
Completeness	Y
QA/QC procedures	Y
Implementation & operation as in PDD	Y
Information flows generating, aggregating, reporting	Y
Interview with personnel, if procedures understood	Y
cross-check of data if available	Y

Comment:

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TABLE 3 RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question	Summary of project owner response	Validation team conclusion
CL.1: Calibration documents have yet to be delivered to the audit team.	Table 1, 4.2	Scans of calibration certificates are provided.	Calibration is shown sufficiently. CL closed.
CL.2: MR: Supplement formulas with units in monitoring report.	Table 2, checklist 1	The parameters used in calculation are explained clearly and defined with units in the same explanation.	Formulas are explained sufficiently. CL closed.
CL.3: MR & Excel: Remove any unnecessary references/contents belonging to electricity generation from the monitoring report and excel sheet, since no electricity is generated in this project.	Table 2, checklist 1	The revised MR is corrected for the requested clarification.	MR is corrected. CL closed.
CL.4: Page 3/4/5 of MR: Provide a list with a clear overview, which meters (incl. serial number) have been used for the period to be credited.	Table 2, checklist 1	The table for the calibrations is revised, and in line with the actual schedule of meter changes and calibration. The internal meter changing memos are also made available during site visit .	Clear overview provided. CL closed.
CL.5: Page 6 of MR: Provide a SCADA-screenshot with the most recent flow diagram of the plant.	Table 2, checklist 1	Latest updated SCADA screen is added (see figure 3) in the revised monitoring report as well as in the GHG calculaiton sheet.	OK. CL closed.
CL.6: Page 11 of MR: Clarify the meaning of abbreviations ABR and KWTE.	Table 2, checklist 1	Abbreviation table is added to the revised version of MR.	OK. CL closed.

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Initials:
MAE

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question	Summary of project owner response	Validation team conclusion
CL.7: Page 15/16 of MR: Provide correct table header descriptions.	Table 2, checklist 1	The correction is done. The table header (monitoring time period) is consistent through the document.	OK. CL closed.
CL.8: A very high wastewater input happened on 30 of October 2008 of 7944 m3 which resulted subsequently in a very high COD load. But the maximum possible WWT input is 7200 m3 (300 m3/h) as discussed on-site. Clarify this figure.	Table 2, checklist 2, ID 1	The error is attributed to be a typographic one and is corrected in revised version.	OK. CL closed.
Acc. to the methodology ID 4 should be monitored. In the monitoring report the data monitored is available, but has several gaps. The CODout (ID4) is calculated by multiplying the CODin (ID 3) with the average removal ratio in the monitoring report. CL.9: Provide evidence, that this is a conservative assumption. Explain why gaps exist and how data of the days with gaps have an effect on emission reductions.	Table 2, checklist 2, ID 4	The figure is revised as per actual monitoring in revised version of excel sheet. The gaps in data specially for COD are considered in conservative manner as no emission reductions from these days are accounted for in the ER calculation. However project emissions resulting from any biogas usage or flaring on these days is considered.	OK. CL closed.
CL.10: Invoice document of Jan 2009 of sold biogas to GSL shall be provided to the DOE for cross-checking with the excel-calculation.	Table 2, checklist 2, ID 4	A copy of the biogas invoice sold to GSL is provided. The Excel sheet values and MR calculations are made consistent with biogas sold for each month. The changes if any are done transparently in the excel sheet.	OK. CL closed.
CL.11: Explain formula used in the Excel-file (sheet "input data", D19 and E19).	Table 2, checklist 2, ID 11	The methane concentration, on annual basis is multiplied by density of methane to establish the amount of methane by weight present in per m3 of biogas on an annual average basis. This parameter is important for project emissions from flare emissions, however all the biogas sent to flare is assumed to be burnt at 0% efficiency and average methane percentage in biogas is used to estimate the amount of methane flared / emitted.	OK. Formula is corrected and now correct. CL closed.
CAR.1: Page 7/8/18 of MR, Excel-file: For E _{CH4_lagoons} and M _{lagoon_anaerobic} negative values are given, which is	Table 2, checklist 1	The correction is done.	OK. CAR closed.

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Initials:
MAE

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question	Summary of project owner response	Validation team conclusion
wrong. Provide correct calculations.			
CAR.2: Acc. to the Tool to determine project emissions from flaring gases containing Methane the flare efficiency has to be monitored. Provide proof, that the biogas was actually flared with 50% efficiency. (page 14 of tool).	Table 2, checklist 2, ID 12	Flare efficiency is assumed zero for conservative estimate.	OK. CAR closed.
CAR.3: Loss of biogas from pipeline is assumed zero. But if the yearly balance of the total biogas production and amount of biogas sent to the flare and the boiler is calculated, there is a surplus of biogas produced. This surplus has to be regarded as leaked biogas. (Also during site-visit, leaks had been seen in the biogas tanks).	Table 2, checklist 2, ID 17	All the remaining biogas is assumed to be as leakage amount and is accounted in the same parameter as biogas flared. Because the efficiency of flare is anyway assumed to be zero, the leakages are taken into account in conservative manner.	OK. CAR closed.

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Date:
2010/02/09

Initials:
MAE

6 Appendix B: Audit program

Time approx.		Topic	Place	Details	People to be interviewed
from	until				

Thursday, October 8th					
9:00	16:30	Review of General Starch	South Pole Office, Bangkok	Review of monitoring report Review Calculations Consistency of data	- Mr. Patrick Bürgi - Ms. Kuntida Krisorncharoen - Mr. Harshpreet Singh
17:00	20:30	Transfer to Nakhon Ratchasima			
Friday, October 9th					
9:00	16:30	Site-visit of General Starch WWT plant	On-site	Construction and operation of plant QC/QA procedures Data flow	- Ms. Kuntida Krisorncharoen - Mr. Harshpreet Singh - Mr. Suchai Rattananadhekul
16:30	20:00	Transfer to Bangkok			

7 Appendix C: Interviews

Date	Name	Position	Issues
8. Sept. 09	Mr. Patrick Bürgi	Managing Partner South Pole Carbon Asset Management Ltd.	See Appendix B: Audit Program
8./9. Sept. 09	Ms. Kuntida Krisorncharoen	CDM Project Associate South Pole Carbon Asset Management Ltd.	
8./9. Sept 09	Mr. Harshpreet Singh	CDM Expert South Pole Carbon Asset Management Ltd.	
9. Sept 09	Mr. Suchai Rattananadhekul	Project Management Manager Papop Co., Ltd.	

8 Appendix D: Documents reviewed

A) Documents being available before and in preparation of the on-site audit:

Nr.	Document
A.1	Monitoring Report version no.1, dated September 30 th 2009
A.2	Excel calculation sheet "044_GSL_3rdVerification_090924.xls", dated September 24 th 2009
A.3	VCS-PD, version 1, dated June 19 th 2007
A.3	Validation and Verification Report, dated August 31 st 2007
A.4	Verification Report, dated August 22 nd 2008

B) Documents handed over during the on-site audit:

Nr.	Document
B.1	Up-to-date SCADA screenshot of wastewater treatment plant

C) Documents sent after the on-site audit:

Nr.	Document
C.1	Meter installation letter GM1 (A9010402000), September 22 nd 2008
C.2	Meter uninstallation letter GM1 (A9010402000) and installation of C3010D02000 at GM1, May 19 th 2009
C.3	Meter installation letter GM2 (AA083102000), November 5 th 2008
C.4	Meter installation letter GM3 (A9059602000), October 10 th 2008
C.5	Meter installation letter GM4 (9B09BD02000), January 12 th 2008
C.6	Temporary uninstallation letter GM4 (9B09BD02000), September 1 st 2008
C.7	Temporary installation letter GM4 (96092802000), September 10 th 2008
C.8	FM3 (6B00EB20000) flowmeter verification certificate, March 13 th 2008
C.9	FM3 (6B00EB20000) flowmeter verification certificate, July 2 nd 2009
C.10	FM5 (6B00E920000) flowmeter verification certificate, March 18 th 2008
C.11	FM5 (6B00E920000) flowmeter verification certificate, July 2 nd 2009
C.12	FM5 (6B00E920000) flow calibration with adjustment, August 13 th 2004
C.13	GM1 (EJ-10214) certificate of calibration, January 10 th 2008
C.14	GM1 (A9010402000) flow calibration with adjustment, September 17 th 2008
C.15	GM1 (C3010D02000) flow calibration with adjustment, March 10 th 2009
C.16	GM1 (C3010D02000) flow calibration with adjustment, April 9 th 2009
C.17	GM2 (EJ-10211) pressure test report, December 7 th 2004
C.18	GM2 (EJ-10211) turbar calibration certificate, January 24 th 2005
C.19	GM2 (F8-12093) pc manchester service report, January 30 th 2007
C.20	GM2 (F8-12093) certificate of calibration, January 11 th 2008
C.21	GM2 (AA083102000) flow calibration with adjustment, October 21 st 2008
C.22	GM3 (F8-12094) pressure test report, December 13 th 2005
C.23	GM3 (F8-12094) turbar calibration certificate, December 20 th 2005
C.24	GM3 (EJ-10213) turbar calibration certificate, February 7 th 2006
C.25	GM3 (EJ-10213) certificate of calibration, March 28 th 2007
C.26	GM3 (A9059602000) flow calibration with adjustment, September 19 th 2008
C.27	GM4 (96092802000) flow calibration with adjustment, June 25 th 2007
C.28	GM4 (9B09BD02000) flow calibration with adjustment, November 29 th 2007
C.29	GSL biogas invoice, February 3 rd 2009

C.30	Flare specification
C.31	Overview of documents requested "4) GSL_documents-requested_091203.doc"
C.32	Monitoring Report version no.2, dated December 2 nd 2009
C.33	Excel calculation sheet "044_GSL_3rdVerification_090924.xls", dated December 9 th 2009
C.34	Evidences for resolution of CARs and CLs (see Validation protocol)

All documents have been archived by SQS; they will be kept secure and in a retrievable manner for at least two years after the end of the project crediting period.

9 Appendix E: Certificates of Competence

Audit team member's statement of competence

Name **Mr. Felix Martin**

Climate auditor for:

Validation / verification	☒
Methodological expertise	☒
Local expertise	☐

Scopes of expertise:

1	Energy industries	☒
2	Energy distribution	☒
3	Energy demand	☐
4	Manufacturing	☒
5	Chemical production	☒
6	Construction	☐
7	Transport	☒
8	Mining/mineral production	☐
9	Metal production	☐
10	Fugitive emissions from fuels	☐
11	Fugitive emissions from Production and consumption of halocarbons and sulphur hexafluoride	☐
12	Solvent use	☐
13	Waste handling and disposal	☒
14	Afforestation and Reforestation	☒
15	Agriculture	☒

Name **Mr. Rudolf Brodbeck**

Climate auditor for:

Validation / verification	☒
Methodological expertise	☐
Local expertise	☐

Scopes of expertise:

1	Energy industries	☒
2	Energy distribution	☐
3	Energy demand	☒
4	Manufacturing	☒
5	Chemical production	☒
6	Construction	☐
7	Transport	☒
8	Mining/mineral production	☐
9	Metal production	☐
10	Fugitive emissions from fuels	☐
11	Fugitive emissions from Production and consumption of halocarbons and sulphur hexafluoride	☐
12	Solvent use	☒
13	Waste handling and disposal	☒
14	Afforestation and Reforestation	☐
15	Agriculture	☐

Name **Oliver Stankiewicz**

Climate auditor for:

Validation / verification	☒
Methodological expertise	☒
Local expertise	☐

Scopes of expertise:

1	Energy industries	☒
2	Energy distribution	☒
3	Energy demand	☒
4	Manufacturing	☒
5	Chemical production	☐
6	Construction	☒
7	Transport	☒
8	Mining/mineral production	☐
9	Metal production	☐
10	Fugitive emissions from fuels	☒
11	Fugitive emissions from Production and consumption of halocarbons and sulphur hexafluoride	☐
12	Solvent use	☐
13	Waste handling and disposal	☒
14	Afforestation and Reforestation	☒
15	Agriculture	☒

10 Appendix F: Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IEE	Initial Environmental Examination
IPCC	Intergovernmental Panel on Climate Change
LFG	Landfill Gas
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
N ₂ O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PD	Project Description
SQS	The Swiss Association for Quality and Management Systems (verifier)
TPD	Tonnes per day
UNFCCC	United Nations Framework Convention on Climate Change
UASB	Upflow Anaerobic Sludge Blanket technology
SCADA	Supervisory Control and Data Acquisition
VCS	Voluntary Carbon Standard