

VERIFICATION REPORT

“CHOL CHAROEN GROUP WASTEWATER TREATMENT WITH BIOGAS SYSTEM I (CHOLBURI)”



Document Prepared By RINA Services S.p.A. (RINA)

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Summary:

RINA Services S.p.A. (RINA), commissioned by South Pole Carbon Asset Management Ltd., is verifying the greenhouse gas emission reductions reported for the project activity “Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)” in Thailand, VCS Registration Reference N° 430, for the period 01/01/2018 to 31/03/2019 with regard to the relevant requirements for VCS activities.

The objective of the verification is to have an independent review ex-post determination of the monitored reductions in GHG emission reductions. Verification was conducted using RINA procedures in line with the requirements specified in the VCS Version 3.7 Requirements, VCS validation and verification manual version 3.2, CDM M&P, the latest version of the CDM Validation and Verification Standard, and relevant decisions of the COP/MOP and the CDM EB and applying standard auditing techniques. The verification consisted of desk review, on-site assessment and the resolution of outstanding issues and the issuance of the final verification report and certification.

The verification shall ensure that reported emission reductions are complete and accurate in accordance with applicable VCS / CDM requirements in order to be certified.

The project was validated by TUV Nord (validation report N° 53208109-08/510 of 14/11/2009) and it was registered under the VCS registration reference N° 430. The validation on renewal of crediting period was done by KBS Certification Services Pvt. Ltd. (VCS.18.VER.010_Crediting period renewal) dated 28/05/2018.

The GHG emission reductions were calculated on the basis of the approved methodology AMS-III.H ‘Methane Recovery in Wastewater Treatment’ version 18, AMS-I.C ‘Thermal energy production with or without electricity’ version 20 and AMS-I.D ‘Grid connected renewable electricity generation’ version 18 and the monitoring plan included in the registered Project Description, version 03 of 21/05/2018.

During this verification, 01 Corrective Action Request (CAR) and 2 Clarification Requests (CRs) were identified related to operation, GHG emission reduction estimation, monitoring and baseline scenario of the VCS project activity in relation to all relevant VCS requirements for the project activity and the applied baseline and monitoring methodology, and these CARs and CRs are successfully closed after necessary corrections/clarifications by the client. The same has been discussed in Appendix B of this verification report.

In conclusion, it is RINA’s opinion that the project activity “Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)” in Thailand, VCS project ID 430, meets all relevant requirements for VCS standard and guidelines and correctly applies the baseline and monitoring methodology AMS-III.H ‘Methane Recovery in Wastewater Treatment’ version 18, AMS-I.C ‘Thermal energy production with or without electricity’ version 20 and AMS-I.D ‘Grid connected renewable electricity generation’ version 18. The monitoring system is in place and the emission reductions are calculated without material misstatement. Hence, RINA is able to certify that the emission reductions from the project during the monitoring period 01/01/2018 to 31/03/2019 amount to 61,104 tCO₂e.

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1 INTRODUCTION

1.1 Objective

RINA has been commissioned by “South Pole Carbon Asset Management Ltd.” to perform an independent verification of its VCS project, “Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)”, already registered under VCS with Project ID. 430 for the reported GHG emission reductions for the given monitoring period 01/01/2018 up to 31/03/2019. The VCS projects must undergo independent third party verification and certification of emission reductions as the basis for issuance of Voluntary Emission Reductions (VERs/VCUs).

The objectives of this verification exercise are, by review of objective evidence, to establish that:

- The project activity has been implemented and operated as per the project description (PD) and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- Monitoring report and other supporting documents are complete;
- The data is recorded and stored as per the monitoring methodology and approved monitoring plan.
- To confirm that the monitoring system is implemented and fully functional to generate Voluntary Emission Reductions (VERs/VCUs) without any double counting, and

To establish 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.

1.2 Scope and Criteria

The verification scope is:

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

The project is assessed against the requirements of VCS standard version 3.7, VCS program guide version 3.7, validation and verification manual version 3.2 and related rules and guidance. RINA has, based on the recommendations in the latest version of CDM Validation and Verification Standard, VCS validation and verification manual and employed a rule-based approach (as criteria) in the verification, focusing on the identification of significant reporting rules and the reliability of project monitoring.

Verification is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the monitoring.

1.3 Level of Assurance

All the revisions of the verification report before being submitted to the client were subjected to an independent internal technical review to confirm that all verification activities had been completed according to the pertinent RINA instructions, with reasonable level of assurance.

The technical review was performed by a technical reviewer(s) qualified in accordance with RINA's qualification scheme for VCS and CDM validation and verification.

The verification team and the technical reviewers consist of the following personnel.

Role	Last Name	First Name	Country
Team Leader and verifier	Buragohain	Champok	India
Technical Expert	Augustus	Cyril	India
Technical reviewer	Liu	Huifeng	China

1.4 Summary Description of the Project

The project activity involves the installation and operation of a biogas recovery and utilization system (an open anaerobic effluent treatment system) at Chol Charoen Co. Ltd., a tapioca starch factory in Choburi, Thailand. The system has been in operation since 7th January 2006 (project start date).

The starch factory has a design daily production capacity of 240 ton of dried starch, generating 2,400 m³ of wastewater per operational day. Under the previous system, wastewater released from the plant was treated in 13 cascading open anaerobic lagoons. With the depths of these ponds being more than 2 meter from the water surface and the mean temperature of the region being 29°C, there is a suitable anaerobic environment within the ponds. Anaerobic bacteria in the ponds break down organic compounds in the wastewater, resulting in the release of biogas. The resulting biogas is characterised by the chemical oxygen demand or COD of the wastewater.

The project activity involves modification of the existing open anaerobic lagoon-based process into a closed anaerobic system for treatment of high organic matter wastewater. This is based on anaerobic fixed film reactor (AFFR) technology, which is a technology. In addition, three open lagoons at the outlet of the AFFRs were redesigned and converted to covered lagoons in order to 1) increase gas storage capacity and 2) serve as an emergency wastewater treatment system in case the AFFR system malfunctions.

The implementation of AFFR system enables the recovery of biogas that would have been released to the atmosphere and the utilization of the recovered biogas for thermal and electricity generation. Excess biogas (if any) sent to the enclosed flare system. The hot oil boiler in the existing plant was originally designed to burn fuel oil for heat generation. Under the project activity, the burner is retrofitted with a combination fuel burner, which allows the boiler to be co-fired using both fuel oil and the biogas collected from the reactors. The power produced by the captured biogas augments the electricity requirement of the plant and may, in the future be fed to national grid, under the pending power purchase agreement with Provincial electricity Authority (PEA). With such utilization of biogas, the project activity achieves GHG emission reduction through avoidance of methane being released to the atmosphere and also through reduction of fossil fuel consumption (with fuel oil and grid electricity being replaced). Verification team has checked the project activity equipments installed at the project site and found in compliance with registered VCS PD version 03 of 21/05/2018.

The project site is located in the compound of Chol Charoen Co., Ltd., located in Banbung district, Choburi province, Thailand, about 250 km away from Bangkok. Geographical coordinates: 13° 17.736'N latitude 101° 09.108'E longitude.

As per the registered VCS PD (VCS Ref. No: 430) of the VCS project, baseline emissions are calculated as the sum of fugitive methane emissions from lagoons in the baseline case in the absence of the project activity and CO₂ emissions from burning of fossil fuel. Project emissions are calculated as the fugitive methane emissions from the project activity, the electricity consumption to run the project activity in present scenario. The emission reduction is calculated as the difference of baseline emissions and the project emissions as the leakage emissions are considered to be negligible for the project activity as per the applied methodologies.

The project is going for the 2nd verification covering monitoring period from 01/01/2018 to 31/03/2019 under the second crediting period (01/01/2017 to 31/12/2026) with emission reductions 61,104 tCO_{2e}. The emission reductions are calculated conservatively as per the applied methodologies.

Main components of the project activity include AFFR, Thermal oil boilers, gas engines, gas storage system, Cascading open lagoons system and enclosed flaring system.

The main information of the project activity is summarized in the table below:

Project Participant(s)	Chol Charoen Co., Ltd. South Pole Carbon Asset Management Ltd.
Project Title	Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)
Location of the project	The project site is located in the compound of Chol Charoen Co., Ltd., located in Banbung district, Choburi province, Thailand, about 250 km away from Bangkok. Geographical coordinates: 13° 17.736'N latitude 101° 09.108'E longitude
Methodology(ies)	AMS-III.H 'Methane Recovery in Wastewater Treatment' version 18, AMS-I.C 'Thermal energy production with or without electricity' version 20 and AMS-I.D 'Grid connected renewable electricity generation' version 18.

Sectoral Scope(s)	13 & 1	RINA's Technical Area(s)	13.1 & 1.1
Registered PDD	Version 3 of 21/05/2018		
Starting date of the crediting period	01/01/2007 (Under first crediting period of 10 years) 01/01/2017 (Under second crediting period of 10 years)		
Project's crediting period	01/01/2007 – 31/12/2016 (First crediting period) 01/01/2017 – 31/12/2026 (Second crediting period)		
Project documentation link	https://www.vcsprojectdatabase.org/#/project_details/430		

2 VERIFICATION PROCESS

2.1 Method and Criteria

Verification was conducted using RINA procedures in line with the requirements specified in the VCS Requirements, i.e. VCS Program Guide, VCS Version 3 (v3.7) and VCS Standard, VCS Version 3 (v3.7). The GHG emission reductions are on the basis of the approved Baseline and monitoring methodology AMS-III.H 'Methane Recovery in Wastewater Treatment' version 18, AMS-I.C 'Thermal energy production with or without electricity' version 20 and AMS-I.D 'Grid connected renewable electricity generation' version 18.

The verification consisted of the following three phases

- Document review;
- On-site assessment including Interviews and Site Inspections;
- Resolution of Any Material Discrepancy and the issuance of the final verification report and certification.

The following sections outline each step in more detail.

2.2 Document Review

The monitoring report (MR) version 01 of 22/05/2019, version 02 of 04/07/2019 and version 03 of 19/07/2019 /01/, the emission reduction calculations spreadsheet (300283 Cholburi_ER cal-ongoing.xlsx) version 01 of 22/05/2019, version 02 '300283Cholburi_WWT_ex-post ER cal_04072019.xlsx' of 04/07/2019 and version 03 '300283Cholburi_WWT_ex-post ER cal_19072019.xlsx' of 19/07/2019 /03/, were assessed as part of the verification. In addition the registered Project Design Document (VCS-PD) /02/ in particular the baseline estimations and the monitoring plan for the project were reviewed.

The following table lists the documentation that was reviewed during the verification

/01/	South Pole Carbon Asset Management Ltd.: VCS monitoring report for the project activity "Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)", version 1.0 of 22/05/2019, version 02 of 04/07/2019 and version 03 of 19/07/2019
/02/	South Pole Carbon Asset Management Ltd.: VCS project description for project activity "Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)" in Thailand, version 3 of 21/05/2018
/03/	South Pole Carbon Asset Management Ltd.: Emission Reduction spread sheet titled "300283 Cholburi_ER cal-ongoing.xlsx" version 01 of 22/05/2019, version 02 of 04/07/2019

	and version 03 of 19/07/2019
/04/	VCS: VCS Program Guide, VCS Version 3 (v3.7), Requirements Document of 21/06/2017
/05/	VCS: VCS Standard, VCS Version 3 (v3.7), Requirements Document of 21/06/2017
/06/	CDM Executive Board: AMS-III.H 'Methane Recovery in Wastewater Treatment' version 18
/07/	CDM Executive Board: AMS-I.C 'Thermal energy production with or without electricity' version 20
/08/	CDM Executive Board: AMS-I.D 'Grid connected renewable electricity generation' version 18
/09/	VCS: Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi) (ID: 430) https://www.vcsprojectdatabase.org/#/project_details/430
/10/	VCS: Monitoring report form (MONITORING REPORT: VCS Version 3) , version 03.4 dated 19/10/2016
/11/	TUV Nord: Validation report (validation report N° 53208109-08/510 of 14/11/2009) for the project activity "Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)"
/12/	KBS Certification Services Pvt. Ltd.: Validation report on renewal of crediting period (VCS.18.VER.010_Crediting period renewal) dated 28/05/2018
/13/	KBS Certification Services Pvt. Ltd.: Verification report for the project activity 'Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)' covering the monitoring period 01/01/2017 to 31/12/2017 (VCS.18.VER.010-MP-01 (2 nd crediting period)) dated 24/08/2018
/14/	Daily monitoring log sheets of Chol Charoen Co., Ltd: Wastewater flow meter readings for the period 01/01/2018 to 31/03/2019 Methane content (% CH ₄) in biogas for the period 01/01/2018 to 31/03/2019 COD measurement of wastewater for the period 01/01/2018 to 31/03/2019 Biogas consumption for boilers and gas engine (GM 1 & GM 3) for the period 01/01/2018 to 31/03/2019 Biogas consumption for flare for the period 01/01/2018 to 31/03/2019 Electricity generation record during the period 01/01/2018 to 31/03/2019 Daily Starch production records from 01/01/2018 to 31/03/2019 Fuel oil consumption records from 01/01/2018 to 31/03/2019
/15/	Calibration certificates: Flowmeter (YAL1623)- FM1 calibrated on 10/06/2017 by Miracle International Technology Co. Ltd. Flowmeter (KCA4726)- FM1 calibrated on 11/04/2019 by Miracle International Technology Co. Ltd. Flowmeter (YAL1624)- FM2 calibrated on 12/06/2017 and on 11/04/2019 by Miracle International Technology Co. Ltd. Flowmeter (YAL1625)- FM3 calibrated on 12/06/2017 and on 11/04/2019 by Miracle International Technology Co. Ltd. and on Colorimeter (HAC160600001037): Calibrated on 29/02/2016 by HACH Flowmeter (V9107-03.1)- GM 1: Calibrated on 16/06/2016 by Miracle International Technology Co. Ltd. Flowmeter (20880)- GM 3: Calibrated on 19/06/2017 and on 17/04/2019 by Miracle International Technology Co. Ltd. Metahne analyser (12368): By Gas Data on 04/03/2015 and on 12/03/2019 Flow meter (20320)-OM 1: By Miracle International Technology Co. Ltd. on 23/06/2017 and on 11/04/2019 Weighing bridge (2006220): By Central Bureau of Weights and Measures on 30/05/2019
/16/	Chol Charoen Co., Ltd: Confirmation letter stating no flaring since June 2006 due to installation of a gas storage system
/17/	The World Bank: Electric power transmission and distribution losses (% of output); weblink

	https://data.worldbank.org/indicator/EG.ELC.LOSS.ZS in English accessed on 05/07/2019
/18/	List of Accredited Laboratories; webpage https://www.tisi.go.th/home/en in English language retrieved on 25/03/2019

2.3 Interviews

The key personnel interviewed and the main topics of the interviews are summarized in the table below:

	Date	Name and Role	Organization	Topic
/a/	05/06/2019	Ms. Sirinut Raya- Project Manager	South Pole Carbon Asset Management Ltd.	Monitoring report, emission reduction calculations, records of monitoring parameters, VCS rules, application of methodology etc.
/b/	05/06/2019	Kamontorn Muckvichit- Quality Control	Chol Charoen Co., Ltd.	Technical aspects of the project activity. Operational life, environmental aspects etc. Operational details of the project, management structure, legal compliance, health, safety and environmental aspects, data monitoring and recording procedure, safety practices, production controls, internal audits etc.
/c/	05/06/2019	Panya Wisetchart – Quality Control officer-Biogas		
/d/	05/06/2019	Aoy Wisetchart- Quality Control officer-Biogas		
/e/	05/06/2019	Panipak Katunya- QA/QC supervisor		

2.4 Site Inspections

On 05/06/2019, RINA team visited Chol Charoen Co., Ltd. located in Banbung district, Choburi province, Thailand, about 250 km away from Bangkok. Geographical coordinates: 13° 17.736'N latitude 101° 09.108'E longitude. During the on-site assessment of the project, there were no hindrance and all the equipment's and the systems were accessible. RINA assessed the implementation and operation of the proposed project activity, reviewed the information flows for generating, aggregating and reporting the monitoring parameters, interviewed key personnel of the plant to confirm the operational and data collection procedures, cross-checked between information provided in the monitoring report and data plant, checked the monitoring equipment, reviewed calculations and assumptions made in determining the GHG data and emission reductions, checked the quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

2.5 Resolution of Findings

The objective of this phase of the verification is to resolve any outstanding issues which need to be clarified for RINA's positive conclusion on the project description. To guarantee transparency a verification protocol has been customized for the project. The protocol shows in a transparent manner the requirements, means of verification and the results from verifying the identified criteria. The verification protocol consists of three tables; the different columns in these tables are described below.

A corrective action request (CAR) is raised if one of the following occurs:

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

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

In summary, 2 CRs and 1 CAR were raised during this verification which were closed successful and details are given under Appendix B of this report.

2.5.1 Forward Action Requests

Based on the review of the validation report /12/ and previous verification report /13/, no FAR found raised which needs to be closed during this verification.

2.6 Eligibility for Validation Activities

The project activity is registered under VCS registration reference Number 430 /09/, hence this section is not applicable.

3 VALIDATION FINDINGS

The project was validated by TUV Nord (validation report N° 53208109-08/510 of 14/11/2009) and it was registered under the VCS registration reference N° 430. The validation on renewal of crediting period was done by KBS Certification Services Pvt. Ltd. (VCS.18.VER.010_Crediting period renewal) dated 28/05/2018. This is the 2nd verification assessment under the second crediting period for the monitoring period 01/01/2018 to 31/03/2019 by RINA.

3.1 Participation under Other GHG Programs

N/A.

3.2 Methodology Deviations

Methodology applied in the registered project activity remains same; although deviation is applied in calculation formula from the stated one in applied methodology as described below:

Description of deviation:
Methodology and formula that is deviated: Baseline emissions for estimating the fossil fuel replaced. The latest version of the methodology AMS-I.C requires monitoring of fuel that would have been consumed in the absence of the project activity. Deviated approach: The project proponent uses a conservative approach, based on the amount of heat required for starch drying, which in turn is estimated on heat requirements per tonne of starch when only fuel oil was used. The approach compensates the fuel oil usage from total fuel oil replacement (in baseline) and conservatively estimates the fuel oil replaced by methane. Irrespective of quantity of methane burnt. Justification for deviation: Due to incompleteness of the monitoring equipment, a deviation has been made to the approach specified in methodology AMS-I.C. The deviated approach ensures that efficiency lost in the system due to dual fired system is conservatively adjusted in baseline emissions. This means that if any efficiency loss happens due to dual fired system and the energy of same is supplied by fuel oil, using the given approach the loss is accounted in biogas usage, thereby estimating lower fuel oil replacement for baseline emission estimation. In addition, the approach does not have any negative impact on additionality of the project. With reference to the clarification made by the SSG WG, this approach can be considered as not impact negatively on the conservativeness of the applied methodology's criteria and procedures

to quantify data leading to GHG emission reductions or removals. The clarification from EB, as reference above, can be used to substantiate this statement.

Assessment by Verification team:

The deviation has been transparently described in section 2.2.1 of the MR.

The verification team is of the opinion that the approach followed by the PP is appropriately described and justified and the project remains in compliance with VCS rule. The deviation does not overestimate the emission reduction and hence accepted to the verification team. Hence, deviation is accepted.

3.3 Project Description Deviations

N/A

3.4 Grouped Project

This project is not a grouped project. Hence, this section is not applicable.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

On the basis of the on-site visit and the reviewed project documentation, the verification team confirms that the project was implemented as described in the registered VCS PD except the deviations described above. All the physical components and project boundary are in conformity with the description in registered VCS PD. The project activity was implemented in January 2006 and in operation since then. Based on the VCS PD and the available information at VCS database it is confirmed that the project's first crediting period is from 01/01/2007 – 31/12/2016. Verifications under first crediting period was completed. The second crediting period is from 01/01/2017 – 31/12/2026.

The project activity involves capturing of methane generated from the wastewater treatment through AFFR technology and covered lagoons and the utilization of the recovered biogas for thermal and electricity generation.

As per the applied methodologies; AMS-III.H, version 18, AMS-I.C and AMS-I.D, the project boundary is defined as below:

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

Based on document review and onsite verification, it is confirmed that all the emission sources within the boundary have been considered appropriately. Monitoring of all parameters during the monitoring period is followed as per registered monitoring plan except the deviations described in section 3.2 above.

Data parameters fixed ex-ante and available at validation are given below:

DATA/PARAMETER Unit	Source of data	Reported value for the project period	Assessment/Observation
Global Warming Potential for Methane (GWP_{CH_4}) in tCO_2e/tCH_4	Data based on registered PD /02/ and validation report /12/	25	The value is ex-ante fixed for 10 years crediting period as per the registered PD. The value is as per IPCC fourth assessment report. Hence, correct value is considered.
Methane producing capacity of the wastewater ($B_{o,ww}$); kg CH_4 /kg COD	Data based on registered PD /02/ and validation report /12/	0.25	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Model correction factor to account for model uncertainties (UF_{BL})	Data based on registered PD /02/ and validation report /12/	0.89	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Model correction factor to account for model uncertainties (UF_{PJ})	Data based on registered PD /02/ and validation report /12/	1.12	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Methane correction factor for baseline wastewater treatment systems ($MCF_{ww,treatment,BL,i}$)	Data based on registered PD /02/ and validation report /12/	0.8	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Methane correction factor for project wastewater treatment systems equipped with biogas recovery ($MCF_{ww,treatment,PJ,k}$)	Data based on registered PD /02/ and validation report /12/	0.8	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Capture efficiency of	Data based on registered PD /02/	0.9	The value is ex-ante fixed for 10 years crediting period as per the

the biogas recovery equipment in the wastewater treatment systems (CFE_{ww})	and validation report /12/		registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Chemical oxygen demand removal efficiency of baseline treatment system for the starch and sweetener plants ($\eta_{COD,BL,i}$); %	Data based on registered PD /02/ and validation report /12/	87%	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Flare efficiency (%)	Data based on registered PD /02/ and validation report /12/	0%	Default value taken as per applicable tool which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Destruction efficiency of the electricity generator (DE; %)	Data based on registered PD /02/ and validation report /12/	100%	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
CO ₂ emission factor for grid power (EF_y); tCO ₂ /MWh	Data based on registered PD /02/ and validation report /12/	0.5637	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Emission factor of fossil fuel replaced – Residual Fuel oil ($EF_{CO_2,i,y}$); tCO ₂ /TJ	Data based on registered PD /02/ and validation report /12/	77.4	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Density of methane gas at reference conditions ($\rho_{CH_4,n}$); kg/m ³	Data based on registered PD /02/ and validation report /12/	0.716	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.

Efficiency of the boiler using fossil fuel that would have been used in the absence of the project activity ($\eta_{BL, thermal}$); %	Data based on registered PD /02/ and validation report /12/	100%	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
NCV of fuel oil i.e. fossil fuel displaced by biogas ($NCV_{i,y}$); TJ/tonne	Data based on registered PD /02/ and validation report /12/	0.0404	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Liters of fossil fuel required per tonne of dry starch historically ($Q_{FO, starch}$); L/tonne	Data based on registered PD /02/ and validation report /12/	34.3	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Density of fuel oil (D_{FO}); Kg/litre	Data based on registered PD /02/ and validation report /12/	0.93	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.
Total electrical capacity of the equipment installed in the project activity (P_{el}); kW	Data based on registered PD /02/ and validation report /12/	139.25	The value is ex-ante fixed for 10 years crediting period as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /12/.

RINA is able to confirm that the Data and parameters fixed ex ante have been implemented in full compliance with the registered monitoring plan.

Data parameters monitored:

Data/Parameter	Assessment		
Data Unit	$Q_{y,ww,i}$; m ³		
Description	Volume of wastewater treated in the year y		
Source of data to be used	Measured – Volumetric flow meters (FM1, FM2 & FM3)		
Value of monitored parameter for the monitoring period	Period	Lower Value (m ³)	Higher value (m ³)
	01/01/2018 to 31/12/2018	852,698	852,804
	01/01/2019 to 31/03/2019	183,694	184,022
	The values mentioned in the monitoring report and ER sheet		

	have been verified with the daily log book reports /14/. The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.		
Monitoring equipment	Tag No.	Serial Number	Model
	FM1	YAL1623 (up to 03/10/2018)	MUT100EL
		KCA4726 (from 27/11/2018)	MC 608A
	FM2	YAL1624	MUT1000EL
	FM3	YAL1625	MUT1000EL
Accuracy of the monitoring equipment	VCS PD does not specify the accuracy of monitoring equipment. However, the PP has installed flow meter with an accuracy class of 0.2%. The accuracy of the meters represents good monitoring practice.		
Measuring/Reading/Recording frequency	Continuous monitoring, recording on the daily basis. The practice found to be followed during site visit and consistent with registered monitoring plan.		
Calcualtion method (if applicable)	N/A.		
Calibration			
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	The flow meter is calibrated at least once every 3 years. This is consistent with registered monitoring plan and previous verifications and hence accepted.		
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	The monitoring period is from 01/01/2018 to 31/03/2019. The flow meter FM1 was calibrated on 10/06/2017 (valid until 09/06/2020) although the same is replaced with new meter on 27/11/2018 (new meter calibrated on 11/04/2019 and valid until 10/04/2022). There was no flow input for FM1 during 03/10/2018 to 26/11/2018. The calibration certificate of new meter FM1 was not available during 27/11/2018 to 31/03/2019. The error found on the calibration certificate (0.5%) was applied to the monitoring data. The lower values were selected for baseline calculation, while higher values were used for the project emission calculation. For FM2 and FM3 flow meters were calibrated on 12/06/2017 (valid until 11/06/2020) and on 11/04/2019 (valid until 10/04/2022). Hence, the calibration of flow meter covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected.		
Calibration certificates	Serial no.	Calibration details	
	YAL1623	Calibrated by Miracle International on 10/06/2017 /15/	
	KCA4726	Calibrated by Miracle International on 11/04/2019 /15/	

	YAL162 4	Calibrated on 12/06/2017 and on 11/04/2019 by Miracle International Technology Co. Ltd. /15/
	YAL162 5	Calibrated on 12/06/2017 and on 11/04/2019 by Miracle International Technology Co. Ltd. /15/
Does the calibration of meters have been done by an accredited person or institution?		
Miracle International Technology Co. Ltd. is accredited agency /18/		

Data/Parameter	Assessment																						
Data Unit	COD _{ww, untreated, y} ; tCOD/m ³																						
Description	The chemical oxygen demand of the wastewater before the treatment system affected by the project activity (CS1 , CS2)																						
Source of data to be used	Measured – Colorimetric method																						
Value of monitored parameter for the monitoring period	For AFFR system <table><tr><th rowspan="2">Monitoring period</th><th colspan="2">Value(tCOD/m³)</th></tr><tr><th>Lower</th><th>Higher</th></tr><tr><td>01/01/2018 to 31/12/2018</td><td>0.021</td><td>0.024</td></tr><tr><td>01/01/2019 to 31/03/2019</td><td>0.023</td><td>0.026</td></tr></table> For CL system <table><tr><th rowspan="2">Monitoring period</th><th colspan="2">Value(tCOD/m³)</th></tr><tr><th>Lower</th><th>Higher</th></tr><tr><td>01/01/2018 to 31/12/2018</td><td>0.015</td><td>0.017</td></tr><tr><td>01/01/2019 to 31/03/2019</td><td>0.020</td><td>0.026</td></tr></table> The values mentioned in the monitoring report and ER sheet have been verified with log book reports /14/. The reported values in the MR and ER sheet were found to be consistent with the lab analysis reports and the operator log sheet information.	Monitoring period	Value(tCOD/m ³)		Lower	Higher	01/01/2018 to 31/12/2018	0.021	0.024	01/01/2019 to 31/03/2019	0.023	0.026	Monitoring period	Value(tCOD/m ³)		Lower	Higher	01/01/2018 to 31/12/2018	0.015	0.017	01/01/2019 to 31/03/2019	0.020	0.026
Monitoring period	Value(tCOD/m ³)																						
	Lower	Higher																					
01/01/2018 to 31/12/2018	0.021	0.024																					
01/01/2019 to 31/03/2019	0.023	0.026																					
Monitoring period	Value(tCOD/m ³)																						
	Lower	Higher																					
01/01/2018 to 31/12/2018	0.015	0.017																					
01/01/2019 to 31/03/2019	0.020	0.026																					
Monitoring equipment	Colorimeter <table><tr><td>Brand</td><td>HACH</td></tr><tr><td>Model</td><td>DR900</td></tr><tr><td>Serial number</td><td>HAC160600001037</td></tr></table>	Brand	HACH	Model	DR900	Serial number	HAC160600001037																
Brand	HACH																						
Model	DR900																						
Serial number	HAC160600001037																						
Accuracy of the monitoring equipment	VCS PD does not specify the accuracy of monitoring equipment. However, the accuracy class of 2% is of the instrument. The accuracy of the meters represents good monitoring practice.																						
Measuring/Reading/Recording frequency	As per registered monitoring plan it is required to be done on daily basis. However, PP has done periodic analysis following 90/10 confidence/precision level which is consistent with the applied methodology AMS-III.H, version 18. Hence, accepted. The Colorimetric method is well documented and well accepted by international standards.																						

Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	Calibration frequency is defined least once in every 3 years. This is consistent with registered monitoring plan and previous verifications and hence accepted.
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	The monitoring period is from 01/01/2018 to 31/03/2019. The Colorimeter was calibrated on 29/02/2016 (valid until 28/02/2019) /15/. Hence, the calibration covers the monitoring period. The calibration frequency has been checked with calibrations records and found that the calibration frequency has been respected.
Calibration certificates	Calibrated on 29/02/2016 by HACH /15/.
Does the calibration of meters have been done by an accredited person or institution?	HACH is the manufacturer of the instrument and hence credible to calibrate.

Data/Parameter	Assessment											
Data Unit	COD _{ww,treated,y} ; tCOD/m ³											
Description	The chemical oxygen demand of the wastewater after the treatment system affected by the project activity (CS3)											
Source of data to be used	Measured – Colorimetric method											
Value of monitored parameter for the monitoring period	<table><tr><th rowspan="2">Monitoring period</th><th colspan="2">Value(tCOD/m³)</th></tr><tr><th>Lower</th><th>Higher</th></tr><tr><td>01/01/2018 to 31/12/2018</td><td>0.0012</td><td>0.0017</td></tr><tr><td>01/01/2019 to 31/03/2019</td><td>0.0014</td><td>0.0016</td></tr></table> The values mentioned in the monitoring report and ER sheet have been verified with log book reports /14/. The reported values in the MR and ER sheet were found to be consistent with the lab analysis reports and the operator log sheet information.	Monitoring period	Value(tCOD/m ³)		Lower	Higher	01/01/2018 to 31/12/2018	0.0012	0.0017	01/01/2019 to 31/03/2019	0.0014	0.0016
Monitoring period	Value(tCOD/m ³)											
	Lower	Higher										
01/01/2018 to 31/12/2018	0.0012	0.0017										
01/01/2019 to 31/03/2019	0.0014	0.0016										
Monitoring equipment	Colorimeter <table><tr><td>Brand</td><td>HACH</td></tr><tr><td>Model</td><td>DR900</td></tr><tr><td>Serial number</td><td>HAC160600001037</td></tr></table>	Brand	HACH	Model	DR900	Serial number	HAC160600001037					
Brand	HACH											
Model	DR900											
Serial number	HAC160600001037											
Accuracy of the monitoring equipment	VCS PD does not specify the accuracy of monitoring equipment. However, the accuracy class of 2% is of the instrument. The accuracy of the meters represents good monitoring practice.											
Measuring/Reading/Recording frequency	As per registered monitoring plan it is required to be done on daily basis. However, PP has done periodic analysis following 90/10 confidence/precision level which is consistent with the applied methodology AMS-III.H, version 18. Hence, accepted. The Colorimetric method is well documented and well											

	accepted by international standards.
Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	Calibration frequency is defined least once in every 3 years. This is consistent with registered monitoring plan and previous verifications and hence accepted.
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	The monitoring period is from 01/01/2018 to 31/03/2019. The Colorimeter was calibrated on 29/02/2016 (valid until 28/02/2019) /15/. Hence, the calibration covers the monitoring period. The calibration frequency has been checked with calibrations records and found that the calibration frequency has been respected.
Calibration certificates	Calibrated on 29/02/2016 by HACH /15/.
Does the calibration of meters have been done by an accredited person or institution?	HACH is the manufacturer of the instrument and hence credible to calibrate.

Data/Parameter	Assessment
Data Unit	$S_{final,PJ,y}$; tonnes
Description	Amount of dry matter in the sludge
Source of data to be used	As per weighing slips
Value of monitored parameter for the monitoring period	Zero (0). No sludge was removed during the monitoring period. This is confirmed through onsite interviews.
Monitoring equipment	Although weighing scale is available for monitoring any sludge generated, the same is not used during the monitoring period as no sludge is removed.
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Whenever the sludge is removed, the quantity shall be recorded and documented. However, no sludge was removed during the monitoring period.
Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	N/A

Calibration certificates	N/A
Does the calibration of meters have been done by an accredited person or institution?	N/A

Data/Parameter	Assessment		
Data Unit	BG _{burnt,combusted,y} ; Nm ³		
Description	Amount of biogas combusted for gainful use in the year y		
Source of data to be used	Measured using Gas flow meters (GM1 and GM 3)		
Value of monitored parameter for the monitoring period	Period		Value (Nm ³)
	01/01/2018 to 31/12/2018		4,300,581
	01/01/2019 to 31/03/2019		1,453,431
	Total biogas combusted in hot oil boiler (GM1) and gas engine (GM3) is considered. Monitored values of GM 1 and GM 3 mentioned in the monitoring report and ER sheet have been verified with the daily reports /14/. The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.		
Monitoring equipment	Tag No.	Serial Number	Model
	GM1	V9107-03.1	C100-05-H-WCFS-CXXX(detector)
	GM3	20880	FT2A-09ISSSTE3B0
Accuracy of the monitoring equipment	VCS PD does not specify the accuracy of monitoring equipment. However, it was observed during the verification site visit that the PP has a good monitoring practice and installed meters of good accuracy in the order of 1%. The accuracy of the meters represents good monitoring practice.		
Measuring/Reading/Recording frequency	Continuous monitoring and daily recording for emission reduction calculation.		
Calcualtion method (if applicable)	N/A.		
Calibration			
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	The flow meter is calibrated at least once every 3 years as per registered monitoring plan.		
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	The monitoring period is from 01/01/2018 to 31/03/2019. The flow meter V9107-03.1 was calibrated on 16/06/2016 (valid until 15/06/2019) /15/. Also, GM3 (20880) was calibrated on 19/06/2017 (valid until 18/06/2020) and on 17/04/2019 (valid until 16/04/2022). Hence, calibration cover the monitoring period.		

Calibration certificates	Meter no.	Calibration details
	V9107-03.1	By Miracle International Technology Co. Ltd. Calibration date 16/06/2016 /15/.
	20880	By Miracle International Technology Co. Ltd. Calibration date 19/06/2017 and on 17/04/2019 /15/.
Does the calibration of meters have been done by an accredited person or institution?	Miracle International Technology Co. Ltd. is accredited agency /18/.	

Data/Parameter	Assessment
Data Unit	$BG_{\text{burnt, to Flare, y}} / V_{\text{RG, m}}; \text{Nm}^3$
Description	Amount of biogas sent to flare system in the year y
Source of data to be used	Measured using Gas flow meters (GM2)
Value of monitored parameter for the monitoring period	0 (Zero). During the monitoring period no flaring was recorded as verified with the daily reports /13/. The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.
Monitoring equipment	No flow meter found at site. However, as per PP's justification and verification team's judgment, no flaring was done during the monitoring period. The confirmation letter from PP /16/ and biogas consumption rate in boiler and generator matches biogas storage capacity and monitored biogas generation. Hence, PP's justification is considered acceptable.
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	N/A
Calculation method (if applicable)	N/A.

Data/Parameter	Assessment		
Data Unit	$W_{CH_4,y}$; %		
Description	Methane content in the biogas in the year y		
Source of data to be used	Measured using online gas analyzer or using portable gas analyzer.		
Value of monitored parameter for the monitoring period	Period	Lower Value	Higher value
	01/01/2018 to 31/12/2018	59.1%	59.9%
	01/01/2019 to 31/03/2019	48.3%	50.1%

	The average value mentioned in the monitoring report and ER sheet have been verified with the daily reports /14/. The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.	
Monitoring equipment	Serial number	12368
	Model/Brand	GFM406/Gas Data
Accuracy of the monitoring equipment	VCS PD does not specify the accuracy of monitoring equipment. However, the accuracy of gas analyser is 2% as per the specification of the equipment.	
Measuring/Reading/Recording frequency	Periodic using a portable gas analyser. Measurement follows 95% confidence interval which is consistent with the applied methodology.	
Calcualtion method (if applicable)	N/A.	
Calibration		
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	The analyser is calibrated at least once every 3 years as per registered monitoring plan.	
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	The monitoring period is from 01/01/2018 to 31/03/2019. The gas analyser was calibrated on 04/03/2015 (valid until 03/03/2018), on 12/03/2019 (valid until 11/03/2022) /14/. Therefore, calibration gas observed from 03/03/2018 to 12/03/2019. PP has applied the maximum error of the instrument over the measured value to adjust calibration delay. The procedure is correct as per CDM validation and verification standard and hence accepted.	
Calibration certificates	Serial no.	Calibration details
	12368	By Gas Data on 04/03/2015 and on 12/03/2019 /15/
Does the calibration of meters have be done by an accredited person or institution?	Gas Data is the manufacturer of the analyzer and hence credible to calibrate the gas analyser.	

Data/Parameter	Assessment
Data Unit	$\eta_{\text{Flare-m}}$: %
Description	Flare efficiency
Source of data to be used	Default value as per "Tool to determine project emissions from flaring gases containing methane" for the first crediting period and for the second crediting period as per Project emissions from flaring" version 02.0.0.
Value of monitored parameter for the monitoring period	0%. The flare efficiency shall be determined based on the flame detection period. According to the monitoring plan of the VCS PD, "The default factor of 50% might be only applied if a flame is detected at the flare for more than 20

	minutes in hour h, whenever biogas is sent to the flare system. If these conditions are not met, 0% default value should be used for this period". Since no flaring was done during the monitoring period, 0% flare efficiency is considered conservatively as per the tool.
Monitoring equipment	N/A
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	N/A
Calculation method (if applicable)	N/A
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	N/A
Calibration certificates	N/A
Does the calibration of meters have been done by an accredited person or institution?	N/A

Data/Parameter	Assessment						
Data Unit	EC _{PJ,y} ; MWh						
Description	Electricity consumption by wastewater treatment system and biogas plant in year y						
Source of data to be used	Maximum rated consumption is calculated by multiplying total electrical capacity with actual operational days and 24 hours each day and 6.073% additional factor to be conservative for the first crediting period.						
Value of monitored parameter for the monitoring period	<table border="1"> <thead> <tr> <th>Period</th><th>Value (MWh)</th></tr> </thead> <tbody> <tr> <td>01/01/2018 to 31/12/2018</td><td>1342</td></tr> <tr> <td>01/01/2019 to 31/03/2019</td><td>335</td></tr> </tbody> </table> The load factor of 10% has been added to actual rated capacity of equipments connected to the project activity which is as per registered VCS-PD.	Period	Value (MWh)	01/01/2018 to 31/12/2018	1342	01/01/2019 to 31/03/2019	335
Period	Value (MWh)						
01/01/2018 to 31/12/2018	1342						
01/01/2019 to 31/03/2019	335						
Monitoring equipment	N/A						
Accuracy of the monitoring equipment	N/A						

Measuring/Reading/Recording frequency	N/A
Calculation method (if applicable)	N/A.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	N/A
Calibration certificates	N/A
Does the calibration of meters have been done by an accredited person or institution?	N/A

Data/Parameter	Assessment
Data Unit	TDL; %
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data to be used	Recent data available for the host country
Value of monitored parameter for the monitoring period	6.073% as per International Energy Agency for the year 2014 /17/. The source value is within 5 years old.
Monitoring equipment	N/A
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Annual as per registered monitoring plan /04/. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
Calculation method (if applicable)	N/A

Data/Parameter	Assessment	
Data Unit	EG _{PJ,y} ; MWh	
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y	
Source of data to be used	Electricity meter built into the generator sets	
Value of monitored parameter for the monitoring period	Monitoring period	Value monitored (MWh)
	01/01/2018 to 31/12/2018	4,927
	01/01/2019 to 31/03/2019	1,922

	During the monitoring period electricity generation as recorded was verified with the daily reports /14/. The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information. However, PP has not claimed emission reductions from electricity generation under AMS-I.D and therefore, the above values are not used in the emission reduction calculations.		
Monitoring equipment	Tag No	Serial Number	Model
	EM1	HT08051884	PDM-803AC-M4
	EM2	HT09050004	PDM-803AC-M4
	EM3	HT07051676	PDM-803AC-M4
	EM4	N/A	IS-NT-BB
Accuracy of the monitoring equipment	PP has not claimed emission reductions from electricity generation under AMS-I.D and therefore, the above values are not used in the emission reduction calculations. Hence, details of monitoring equipments are not relevant during this monitoring period.		
Measuring/Reading/Recording frequency	N/A		
Calculation method (if applicable)	N/A.		

Data/Parameter	Assessment	
Data Unit	EG _{thermal,y} ; TJ/year	
Description	Net quantity of thermal energy supplied by the project activity.	
Source of data to be used	In this monitoring period, the direct measurement of temperature (in and out) and the flow of the thermal fluid was not conducted and deviation approach as explained in section 3.2 of this report is applied. Therefore, the amount of dry starch is the monitored parameter in order to calculate the thermal energy required in the project activity	
Value of monitored parameter for the monitoring period	Monitoring Period	Value (TJ)
	01/01/2018 to 31/12/2018	83.85
	01/01/2019 to 31/03/2019	24.52
	The values in the MR and ER sheet were verified with the log records starch production/14/. The reported values in the MR and ER sheet were found to be consistent with the daily reports and the operator log sheet information.	
Monitoring equipment	N/A	
Accuracy of the monitoring equipment	N/A	
Measuring/Reading/Recording frequency	N/A	
Calculation method (if applicable)	This parameter is calculated based on the quantity of dry starch production and average HFO consumption for starch production as estimated conservatively from historical data.	

	This approach is explained in section 3.2 of this report in detail.
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	N/A
Calibration certificates	N/A
Does the calibration of meters have been done by an accredited person or institution?	N/A

Data/Parameter	Assessment		
Data Unit	FC _{i,i,y} ; Liters/y		
Description	Quantity of fossil fuel used in boiler in year y		
Source of data to be used	Measured by continuous Fuel oil meter		
Value of monitored parameter for the monitoring period	Monitoring period		Value monitored (Litres)
	01/01/2018 to 31/12/2018		33,775
	01/01/2019 to 31/03/2019		15,386
	The reported values was checked during site visit from log book records, purchase records and stock records /14/.		
Monitoring equipment	Tag No.	Serial Number	Model
	OM 1	20320	VZF20
Accuracy of the monitoring equipment	±1% as per equipment specification.		
Measuring/Reading/Recording frequency	Defined frequency is continuous measurement and monthly recording.		
Calcualtion method (if applicable)	N/A.		
Calibration			
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	Calibration frequency is once in three years.		
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	Monitoring period is from 01/01/2018 to 31/03/2019. Flow meter was calibrated on 23/06/2017 (valid until 22/06/2020), on 11/04/2019 (valid until 10/04/2022). Therefore, calibration cover the monitoring period.		
Calibration certificates	By Miracle International Technology Co. Ltd. on 23/06/2017 and on 11/04/2019 /15/		

Does the calibration of meters have been done by an accredited person or institution?	Miracle International Technology Co. Ltd. is accredited to calibrate the flow meter /18/.
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Data/Parameter	Assessment		
Data Unit	Q _{starch,y} ; Tonnes		
Description	Quantity of dry starch produced		
Source of data to be used	Based on operational log sheet at the plant		
Value of monitored parameter for the monitoring period	Period	Lower Value (Ton)	Higher Value (Ton)
	01/01/2018 to 31/12/2018	66,052	67,384
	01/01/2019 to 31/03/2019	19,477	19,870
	This was checked during site visit from log book records, purchase records and sales records /14/.		
Monitoring equipment	Type	Weighing bridge	
	Sl. Number	2006220	
	Brand/Model	Linear / PM02	
Accuracy of the monitoring equipment	N/A		
Measuring/Reading/Recording frequency	Defined frequency is daily measurement and daily recording.		
Calcualtion method (if applicable)	N/A.		
Calibration			
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	Calibration frequency is once in two years.		
Does the calibration cover the monitoring period? Has the calibration frequency been respected?	The monitoring period is from 01/01/2018 to 31/03/2019. The weighing bridge was calibrated on 30/05/2019 (valid until 29/05/2021) /15/. There is calibration gap from 01/01/2018 to 30/05/2019 and to cover the calibration gap maximum error of the equipment (1%) is applied over the measured value during that period. Therefore, calibration cover the monitoring period.		
Calibration certificates	Serial no.	Calibration details	
	2006220	By Central Bureau of Weights and Measures on 30/05/2019 /15/	
Does the calibration of meters have be done by an accredited person or institution?	Central Bureau of Weights and Measures is government entity to calibrate weighing scales.		

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

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

The emission reduction due to methane capturing and utilisation in onsite boilers was estimated by measuring the required parameters using appropriate monitoring equipment and using the formulae described in the methodologies; AMS III.H., version 18 and AMS I.C., version 20 and the VCS PD except the deviations described in the above section 3.2. Emission reductions pertaining to electricity generation as per AMS-I.D is excluded from emission reduction calculation due to calibration gap of energy meters. All the ex-ante parameters which are used in the calculation of emission reduction are presented in section 4.1 of this report. It is confirmed that all the ex-ante parameters have been correctly used in the emission reduction calculation. According to the applied methodologies, the conservativeness of the achieved emission reduction was checked and the calculation has been transparently provided in the ER sheet.

Baseline emissions related to methane avoidance as per AMS-III.H is calculated as below:

$$BE_{ww,treatment,y} = \sum_i (Q_{ww,i,y} \times COD_{inflow,i,y} \times \eta_{COD,BL,i} \times MCF_{ww,treatment,BL,i}) \times B_{o,ww} \times UF_{BL} \times GWP_{CH4}$$

Volume of wastewater treated in baseline wastewater treatment system i ($Q_{ww,i,y}$) lower value in year y (m^3). The reported lower value during the monitoring period from 01/01/2018 to 31/03/2019 is 1,036,391 m^3 . RINA has verified the values in the monitoring report /01/ against the daily recording of volume of the wastewater treated /14/, which is in line with the requirements of the registered monitoring plan /02/ and the applied monitoring methodology. Daily wastewater flow to digester is recorded in log books as per readings in flow meter totalizer (difference of previous days reading and the reporting day) /14/. When the mill does not operate the reported value is kept as zero and the emission reduction worksheet represents the same /03/. Hence, RINA was able to determine that all data applied in the emission reduction calculation spread sheet /03/ and monitoring report /01/ were correct and from the original data.

Chemical oxygen demand removed by baseline treatment system i in year y ($COD_{removed,i,y}$) in tonnes/ m^3 , measured as the difference between inflow COD and the outflow COD in system i. In line with the methodology and registered VCS PD, $COD_{removed,y}$ is estimated considering *ex-post* monitored value of $COD_{ww,untreated,y}$ and COD removal efficiency of 87% determined *ex-ante* considering COD campaign data /02/. This is as per registered VCS-PD and applied methodology /02/,/03/,/06/. $COD_{ww,untreated,y}$ is analyzed daily (Colorimetric method) in in-house laboratory from sample of wastewater entering digesters and average value (with 90/10 confidence) is reported in ER sheet. RINA has verified the values in the monitoring report /01/ against the Original test reports of the $COD_{ww,untreated,y}$, /14/ which is in line with the requirements of the registered monitoring plan /02/ and the applied monitoring methodology AMS-III.H /06/.

Methane correction factor for baseline wastewater treatment system i ($MCF_{ww,treatment,BL,i}$) has been fixed ex-ante as 0.8 for anaerobic deep lagoon /03/.

Methane producing capacity of the wastewater ($B_{o,ww}$) (IPCC default value for domestic wastewater of 0.25 kg CH_4 /kg COD as per applied methodology /06/.

Model correction factor to account for model uncertainties (UF_{BL}) is 0.89 /03/. Global Warming Potential for methane (GWP_{CH4}) is 25 as per IPCC /02/.

Therefore, $BE_{ww,treatment,y}$ for the monitoring period from 01/01/2018 to 31/03/2019 is **71,086 tCO₂e**.

Baseline emissions related to heat generation as per AMS-I.C, is calculated as below:

$$BE_{thermal,CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO2}$$

As explained in section 3.2 of this report (deviation 2), $BE_{thermal,CO2,y}$ is determined from the amount of fossil fuel consumed in boiler for starch production and quantity of starch production. Quantity of starch produced during the period from 01/01/2018 to 31/03/2019 is 85,528 ton as verified from daily log book records /14/. Quantity of FO consumed in boiler is 49,161 liter for the period from 01/01/2018 to 31/03/2019 /14/.

NCV of FO is 0.0404 TJ/ton and density is 0.93 kg/liter fixed ex-ante in the registered VCS-PD. Accordingly, $BE_{thermal,y}$ from biogas consumption is calculated for the monitoring period to be **8,388 tCO₂e**.

Emission reductions as part of electricity generation as per AMS-I.D is not claimed during this monitoring period.

Project Emissions:

Project emissions related to methane avoidance component as per AMS-III.H, version 18 is calculated as below:

$$PE_y = \{ PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{y,ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y} \}$$

Emissions from electricity consumption in the year y ($PE_{power,y}$) is calculated as follows:

$$PE_{power,y} = \sum_j EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y})$$

Electricity consumed by biogas system is considered as per AMS-III.H considering maximum connected load with full operational hours (considering per day 24 hours of operation during plant operational days). Accordingly, electricity consumption during the monitoring period is 1,677.27 MWh. Grid emission factor is 0.5637 tCO₂e/MWh fixed ex-ante /02/. Therefore $PE_{power,y}$ is estimated to be **1,003 tCO₂e** for the current monitoring period considering transmission and distribution loss of 6.073%.

Emissions from wastewater treatment system affected by the project activity and not equipped with biogas recovery system and are calculated as per AMS-III.H and as follows:

$$PE_{ww,treatment,y} = Q_{ww,y} * COD_{removed,PJ,lagoon,y} * MCF_{ww,treatment,PJ,lagoon} * B_{o,ww} * UF_{PJ} * GWP_{CH4}$$

Flow of wastewater treated in the year y ($Q_{ww,y}$): The reported value during the monitoring period is 1,036,391 m³. RINA has verified the values in the monitoring report /01/ against the daily recording of volume of the wastewater treated digesters/14/, which is in line with the requirements of the registered monitoring plan /02/ and the applied monitoring methodology AMS-III.H /06/. Daily wastewater flow to digester is recorded in log books as per readings in flow meter totalizer (difference of previous days reading and the reporting day) /14/. When the mill does not operate the reported value is kept as zero and the emission reduction worksheet represents the same /03/. Hence, RINA was able to determine that all data applied in the emission reduction calculation spread sheet /03/ and monitoring report /01/ were correct and from the original data.

$COD_{removed,PJ,k}$: Chemical oxygen demand removed by project wastewater treatment system in year y (tonnes/m³), are analysed daily from sample of wastewaters and average value is reported in ER sheet. RINA has verified the values in the monitoring report /01/ against the Original test reports /14/ which is in line with the requirements of the registered monitoring plan /02/ and the applied monitoring methodology AMS-III.H version 18 /06/.

Methane correction factor for project wastewater treatment system k without biogas recovery ($MCF_{ww,treatment,PJ,k}$) is fixed ex-ante to be 0.8 as per registered VCS-PD /02/.

Global Warming Potential for methane (GWP_{CH_4}) is fixed 25 as per IPCC /02/. Methane producing capacity of the wastewater ($B_{o,ww}$) is fixed ex-ante to be 0.25 kg CH₄/kg COD as per IPCC /02/. Model correction for uncertainties (UF_{PJ}) is fixed ex-ante to be 1.12 as per registered VCS-PD /02/ and applied methodology /06/.

Accordingly, $PE_{ww,treatment,y}$ for the monitoring period is **6,140 tCO₂e**.

Methane fugitive emissions on account of inefficiencies in capture systems ($PE_{fugitive,y}$) are determined as per AMS-III.H and as follows:

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$$

It was seen during the site visit that there was no sludge treatment during the monitoring period. Hence, $PE_{fugitive,s,y}$ is considered zero in this monitoring period.

Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y ($PE_{fugitive,ww,y}$) is estimated as follows:

$$PE_{fugitive,ww,y} = (1 - CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH_4}$$

Capture efficiency of the biogas recovery equipment in the wastewater treatment (CFE_{ww}) is fixed ex-ante to be 0.9 as per registered VCS-PD /02/. Global Warming Potential for methane (GWP_{CH_4}) is fixed 25 as per IPCC /02/.

Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year y ($MEP_{ww,treatment,y}$) is calculated as follows:

$$MEP_{ww,treatment,y} = B_{o,ww} * UF_{PJ} * \sum_k COD_{removed,PJ,k,y} * Q_{y,,k,ww} * MCF_{ww,treatment,PJ,k}$$

Flow of wastewater treated in the year y ($Q_{ww,y}$) during the monitoring period is 1,036,391 m³ as explained in above. Methane producing capacity of the wastewater ($B_{o,ww}$) is fixed ex-ante to be 0.25 kg CH₄/kg COD /02/. Model correction factor to account for model uncertainties (UF_{PJ}) is fixed ex-ante to be 1.12 /02/. Methane correction factor for wastewater treatment system k equipped with biogas recovery ($MCF_{ww,treatment,PJ,k}$) is fixed ex-ante to be 0.8 as per registered PD /02/. $COD_{removed,PJ,k,y}$ is calculated as the difference between $COD_{ww,untreated,y}$ and $COD_{ww,treated,y}$ /03/. $COD_{ww,untreated,y}$ and $COD_{ww,treated,y}$ is analyzed daily from sample of wastewater entering digesters and leaving the digester and average value of samples on daily basis is reported in ER sheet /03/. RINA has verified the values in the monitoring report /01/ against the Original test reports /14/ which is in line with the requirements of the registered monitoring plan /02/ and the applied monitoring methodology AMS-III.H version 18 /06/. $MEP_{ww,treatment,y}$ for the monitoring period is 4,490 tonnes and $PE_{fugitive,ww,y}$ for the monitoring period is **11,225 tCO₂e** /03/.

Project Emissions from flaring is zero as there was no flaring during the monitoring period.

Leakage Emissions:

In line with applied methodologies and registered VCS-PD, there is no leakage emissions. Hence, LE_y is zero.

Emission Reductions:

As per applied methodologies AMS-III.H version 18 and registered VCS-PD, the emission reductions achieved ($ER_{y,ex\ post}$) in any year are the lowest value of the following:

$$ER_{y,ex\ post} = \min((BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{power,y} - PE_{biomass,y} - LE_{y,ex\ post}))$$

For the current monitoring period the achieved $BE_{y,ex\ post} = BE_{ww,treatment,y}$ is **71,086 tCO_{2e}**, achieved $PE_{y,ex-post}$ is **18,368 tCO_{2e}** and $LE_{y,ex-post}$ is zero as explained in above. $PE_{biomass}$ is not applicable as there was no biomass consumption in the project activity.

As per AMS-III.H, version 18, in case of flaring/combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * W_{CH4,y} * D_{CH4} * FE * GWP_{CH4}$$

$BG_{burnt} = BG_{combusted,y}$ during the monitoring period is 5,754,012 Nm³.

RINA has verified the values in the monitoring report /01/ against the daily recording of the amount of biogas fired in boiler and gas engine /14/, which is in line with the requirements of the registered monitoring plan /02/ and the applied monitoring methodology AMS-III.H version 18 /06/. Density of methane at normal condition (D_{CH4}) is fixed ex-ante to be 0.716 kg/m³ as per the 'Tool to determine project emissions from flaring gases containing methane'. Global Warming Potential for methane (GWP_{CH4}) is fixed 25 as per IPCC /02/. Destruction efficiency (DE) is taken as 100% conservatively. Average methane fraction (W_{CH4}) is as per periodic measurement /14/.

Therefore, MD_y achieved during 01/01/2018 to 31/03/2019 amounts to **56,446 tCO₂** equivalent /03/.

$$ER_{y,ex\ post} = \min((BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{power,y} - PE_{biomass,y} - LE_{y,ex\ post}))$$

$$= \min (71,086 - 18,368 - 0), (56,446 - 1,003 - 0 - 0)$$

$$= 52,718 \text{ tCO}_2\text{e (round down value)}$$

Emission reductions as part of thermal application under AMS-I.C is **8,388 tCO_{2e}**.

Therefore, overall emission reductions achieved from the project activity during the monitoring period is **61,104 tCO_{2e}** (round down value).

The higher emission reductions achieved during the monitoring period compared to estimate in registered VCS-PD is due to increased quantity of wastewater during the monitoring period and higher operational days. The verification team confirms that the increase in emission reduction is justified.

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

To be completed in the final report.

4.4 Non-Permanence Risk Analysis

There is no non-permanence risk rating determined by the project proponent.

5 SAFEGUARDS

5.1 No Net Harm

The project involves treatment of wastewater and capture of biogas from wastewater treatment system. Generated biogas is used in boiler and gas engine which replaces HFO consumption. Therefore, the project results in avoidance of methane emissions and CO₂ emissions which otherwise would have been there without the project activity. However, PP is claiming emission reduction only from methane avoidance and no emissions are claimed from fossil fuel replacement. Therefore, there is no negative environmental impact from the project activity. In addition, due to the project activity, jobs are created in local level as verified during site visit interview and raw materials are procured from local area which has improved socio-economic impacts in the project area. Therefore, there is no net harm from the project activity.

5.2 Local Stakeholder Consultation

Local stakeholder consultation is not applicable for the project proponent during verification. PP organized stakeholder consultation during validation of the project activity which was validated by the validation agency/11/. RINA has interacted local stakeholders during this verification site visit and details are summarized in section 2.3 of this report. There was no negative comment or feedback from local stakeholders as recorded by RINA during site visit.

6 VERIFICATION CONCLUSION

RINA Service Spa (RINA) has performed verification of the emission reductions reported for the project activity “Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)” in Thailand, VCS Registry Project ID 430, for the period 01/01/2018 to 31/03/2019, with regard to the relevant requirements for VCS activities. The project participants of the “Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)” project are responsible for:

- the preparation of greenhouses gas emissions data and the reported greenhouse gas emission reductions from the project on the basis set out in the monitoring plan contained in the registered project design document version 03 of 21/05/2018
- the development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of greenhouse gas emission reductions of the project.

It is the responsibility of RINA to express an independent verification opinion about the project's conformity with the requirements of VCS Standard version 3 (v 3.7) and GHG program applied, on the reported greenhouse gas emission reductions from the project.

Based on documented evidence and corroborated by an on-site assessment RINA can confirm that:

- the project has been implemented and operated as per the registered VCS-PD;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS Standard version 3 requirements;
- the monitoring is in place as per the applied baseline and monitoring methodology;

- the monitoring plan in the registered VCS-PD is as per the applied baseline and monitoring methodology.

It is RINA's opinion that the GHG emission reduction stated in the monitoring report version 03 of 19/07/2019 for the "Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)" in Thailand for the period 01/01/2018 to 31/03/2019 are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology CDM Executive Board: AMS-III.H 'Methane Recovery in Wastewater Treatment' version 18, AMS-I.C 'Thermal energy production with or without electricity' version 20 and the monitoring plan contained in the registered VCS-PD.

Hence RINA is able to certify that the emission reduction from the project during the monitoring period 01/01/2018 to 31/03/2019 is amount to 61,104 tCO₂.

Verification period: From 01/01/2018 to 31/03/2019

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/01/2018 to 31/12/2018	62,533	14,472	0	48,061
01/01/2019 to 31/03/2019	16,940	3,897	0	13,043
Total	79,475	18,369	0	61,104

APPENDIX A: ABBREVIATIONS

Abbreviations	Full texts
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CER(s)	Certified Emission Reduction(s)
CH ₄	Methane
CR	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
CRT	Coordination and Technical Control Staff
DCI	Certification Division of RINA Services S.p.A.
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
ER	Emission Reductions
FAR	Forward Action Request
GHG(s)	Greenhouse gas(es)
GWP	Global Warming Potential
HFO	Heavy Fuel Oil
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
MoV	Means of Verification
MR	Monitoring Report
NGO	Non-governmental Organization
ODA	Official Development Assistance
PDD	Project Design Document

PE	Project Emission
PEA	Provincial Electricity Authority
PP(s)	Project Participant(s)
Ref.	Document Reference
RINA	RINA Services S.p.A.
SS(s)	Sectoral Scope(s)
TA(s)	Technical Area(s)
TPD	Tons per day
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit
VER	Voluntary Emission Reductions
VVS	Validation and Verification Standard

APPENDIX B: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUEST

Table 1. Remaining FAR from validation and/or previous verification

FAR ID	xx	Section no.	2.5.1	Date: DD/MM/YYYY
Description of FAR				
<i>No remaining FAR to be addressed.</i>				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY

Table 2. CR from this verification

CR ID	01	Section no.	4.1	Date: 19/06/2019
Description of CR				
<i>PP is requested to submit copies of calibration certificates of all monitoring equipments covering the monitoring period.</i>				
Project participant response				Date: 03/07/2019
The copies of calibration certificates of all monitoring equipment have been prepared in the attached folder, Att01. All the certificates are covering the monitoring period, more detail have been provided in "Calibration" sheet of the excel. Though electrical meter for power generation have not been calibrated during this monitoring period. Thus PD has decided to exclude the baseline emission from the ER calculation. Please also see the revised MR and ER.				
Documentation provided by project participant				
<i>Att01Calibration</i> <i>300283Cholburi_WWT_ex-post ER cal _ver02</i> <i>300283Cholburi_WWT_MR _ver02</i>				

DOE assessment	Date: 06/08/2019
The calibration records are consistent with details provided in MR and ER sheet. Emission reductions are calculated considering calibration plan of equipments and wherever there is any calibration gap, PP has applied maximum error of the equipment over the measured value. Details of all measuring equipments are also consistent in the MR and hence CR is closed.	

CR ID	02	Section no.	4.1	Date: 19/06/2019
Description of CR				
<i>PP is requested to clarify whether generated electricity is exported to grid or used in-house. If generated electricity is not exported to grid, how applicability condition as per AMS-I.D is justified?</i>				
Project participant response				Date: 03/07/2019
The main propose of electricity generation is to support their internal consumption. Though project activity has signed an agreement with the PEA under 2 MW Non-firmed Power Purchase Agreement. The generators are connected to a power network directly, known as synchronised system. Anytime that the project activity can not generate enough power, electricity from the grid would automatically support the plant. Only the excess electricity will support the grid and the invoice of selling electricity will be generated accordingly. Please see the attachments(Att02 & Att03) for more information.				
Documentation provided by project participant				
<i>Att02CC_Non-firmed PPA</i> <i>Att03CC_Example of meter reading report</i>				
DOE assessment				Date: 06/08/2019
As part of project design and agreements in place the electricity component of the project is entitled to claim emission reductions under AMS-I.D. However, during this monitoring period PP is not claiming emission reductions for electricity generation component. Therefore, PP's justification is accepted CR is closed.				

Table 3. CAR from this verification

CAR ID	01	Section no.	4.1	Date: 14/06/2019
Description of CAR				
1. <i>The serial number of FM 1(new), FM2 and FM 3 given in MR is not consistent with actual site.</i> 2. <i>Kindly provide the details of flow meter installed for monitoring flow of biogas to flaring system. In case, it has been removed (as there was no flow meter on the day of site visit by auditor), kindly clarify how it is ensured that there was no flow of biogas to flaring system.</i> 3. <i>The details of weighbridge used for monitoring produced starch quantity is not provided in the MR.</i> 4. <i>Whether South Pole Carbon asset management Ltd. qualify as project proponent as per definition of project proponent of VVS.</i>				
Project participant response				Date: 03/07/2019

1. There are two set of serial numbers shown on flow meter. One is for converter and another is for detector part. The serial number of both detector and converter were mentioned in the updated MR and ER. Please see the revised documents and **Att01**.

Tag	Brand	Model	Detector	Model	Converter
FM1	Euromag	MUT1000EL	YAL1623	MC308C	YAP1643
		MC608A	KCA4726	N/A	N/A
FM2	Euromag	MUT1000EL	YAL1624	MC308C	YAP1644
FM3	Euromag	MUT1000EL	YAL1625	MC308C	YAP1645

2. The flaring meter has not been installed during the monitoring period as the gas meter was moved to install at the boiler no.2 which is not included in the project activity. The evidence of no excess biogas has been generated since 2006, is prepared as **Att04**.

Further clarification of no excess biogas for flaring, can be found as follow;

The maximum biogas generation rate during this monitoring period is 44,225.19 Nm³/day or 1,842.72 Nm³/hour

The average daily biogas consumption rate during this monitoring period (**Att05**);

- Boiler: minimum flow rate of 250 m³/hr
- Generators
 - Generator 1_(used to be 2): 245 m³/hr
 - Generator 2_(used to be 3): 245 m³/hr
 - Generator 3_(used to be 4): 245 m³/hr
 - Generator 4_(the new generator): 260 m³/hr
- TOTAL Biogas consumption rate of 1,245 m³/hr, which equals to 1,125 Nm³/hr

Apart from the installed capacity of the boiler and generators the project activity has also implemented the covered lagoon system (3 covered lagoons, please review the *AFFR operation summary* document; page 7 & 10 under Att05 folder) as an additional gas storage. The total installed capacity of the covered lagoon is 60,000 Nm³. With proper biogas storage system and the quantity of biogas consumption rate, PP can ensure that no biogas have been sent for flaring during this monitoring period.

3. The detail of weighbridge has been updated in the monitoring report, please see below for more information.

Tag/location	Weight bridge
Brand	Linear
Model	PM02
Serial number	2006220
Latest calibration	30/05/2019
Validity	29/05/2021

According to VCS project Definitions, "The individual or organization that has overall control and responsibility for the project, or an individual or organization that together with others, each of which is also a project proponent, has overall control or responsibility for the project. The entity(s) that can demonstrate project ownership in respect of the project.", South Pole could be categorized as project proponent because South Pole is responsible for the project by mean having the exclusivity on monitored data and carbon credits generated by the project activity.

Documentation provided by project participant	
Att04 Confirmation letter_No biogas sent for flaring	
Att05 Installed capacity	
300283Cholburi_WWT_ex-post ER cal _ver02	
300283Cholburi_WWT_MR _ver02	
DOE assessment	Date: 06/08/2019
PP has provided adequate clarification on flow meter details and details are consistent with actual arrangement. On flaring, PP's clarification is accepted and weighing bridge details are found consistent with actual details and calibration records. Hence, CAR is closed.	

Table 4. FAR from this verification

FAR ID	xx	Section No.	Date: DD/MM/YYYY
Description of FAR			
<i>No FAR raised during this verification.</i>			
Project participant response			Date: DD/MM/YYYY
Documentation provided by project participant			
DOE assessment			Date: DD/MM/YYYY



CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra:
 We declare that Mr/Mrs/Ms:

Champak Buragohain

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, ITR, Local Expert

per le seguenti aree tecniche:
 for the following technical areas:

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)
1	11/07/2017	Qualification update

Responsabile di schema
 Scheme Leader
 Laura SEVERINO

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TEC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

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VCSA	per condurre la Validazione e la Verifica di Progetti VCS to carry out Validation and Verification of VCS Projects
GS Foundation	per condurre la Validazione e la Verifica di Progetti GS to carry out Validation and Verification of GS Projects
Ecologica Institute	per condurre la Validazione e la Verifica di rapporti SCS to carry out Validation and Verification of SCS Reports
American Carbon Registry ACR	per condurre la Validazione e la Verifica di Progetti ACR to carry out Validation and Verification of ACR projects
The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB to carry out Validation and Verification of co-benefit CCB projects

GHG_QUAL_CERT_EN_07_16 Voluntary(Certificate)

Page 1 of 1



CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra:
 We declare that Mr/Mrs/Ms:

Cyril Augustus Arokiasamy Amalorpavanathan

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, Local Expert, ITRP

per le seguenti aree tecniche:
 for the following technical areas:

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.1	Thermal energy generation	1
1.2	Renewables	1
3.1	Energy Demand	3
5.1	Chemical Industry	5
13.1	Solid Waste and wastewater	13

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)
2	09/10/2017	Qualification update as ITRP

Responsabile di schema
 Scheme Leader
 Laura SEVERINO

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TEC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

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GS Foundation	per condurre la Validazione e la Verifica di Progetti GS to carry out Validation and Verification of GS Projects
Ecologica Institute	per condurre la Validazione e la Verifica di rapporti SCS to carry out Validation and Verification of SCS Reports
American Carbon Registry ACR	per condurre la Validazione e la Verifica di Progetti ACR to carry out Validation and Verification of ACR projects
The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB to carry out Validation and Verification of co-benefit CCB projects



CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra:
 We declare that Mr/Mrs/Ms:

Hui Feng Liu

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, ITRP

per le seguenti aree tecniche:
 for the following technical areas:

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.1	Thermal energy generation	1
1.2	Renewables	1
8.1	Mining and mineral processes	8
9.2	Iron, steel and Ferro alloy production	9
13.1	Solid waste and wastewater	13

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
 Scheme Leader
 Rita Valeroso

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TEC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

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UNPCOC	quali Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects
VCSA	per condurre la Validazione e la Verifica di Progetti VCS to carry out Validation and Verification of VCS Projects
GS Foundation	per condurre la Validazione e la Verifica di Progetti GS to carry out Validation and Verification of GS Projects
Ecologica Institute	per condurre la Validazione e la Verifica di rapporti SCS to carry out Validation and Verification of SCS Reports
American Carbon Registry ACR	per condurre la Validazione e la Verifica di Progetti ACR to carry out Validation and Verification of ACR projects
The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB to carry out Validation and Verification of co-benefit CCB projects

GHG_QUAL_CERT_EN_07_16 Voluntary(Certificate)

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