VERIFICATION REPORT TITLE

Document Prepared By

EPIC Sustainability Services Private Limited

Project Title	Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi) Project ID: 430
Version	01
Monitoring period	01-January-2012 to 31-July-2014 (4th monitoring period)
Report ID	ESSPL/VCS/2014/010

Report Title	Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)
Client	Chol Charoen Co.,Ltd (Service recipient), South Pole Carbon Asset Management Ltd. (Invoice recipient) (Both are project proponents)
Pages	28
Date of Issue	10-October 2014
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Technical reviewer team	Mr. A. Prabu Das Dr. G. Vishnu

Summary:

South Pole Carbon Asset Management Ltd. has appointed EPIC Sustainability Services Private Limited to perform the fourth periodic verification of the emission reductions reported for the project titled "Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)" (Project ID: 430) for the period from 01st January 2012 to 31st July 2014. The verification was based on the validated project design document (PD)/9/ version 3.1 dated 6th November 2009, corresponding validation report, previous monitoring reports, previous verification reports and other supporting documents made available to the verification team by the client.

The project activity involves the installation and operation of a biogas recovery and utilization system (an open anaerobic effluent treatment system). 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, based on Anaerobic Fixed Film Reactor (AFFR) technology. Anaerobic bacteria in the ponds break down organic compounds in the wastewater, resulting in the release of biogas. The resulting biogas is characterized by the chemical oxygen demand of the wastewater. The implementation of AFFR system enables the recovery of biogas that would have been released to the atmosphere in the baseline scenario and the utilization of the recovered biogas for thermal and electricity generation in the project activity.

The verification team identified, through the verification process, Seven CARs, Eight CRs and Two FARs. The client has taken actions and submitted to EPIC the revised monitoring report and supporting evidence. The verification team, through the verification process, confirmed that the emission reductions achieved by the project activity during the monitoring period are correctly calculated in the monitoring report, Version 2, dated 01/10/2014. Therefore, EPIC certifies the emission reductions amounting to 137,474 tCO2e for the period 01st January 2012 to 31st July 2014 (both days inclusive).

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1 INTRODUCTION

1.1 Objective

EPIC Sustainability Services Private Limited (EPIC) has been contracted by South Pole Carbon Asset Management Ltd to undertake the fourth periodic independent verification of the project activity titled "Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)".

- To verify that the actual monitoring system and procedures are in full compliance with the system and procedures described in the monitoring plan of validated PD, version 3.1 dated 6th November 2009 as well as with the applicable methodology;
- To verify the monitoring report with deviations are in compliance with monitoring plan and VCS rules
- To verify that the data reported were accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation; and
- To verify and certify GHG emission reduction reported for the project for the period from 1st January 2012 to 31st July 2014.

1.2 Scope and Criteria

The scope of the verification was the independent and objective review and ex-post determination of the monitored reductions in GHG emissions from 'Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)". The verification of this project was based on the validated and registered project design document (PD), validation report, previous monitoring reports, previous verification reports and supporting documents made available to the verification team. These documents were reviewed against the requirements of the VCS standard[/1/] version 3.4, VCS guidelines, the CDM Modalities and Procedures, related rules and guidance, and the Validation and Verification standard[/2/] Version 7.0. The verification is not meant to provide any consulting towards the client. However, stated request for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Level of Assurance

In line with VCS requirements and as per ISO 14064-3:2006 para A.2.3.2, a reasonable level of assurance is defined for the verification of the project.

This implies that based on the process and procedures conducted EPIC should state whether the information in the monitoring report is materially correct and is a fair representation of the of the actual project details, and is prepared in accordance with the VCS requirements and the applied CDM methodology for information pertaining to additionality, GHG quantification, monitoring and reporting.

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). 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, based on Anaerobic Fixed Film Reactor (AFFR) technology. Anaerobic bacteria in the ponds break down organic compounds in the wastewater, resulting in the release of biogas. The resulting biogas is characterized by the chemical oxygen demand of the wastewater. The implementation of AFFR system enables the recovery of biogas that would have been released to the atmosphere in the baseline scenario and the utilization of the recovered biogas for thermal and electricity generation in the project activity. The project activity started to reduce emission reductions from 7th January 2006 (Project commissioned or project start date).

2 VERIFICATION PROCESS

2.1 Method and Criteria

The verification process consists of the following phases:

i) a document review of the project design documents, monitoring reports and preparation of verification protocol;
ii) on-site visit to the project activity and interviews with project developer and project consultant; and
iii) resolution of outstanding issues and the issuance of final verification report and opinion

In order to ensure transparency, a verification protocol was prepared for the project according to the VVS version 7.0 verification requirements and VCS Standard version 3.4. The verification protocol serves the following purposes:

- it organizes, details and clarifies the requirements that a CDM or VCS project is expected to meet;
- it ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The completed validation protocol is enclosed in Appendix of this report.
During the verification, non-fulfillment of the verification protocol criteria or identified risks to the fulfillment of project objectives were raised as either CAR or CR. Corrective Action Requests (CAR) were issued, where:

i) mistakes had been made that directly impacted on the project results; or
ii) CDM and VCS requirements had not been met; or
iii) there was a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The Clarification Requests (CR) were issued where additional information was needed to clarify issues, and Forward Action Requests (FAR) for issues relating to project implementation that required review during the first verification of the project activity.

The following team members were involved in identifying the following:

Name	Role	Components reviewed
Mr. R. Vijayaraghavan	Lead Auditor	Completeness check, desk review, onsite inspection, Interview with project representatives, issuance of findings, report preparation
Mr. Attavute Ruenruengjai	Technical cum Host country expert	Desk review, onsite inspection, Interview with project representatives, report preparation
Mr. A. Prabu Das Dr. G. Vishnu	Technical Reviewer	Technical review

2.2 Document Review

The verification was performed primarily based on the review of the monitoring report and the supporting documentation. This process included:-

1. a review of data and information presented to verify their completeness
2. a 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 QA/QC procedures, and
3. an evaluation of data management and the QA/QC system in the context of their influence on the generation and reporting of ERs.

The monitoring report[/5/], Version 01, dated 21st August 2014 was initially reviewed and further EPIC requested the PP to present the supporting evidences. Additional background information and documents related to the project performance were also reviewed by EPIC. Through the process of the verification,

the revised monitoring report and the supporting documents were evaluated to confirm the actions taken by the PP to the CARs and CRs issued by EPIC. The documents reviewed by EPIC are listed in References section of this report. EPIC reviewed the final version of the monitoring report[/5/] Version 2.0 dated 1st October 2014 to confirm that all changes agreed had been incorporated.

2.3 Interviews

After the review of the Project description and documents a site visit was carried out on 3rd September 2014. During the site visit physical inspection of the project components followed by interviews with the on-site personnel was carried out to verify the project details. A follow-up meeting was also conducted with the project representatives. The following persons were interviewed.

Name & Designation	Company	Details of Interview
Mr. Santosh Kumar Singh (Regional Director) Ms. Nattaya Lonawan (Project Manager)	Southpole	Technical Details, Monitoring system, calibration procedures and Overall Project management. Technical details Baseline, ER calculations.

2.4 Site Inspections

During the site visit, the actual on-site practices adopted and followed for the operation of the project were compared with the description given in the monitoring report. The implementation of the monitoring plan, metering practices, calibration and level of accuracy were examined. The archived data of the energy generated was also reviewed.

An on-site assessment was conducted as a part of verification activity and involved:

1) an assessment of the implementation and operation of the VCS project activity as per the validation PD
2) a review of information flows for generating, aggregating and reporting of the monitoring parameters
3) interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the Monitoring Plan
4) a cross-check between information provided in the MR and data from other sources
5) a check of the monitoring equipment including calibration performance, and observations of monitoring practices against the requirements of the PD and the applied methodology
6) A review of calculations and assumptions made in determining the GHG data and ERs, and
7) An identification of QA/QC procedures in place to prevent, or identify and correct, any errors or omissions in the reported monitoring parameters.

2.5 Resolution of Findings

Resolution of Clarification and Corrective Action Requests
The objective of this phase of the verification was to resolve the corrective action requests and clarifications and any other outstanding issues which needed to be clarified prior to EPIC positive conclusion on the monitoring report and the project design. During the validation process seven CARs, eight CRs and two FARs were raised.

All the CARs, CRs and FARs were resolved during this phase. In order to ensure the transparency of the validation process, the concerns raised and responses that were given are summarized in Appendix 1 of this report and documented in more detail in the Verification in Appendix 1. All the corrective actions have been incorporated into the monitoring report.

Internal quality control

A Technical Reviewer is appointed to review the final draft verification report and the final verification report. The comments made by the Technical Reviewer are taken into consideration and incorporated in the final report. The final report (after resolutions of all findings) is then submitted to the Head – Operations for review and approval.

2.5.1 Forward Action Requests

There were two FARs raised during this verification process.

2.6 Eligibility for Validation Activities

EPIC has accredited for validation and verification for the scopes 1-11 and 13-15 by CDM UNFCCC and as well as by the VCS board.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The project is not applied for other GHG programs such as CDM, GS etc.

3.2 Methodology Deviations

No methodology deviations found in this verification period. However, methodology deviations carried over from the previous verifications are detailed in section 4.2

3.3 Project Description Deviations

No project related deviations found in this verification period. However, project related deviations carried over from the previous verifications are detailed in section 4.2

3.4 Grouped Project

The project activity is not a grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The verification based on the onsite observation, found that there is no material discrepancies between the project implementation and the project description. The verification team checked the status of monitoring plan the completeness of monitoring system and found no discrepancies between the actual monitoring system and the monitoring plan set in the validated project description. The project is not applied for under any other GHG scheme and there will not be any double counting. The verification team was able to conclude the project has been implemented as described in the validated project description. Refer 4.2 for project and methodology deviations.

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

The verification of all the data ex-ante and data ex-post (monitoring parameters) including data measurement, data transfer, data archiving, aggregation and calculation of baseline emissions, project emissions and leakage emissions are tabulated below.

Parameter	Conclusion by the verification team
Baseline emissions	PP has considered the baseline emissions which include the following emissions. 1) Emissions due to the decomposition of organic matter in the anaerobic conditions or emissions from the existing waste water treatment system i.e. open lagoon system ($BE_{y, AMS.III.H}$). This emission is calculated through the methodology AMS. III.H 2) Emissions due to consumption of grid based electricity for the operation of the wastewater treatment system in the baseline scenario ($BE_{y, AMS.I.D}$). This emission is calculated through the methodology AMS. I.D 3) Emissions from the consumption of fossil fuel in the baseline scenario ($BE_{y, AMS.I.C}$). This emission is calculated through the methodology AMS. I.C. The verification team has checked the validated PD and accepted the same as correct.
Emissions due to the decomposition of organic matter in the anaerobic conditions or emissions from the existing waste water treatment system i.e. open lagoon system ($BE_{y, AMS.III.H}$).	As per AMS.III.H (version 13), baseline emissions consist of 1) emissions due to consumption of electricity and/or fossil fuel in the waste water treatment system in the baseline scenario ($BE_{power,y}$) 2) emissions from baseline wastewater treatment systems ($BE_{ww,treatment,}y$) 3) emissions from baseline sludge treatment systems ($BE_{s, treatment,y}$) 4) emissions due to inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$) 5) emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$). The verification details of each of the parameter are indicated below.
Emissions due to consumption of electricity and/or fossil fuel in the waste water treatment system in the baseline scenario ($BE_{power,y}$)	As per para 19 of AMS.III.H (version 13), baseline emission from electricity consumption is calculated as procedures described in AMS.III.D. $BE_{power,y}$ consist of two items. 1. Emissions due to consumption of fossil fuels in waste water treatment system in the baseline scenario ($BE_{heat,y}$) 2. Emissions due to consumption of electricity in the waste water treatment system ($BE_{elec,y}$). $BE_{power,y} = BE_{heat,y} + BE_{elec,y}$
$BE_{heat,y}$	As per the procedures AMS.I.C v15 para 11, BE heat y is calculated as follows $BE_{heat, y}$ = fossil fuel consumed (FC) in the waste water system in the baseline scenario x emission factor of fossil fuel ($EF\ C_{O2,fuel\ oil}$).
Fossil fuel consumed =0 M^3	PP has assumed that there is no fossil fuel consumed in the open lagoon system prior to the implementation of the project activity.
Net calorific value of fossil fuel NCV_{FO} =42.76 GJ/Tonne	It is assumed at the time of validation and it remains same during the entire crediting period.
Emission factor of fossil fuel ($EF_{CO2,fuel\ oil}$) =77.4 tCO2/TJ	It is assumed at the time of validation and it remains same during the entire crediting period.
$BE_{heat,y}$ =0	Since PP has assumed that there is no fossil fuel consumed in the baseline scenario, BE heat y =0. The verification team has accepted the assumption as it results in conservativeness in the calculation of overall emission reductions.
$BE_{elec,y}$	As per the procedures AMS.I.D para 9, $BE_{elec, y}$ is calculated

	as follows $BE_{elec,y}$ = electricity consumed in the wastewater system x emission factor of grid (EF_y). Since PP has assumed that there is electricity consumed in the wastewater treatment system in the baseline scenario is negligence, $BE_{elec,y}$ =0. The verification team has accepted the assumption as it results in conservativeness of overall emission reductions.
Electricity consumed in the wastewater system =0 MWh	PP has assumed that there is electricity consumed in the wastewater treatment system in the baseline scenario.
Emission factor of grid (EF_y)= 0.5057 tCO2/MWh	It is assumed at the time of validation and it remains same during the entire crediting period.
$BE_{elec,y}$ =0 tCO2	Since PP has assumed that there is electricity consumed in the wastewater treatment system in the baseline scenario is negligence, $BE_{elec,y}$ =0. The verification team has accepted the assumption as it results in conservativeness of overall emission reductions.
Emissions due to consumption of electricity and/or fossil fuel in the waste water treatment system in the baseline scenario ($BE_{power,y}$) =0	$BE_{power,y} = BE_{heat,y} + BE_{elec,y}$ Since both terms are zero, BEpower,y is zero.
Emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$)	As per para 20 of AMS.III.H v13, Methane emissions from the baseline wastewater treatment systems affected by the project ($BE_{ww,treatment,y}$) are determined using the methane generation potential of the wastewater treatment systems using the following formula $BE_{ww,treatment,y} = Q_{ww,i,y} \times COD_{removed,i,y} \times MCF_{ww,treatment,BL,l} \times B_{o,ww} \times UF_{BL} \times GWP_{CH4}$ Or $BE_{ww,treatment,y} = COD\ load_{removal,i,y} \times MCF_{ww,treatment,BL,l} \times B_{o,ww} \times UF_{BL} \times GWP_{CH4}$ PP has used formula 2 which is also deemed correct as biogas is characterized by the COD removed because of the anaerobic treatment in the AFFR and covered lagoon system.

Volume of wastewater treated in wastewater treatment system ($Q_{ww,y}$)

y	Q_{ww} in M3
2012	1151588
2013	1004312
2014	472555

(expost data)

Calibration record

	FM1	FM2	FM3
Serial no of the meter	YAL 1623	YAL 1624	YAL 1625
Max permissible error	0.2%	0.2%	0.2%
Date of calibration no 1	16th May 2011	15th May 2011	15th May 2011
Validity upto	15th May 2014	14th May 2014	14th May 2014
Date of calibration no 2	22nd May 2012	22nd May 2012	22nd May 2012
Validity upto	21st May 2015	21st May 2015	21st May 2015

The total volume of wastewater is the cumulative of waste water flows through flow meter FM1 (installed at inlet of AFFR system), FM2 (installed at inlet of covered lagoons) and FM3 (installed at inlet of covered lagoons). It is measured continuously and recorded on daily basis as per the validated PD. Daily readings of each meter are calculated from the final reading of the day and initial reading of the day for all the three meters. Yearly reading is cumulative of daily data.

The verification team has checked the measurement methods and found that plant operators first manually archive the monitored data onto the log sheets then transfer to the computer for electronic storage.

The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. The verification team was able to conclude that QA/QC of the meters is ensured.

COD concentration of Influent ($COD_{ww, untreated,y}$)

y	$COD_{ww, untreated,y}$
2012	26422 mg/L
2013	27829 mg/L
2014	22524 mg/L

Calibration record

	CS1	CS2
Serial no of the meter	50100006 010	1422847
Max permissible error	0.13%	8 mg/l COD
Date of calibration no 1	12th May 2011 (replaced since by CS2)	3rd June 2013
Validity upto	11th May 2014	2nd June 2016

It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted.

Lower bound value = Mean value- t x standard deviation/count
Where Mean value- Final average
t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1)

The verification team has checked the measurement methods and found that COD content will be analyzed using colorimetric method in the onsite lab. The results are then logged by the operators in the plant operation report on a daily basis. The plant operators then transfer to the computer for electronic storage. The colorimetric method is found to be as per national standards. (SPCC-WI-24-Rev 5). In addition, PP

<table>
<tr><td></td><td>has sent the wastewater samples to external lab to compare the internal readings. The results are found to be satisfactory.

The verification team has checked the calibration certificates against model, serial number, date of calibration, validity and actual error and found that spectrometers are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. The verification team was able to conclude that QA/QC of the meters is ensured.</td></tr>
<tr><td>COD load of untreated wastewater going into AFFR and Covered lagoons (COD load, $_{ww, untreated, y}$)
<table><tr><td>y</td><td>Tonnes</td></tr><tr><td>2012</td><td>30427</td></tr><tr><td>2013</td><td>27949</td></tr><tr><td>2014</td><td>10644</td></tr></table></td><td>COD load of untreated wastewater going into the AFFR and covered lagoon is calculated as follows.

COD load,$_{ww, untreated, y}$= Q_{ww} x Average level of COD concentration of Influent (COD $_{ww, untreated,y}$)</td></tr>
<tr><td>COD removal efficiency =87%</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>COD load that would have been removed by the baseline treatment system (COD load $_{removed, i, y}$)

<table><tr><td>y</td><td>Tonnes</td></tr><tr><td>2012</td><td>26471</td></tr><tr><td>2013</td><td>24315</td></tr><tr><td>2014</td><td>9260</td></tr></table></td><td>COD load removed = COD load of untreated wastewater going into AFFR and covered lagoons x COD removal efficiency</td></tr>
<tr><td>Methane correction factor for the baseline anaerobic wastewater treatment system. (MCF $_{ww,treatment,BL,i}$) =0.8</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>Methane producing capacity of COD in wastewater.($B_{o,ww}$) =0.21 kg CH4/ kg COD</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>Model correction factor to account for model uncertainties - baseline. (UF_{BL}) =0.94</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>Global warming potential of methane gas. (GWP $_{CH4,y}$)

<table><tr><td></td><td>GWP CH4,y</td></tr><tr><td>y=2012</td><td>21</td></tr><tr><td>y=2013</td><td>25</td></tr><tr><td>y=2014</td><td>25</td></tr></table></td><td>PP has considered for the first commitment period upto 2012, as 21 kg CO2/Kg CH4. PP has considered GWP of methane as 25 which is accepted for the second commitment period which is in accordance with decision 4/CMP 7 as prescribed by the “Standard for application of the global warming potentials to CDM PA and PoA for the second commitment period of the Kyoto protocol” Version 1.0 (EB 69 Annex 3).</td></tr>
<tr><td>Emissions from baseline wastewater treatment systems (BE $_{ww,treatment,y}$)

<table><tr><td></td><td>BE $_{ww,treatment,y}$ in tCO2e</td></tr><tr><td>y=2012</td><td>87788</td></tr><tr><td>y=2013</td><td>80637</td></tr><tr><td>y=2014</td><td>30710</td></tr></table></td><td>Emissions from baseline wastewater treatment systems is calculated as per the given formula and found to be correct.</td></tr>
</table>

<table>
<tr><td>Emissions from baseline sludge treatment systems ($BE_{s, treatment,y}$)</td><td>As per AMS.III.H v13, Methane emissions from the baseline sludge treatment systems affected by the project activity are determined using the methane generation potential of the sludge treatment systems. The formula used is as follows
$BE_{s, treatment,y} = S_{j,BL,y} \times MCF_{ww, treatment,BL,j} \times DOC_s \times UF_{BL} \times DOC_F \times F \times 16/12 \times GWP_{CH4}$</td></tr>
<tr><td>Amount of dry matter in the sludge that would have been treated by the sludge treatment system j in the baseline scenario ($S_{j,BL,y}$)
<table><tr><td></td><td>$S_{J, BL,y}$ in tonnes</td></tr><tr><td>y=2012</td><td>0</td></tr><tr><td>y=2013</td><td>0</td></tr><tr><td>y=2014</td><td>0</td></tr></table>(ex-post parameter)</td><td>There was no treatment plant available for sludge in the baseline scenario. There was little sludge generated which is used aerobically for soil application. Hence amount of sludge is assumed to be zero as per the validated PD. It is monitored and no sludge was available for treatment. As per the validated PD, plant manager’s approval signature in the log sheets ensures the accuracy of the data. The verification team has checked the log sheets and found it to be satisfactory.</td></tr>
<tr><td>Emissions from baseline sludge treatment systems ($BE_{s, treatment,y}$) =0 tonne</td><td>Since no sludge is zero, the emissions from baseline sludge treatment systems are also zero.</td></tr>
<tr><td>Emissions from degradable organic carbon in treated wastewater discharged in e.g., a river, sea or lake in the baseline scenario ($BE_{ww,treated,y}$)</td><td>As per the AMS.III.H v13, the formula used is as follows.
$BE_{ww,treated,y} = Q_{ww,y} \times GWP_{CH4} \times B_{o,WW} \times UF_{BL} \times COD_{ww,discharge,BL,y} \times MC_{ww, BL, discharge}$

Where $Q_{ww,y}$ = Volume of treated water discharged into the river.</td></tr>
</table>

<table>
<tr><td>Volume of treated water discharged into the river, lake or sea =0</td><td>It is assumed that no treated water is discharged into the river, hence $Q_{ww,y}$ =0.</td></tr>
<tr><td>Emissions from degradable organic carbon in treated wastewater discharged in e.g., a river, sea or lake in the baseline scenario ($BE_{ww,treated,y}$) =0 tonne</td><td>Since there is no treated water discharged into the river/lake or sea, the emissions from degradable organic carbon in treated wastewater discharged in a river, sea or lake in the baseline scenario are also zero.</td></tr>
<tr><td>Emissions from anaerobic decay of the final sludge produced ($BE_{s,final,y}$)</td><td>As per the AMS.III.H v 13, the formula used is as follows.
$BE_{s,final,y} = S_{final,BL,y} \times DOC_s \times UF_{BL} \times MCF_{s,BL,final} \times DOC_F \times F \times 16/12 \times GWP_{CH4}$
Where $S_{final,BL,y}$ = Amount of dry matter in final sludge generated by the baseline wastewater treatment systems in the year y</td></tr>
<tr><td>Amount of dry matter in final sludge generated by the baseline wastewater treatment systems
<table><tr><td></td><td>$S_{final,BL,y}$ in tonnes</td></tr><tr><td>y=2012</td><td>0</td></tr><tr><td>y=2013</td><td>0</td></tr><tr><td>y=2014</td><td>0</td></tr></table>(ex-post parameter)</td><td>There was no treatment plant available for sludge in the baseline scenario. There was little sludge generated which is used aerobically for soil application. Hence amount of sludge is assumed to be zero as per the validated PD. It is monitored and no sludge was generated by the baseline wastewater treatment systems. As per the validated PD, plant manager's approval signature in the log sheets ensures the accuracy of the data. The verification team has observed that there is no sludge generated.</td></tr>
<tr><td>Emissions from anaerobic decay of the final sludge produced $BE_{s,final,y}$ = 0 tonne</td><td>Since no sludge is generated by the baseline wastewater treatment systems, emissions from anaerobic decay of the final sludge produced is zero.</td></tr>
<tr><td>$BE_{y,AMS.III.H}$
<table><tr><td></td><td>$BE_{y,AMS.III.H}$ in tCO2e</td></tr><tr><td>Y =2012</td><td>87788</td></tr><tr><td>Y=2013</td><td>80637</td></tr><tr><td>Y=2014</td><td>30710</td></tr><tr><td></td><td></td></tr></table></td><td>$BEy_{AMS.III.H} = BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,}y + BE_{ww,discharge,y} + BE_{s,final,y}$</td></tr>
<tr><td>Methane captured and destroyed/gainfully used by the project activity (MD_y)

(deviation 2)</td><td>As per the SSC WG response, MD_y value is calculated which is deviated from the approved methodology AMS.IIII.H as follows. With reference to the clarification made by the SSC WG, this approach can be considered as not impact negatively on the conservativeness of the applied methodology's criteria to quantity data leading to overall emission reductions. The verification team was able to conclude that the deviation 2 is in compliance with VCS requirements.
$MDy = W_{CH4} \times D_{CH4} \times GWP_{CH4} \times [(BG_{TOFlare,y} \times FE) + BG_{combusted,y} \times DE)]$</td></tr>
<tr><td>Methane content in the biogas (W_{CH4})
(Deviation 4)
<table><tr><td></td><td>W_{CH4}</td></tr><tr><td>y =2012</td><td>52.6%</td></tr><tr><td>y =2013</td><td>49.9%</td></tr><tr><td>y =2014</td><td>50.2%</td></tr></table>(ex-post parameter)</td><td>As per the validated PD, methane content will be measured continuously. But the readings are not stable when connected online. Hence the monitoring of this parameter is the periodic measurement by the portable gas analyzer at 95% confidence level. The measuring is conducted at three locations (common header, boiler inlet and gas engine inlet). The monitored data is adjusted for 95% confidence level. The verification team has checked the approach and accepted the</td></tr>
</table>

<table>
<tr>
<td>
Calibration record

<table>
<tr><td></td><td>MS1</td><td>MS2</td></tr>
<tr><td>Serial no of the meter</td><td>VI3-3005</td><td>11824</td></tr>
<tr><td>Max permissible error</td><td>2%</td><td>3%</td></tr>
<tr><td>Date of calibration no 1</td><td>21st Dec 2011 (replaced since by MS2)</td><td>16th April 2013</td></tr>
<tr><td>Validity upto</td><td>20th Dec 2014</td><td>15th April 2016</td></tr>
</table>
</td>
<td>
deviation as it complies with the VCS requirements. (Deviation 4).

The readings are measured at three places as mentioned above every four hours and average value is considered for calculation. The final average is adjusted as per deviation 4 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted.
Lower bound value = Mean value- t x standard deviation/count
Where Mean value- Final average
t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1)

The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. In addition to this calibration, flow meter was calibrated via an external agency which the verification team has checked and found to be satisfactory., The verification team was able to conclude that QA/QC of the meters is ensured.
</td>
</tr>
<tr>
<td>Density of methane (D_{CH4}) =0.716 kg/M^3</td>
<td>It is assumed at the time of validation and it remains same during the entire crediting period.</td>
</tr>
<tr>
<td>
Global warming potential of methane gas. (GWP $_{CH4,y}$)

<table>
<tr><td></td><td>GWP CH4,y</td></tr>
<tr><td>y=2012</td><td>21</td></tr>
<tr><td>y=2013</td><td>25</td></tr>
<tr><td>y=2014</td><td>25</td></tr>
</table>
</td>
<td>PP has considered for the first commitment period upto 2012, as 21 kg CO2/Kg CH4. PP has considered GWP of methane as 25 for the second commitment period which is in accordance with decision 4/CMP 7 as prescribed by the “Standard for application of the global warming potentials to CDM PA and PoA for the second commitment period of the Kyoto protocol” Version 1.0 (EB 69 Annex 3).</td>
</tr>
<tr>
<td>
Amount of biogas sent to flare at normal conditions ($BG_{TOFlare,y}$)
(Deviation 3)

<table>
<tr><td></td><td>BG $_{TOFlare,y}$</td></tr>
<tr><td>y=2012</td><td>0 M3</td></tr>
<tr><td>y=2013</td><td>0 M3</td></tr>
<tr><td>y=2014</td><td>0 M3</td></tr>
</table>

(ex-post parameter)
Calibration record

<table>
<tr><td></td><td>GM2</td></tr>
<tr><td>Serial no of the meter</td><td>V10S08-01.1</td></tr>
<tr><td>Max permissible error</td><td>1%</td></tr>
<tr><td>Date of calibration no 1</td><td>23rd May 2011</td></tr>
</table>
</td>
<td>
The volume of biogas flared is measured using the flow meter GM2 located at the inlet of flaring system. As per the validated PD, this parameter is to be monitored daily basis. The correction factor is applied to adjust temperature difference between NM^3 conditions and M^3 is done conservatively as per deviation 3.
Adjustment factor is done as follows

V2 = V1 x 273 /(273 +29.04)
Where V2 in value in NM^3
V1 in value in M^3
29.04 refers to ambient temperature

The verification team has checked the deviation 3 and accepted the approach as reasonable. Since the deviation 3 does not affect additionality and conservativeness in the calculation of the overall emission reductions, the verification team has accepted this deviation. On enquiry with the project owner, biogas generated is just sufficient for boiler and gas
</td>
</tr>
</table>

<table>
<tr><td>
<table>
<tr><td>Validity upto</td><td>22nd May 2014</td></tr>
<tr><td>Date of calibration no 2</td><td>15th May 2013</td></tr>
<tr><td>Validity upto</td><td>14th May 2016</td></tr>
</table>
</td><td>engines and there is no excess biogas storage system and even if some excess biogas available, it is being stored in covered lagoon 3. Hence there is no need for flaring.
As per the validated PD, this parameter is to be measured continuously and recorded daily which is being followed in the monitoring period. The verification team has checked the measurement methods and found that plant operators first manually archive the monitored data onto the log sheets then transfer to the computer for electronic storage.

The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. In addition to this calibration, flow meter to be calibrated via an external agency which the verification team has checked and found to be satisfactory., The verification team was able to conclude that QA/QC of the meters is ensured.</td></tr>
<tr><td>Flare efficiency for enclosed flare (FE) =0% (Deviation 2)</td><td>It is assumed at the time of validation and it remains same during the entire crediting period. For the portion of biogas that is sent to flare, a flare efficiency of 0% has been adopted for the current monitoring period to account for non-operation of the flare system due to unavailability of excess biogas. The verification team has checked the deviation and found that this complies with the VCS requirements.</td></tr>
<tr><td>Amount of biogas combusted at boiler and generator ($BG_{combusted,y}$)
(deviation 3)
<table>
<tr><td></td><td>$BG_{combusted,\ y}$</td></tr>
<tr><td>y=2012</td><td>8229058 NM3</td></tr>
<tr><td>y=2013</td><td>6597187 NM3</td></tr>
<tr><td>y=2014</td><td>2241086 NM3</td></tr>
</table>
(ex-post parameter)
Calibration record
<table>
<tr><td></td><td>GM1</td><td>GM3</td></tr>
<tr><td>Serial no of the meter</td><td>V9107-03.1</td><td>Ft2-091</td></tr>
<tr><td>Max permissible error</td><td>1%</td><td>1%</td></tr>
<tr><td>Date of calibration no 1</td><td>23rd May 2011</td><td>21st May 2011</td></tr>
<tr><td>Validity upto</td><td>22nd May 2014</td><td>20th May 2014</td></tr>
<tr><td>Date of calibration no 2</td><td>23rd May 2012</td><td>23rd May 2012</td></tr>
<tr><td>Validity upto</td><td>22nd May 2015</td><td>22nd May 2015</td></tr>
</table>
</td><td>Total biogas consumed is summation of biogas consumed in the boiler (measured by flow meter GM1) and generator set (measured by flow meter GM3). The value measured through GM1 is available in M^3 and therefore temperature adjustment as per deviation 3 is required whereas GM3 measures in NM^3 and hence no adjustment is required.
Adjustment factor is done as follows

V2 = V1 x 273 /(273 +29.04)
Where V2 in value in NM3
V1 in value in M3
29.04 refers to ambient temperature

The verification team has checked the deviation 3 and accepted the approach as reasonable. Since the deviation 3 does not affect additionality and conservativeness in the calculation of the overall emission reductions, the verification team has accepted this deviation

As per the validated PD, this parameter is to be measured continuously and recorded daily which is being followed in the monitoring period. The verification team has checked the measurement methods and found that plant operators first manually archive the monitored data onto the log sheets then transfer to the computer for electronic storage.

The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having</td></tr>
</table>

<table>
<tr><td></td><td>sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. The verification team was able to conclude that QA/QC of the meters is ensured.</td></tr>
<tr><td>Destruction efficiency (DE) =100%</td><td>It is assumed at the time of validation and it remains same during the entire crediting period. A destruction efficiency of 100% is used for the portion of biogas that is combusted for gainful used.</td></tr>
<tr><td>Methane captured and destroyed/gainfully used by the project activity (MD_y)
<table><tr><td></td><td>MD_y in tCO2e</td></tr><tr><td>y=2012</td><td>65023</td></tr><tr><td>y=2013</td><td>58944</td></tr><tr><td>y=2014</td><td>20153</td></tr></table></td><td>MD_y is calculated as follows.

$MDy = W_{CH4} \times D_{CH4} \times GWP_{CH4} \times [(BG_{TOFlare,y} \times FE) + BG_{combusted,y} \times DE)]$</td></tr>
<tr><td>Project emissions as per AMS.III.H ($PE_{y\ AMS.IIII.H}$)</td><td>PP has considered the project emissions which include the following emissions which is as per AMS.IIII.H v13.
1) Emissions on account of power and fuel used by the project activity facilities ($PE_{power,y}$);
2) Emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{ww,treatment,y}$);
3) Emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);
4) Emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww\ discharge\ y}$);
5) Emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s\ final\ y}$);
6) Fugitive emissions on account of inefficiencies in capture systems ($PE_{fugitive,\ y}$);
7) Emissions due to incomplete flaring ($PE_{flaring,\ y}$);
8) Emissions from biomass stored under anaerobic conditions ($PE_{biomass,y}$)</td></tr>
</table>

<table>
<tr><td>Emissions on account of power and fuel used by the project activity facilities ($PE_{power,y}$)</td><td>Emissions due to electricity consumed in the wastewater treatment plant is calculated as electricity consumed (EC_y)x grid emission factor (EF_y)</td></tr>
<tr><td>Electricity consumed in the waste water treatment plant (EC_y)</td><td>It is specified in the validated PD that in the absence of electricity meter measuring the consumption of electricity it is calculated as below.
EC_y = Total electrical capacity of the equipments installed in the project activity in kW x (100%+distribution losses) x No of operating hours.</td></tr>
<tr><td>Total electrical capacity of the equipments installed in the project activity=139.25 kW</td><td>It is assumed that all the electrical appliances are running at full capacity for the entire period. The nameplate details of the electrical load is verified and found to be 139.25 kW.</td></tr>
<tr><td>Distribution losses=10%</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>No of operating hours y
<table><tr><td></td><td>Hours</td></tr><tr><td>y=2012</td><td>8760</td></tr><tr><td>y=2013</td><td>8760</td></tr><tr><td>y=2014</td><td>3600</td></tr></table></td><td>In the absence of electricity meter, it is assumed that it is running at full load all through the day. Since this parameter is used for project emission, it is accepted by the verification to be conservative.</td></tr>
<tr><td>Electricity consumed in the waste water treatment plant (EC_y)
<table><tr><td></td><td>ECy in MWh</td></tr><tr><td>y=2012</td><td>1342</td></tr><tr><td>y=2013</td><td>1342</td></tr><tr><td>y=2014</td><td>551</td></tr></table></td><td>EC_y = Total electrical capacity of the equipments installed in the project activity in kW x (100%+distribution losses) x No of operating hours.</td></tr>
<tr><td>Emission factor of grid (EF_y)= 0.5057 tCO2/MWh</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>Emissions on account of power and fuel used by the project activity facilities (PEpower,y)
<table><tr><td></td><td>$PE_{power,y}$ in tCO2e</td></tr><tr><td>y=2012</td><td>679</td></tr><tr><td>y=2013</td><td>679</td></tr><tr><td>y=2014</td><td>279</td></tr></table></td><td>Emissions due to electricity consumed in the wastewater treatment plant is calculated as electricity consumed (EC_y)x grid emission factor (EF_y).</td></tr>
<tr><td>Emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{ww,treatment,y}$)</td><td>As per para 20 of AMS.III.H v13, Methane emissions from the baseline wastewater treatment systems affected by the project ($PE_{ww,treatment,y}$) are determined using the methane generation potential of the wastewater treatment systems using the following formula
$PE_{ww,treatment,y} = Q_{ww,k,y} \times COD_{removed,PJ,k,y} \times MCF_{ww,treatment,PJ,k} \times B_{o,ww} \times UF_{PJ} \times GWP_{CH4}$

$PE_{ww,treatment,y} = Q_{ww,k,y} \times (COD_{out,CL} - COD_{out,lagoon,PJ}) \times MCF_{ww,treatment,PJ,k} \times B_{o,ww} \times UF_{PJ} \times GWP_{CH4}$</td></tr>
<tr><td>Volume of wastewater treated in wastewater treatment system ($Q_{WW,y}$)</td><td>The total volume of wastewater is the cumulative of waste water flows through flow meter FM1 (installed at inlet of AFFR system), FM2 (installed at inlet of covered lagoons) and FM3 (installed at inlet of covered lagoons). It is measured</td></tr>
</table>

<table><tr><td>y</td><td>QWW in M^3</td></tr><tr><td>2012</td><td>1151588</td></tr><tr><td>2013</td><td>1004312</td></tr><tr><td>2014</td><td>472555</td></tr></table> (expost data)	continuously and recorded on daily basis as per the validated PD. Daily readings of each meter are calculated from the final reading of the day and initial reading of the day for all the three meters. Yearly reading is cumulative of daily data.
$COD_{out, CL,y}$ <table><tr><td>y</td><td>$COD_{out, CL}$ in mg/L</td></tr><tr><td>2012</td><td>1249</td></tr><tr><td>2013</td><td>2202</td></tr><tr><td>2014</td><td>1614</td></tr></table>	It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for project emission calculation, upper bound value is used for the calculation which is considered conservative and hence accepted. Upper bound value = Mean value + t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1)
$COD_{out,lagoon.PJ}$ <table><tr><td>y</td><td>$COD_{out, lagoon.PJ}$ in mg/L</td></tr><tr><td>2012</td><td>532</td></tr><tr><td>2013</td><td>683</td></tr><tr><td>2014</td><td>741</td></tr></table>	It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for project emission calculation, upper bound value is used for the calculation which is considered conservative and hence accepted. Upper bound value = Mean value + t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1)
Methane correction factor for project wastewater treatment system k ($MCF_{ww, treatment, PJ, k}$)=0.8	It is assumed at the time of validation and it remains same during the entire crediting period.
Methane producing capacity of COD in wastewater ($B_{o,ww}$) =0.21 kg CH4/Kg COD	It is assumed at the time of validation and it remains same during the entire crediting period.
Model correction factor to account for model uncertainties – project (UF_{PJ})=1.06	It is assumed at the time of validation and it remains same during the entire crediting period.
Global warming potential of methane gas. ($GWP_{CH4,y}$) <table><tr><td></td><td>$GWP_{CH4,y}$</td></tr><tr><td>y=2012</td><td>21</td></tr><tr><td>y=2013</td><td>25</td></tr><tr><td>y=2014</td><td>25</td></tr></table>	PP has considered for the first commitment period upto 2012, as 21 kg CO2/Kg CH4. PP has considered GWP of methane as 25 for the second commitment period which is in accordance with decision 4/CMP 7 as prescribed by the "Standard for application of the global warming potentials to CDM PA and PoA for the second commitment period of the Kyoto protocol" Version 1.0 (EB 69 Annex 3).
Emissions from wastewater treatment	$PE_{ww,treatment,y}$ is calculated as follows.

<table>
<tr><td>systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{ww,treatment,y}$)

<table><tr><td></td><td>$PE_{ww,treatment,y}$</td></tr><tr><td>y=2012</td><td>14723</td></tr><tr><td>y=2013</td><td>32353</td></tr><tr><td>y=2014</td><td>8754</td></tr></table></td><td>$PE_{ww,treatment,y} = Q_{ww,k,y} \times (COD_{out,CL} - COD_{out,lagoon,PJ}) \times MCF_{ww,treatment,PJ,k} \times B_{o,ww} \times UF_{PJ} \times GWP_{CH4}$</td></tr>
<tr><td>Fugitive emissions on account of inefficiencies in capture systems ($PE_{fugitive,y}$);</td><td>As per the para 27 of AMS.III.H v13, $PE_{fugitive,y}$ is calculated as below.
$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$
Where $PE_{fugitive,y}$ is fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment system
$PE_{fugitive,s,y}$ is fugitive emissions through capture and utilization/combuston/flare inefficiencies in the anaerobic sludge treatment system</td></tr>
<tr><td>Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment system ($PE_{fugitive,ww,y}$)</td><td>$PE_{fugitive,ww,y}$ is calculated as below
$PE_{fugitive,ww,y} = (1-CFE_{ww}) \times MEP_{ww,treatment,y} \times GWP_{CH4}$
Where CFE_{ww} is capture efficiency of the biogas recovery equipment in the wastewater treatment systems
$MEP_{ww,treatment,y}$ is Methane emission potential of wastewater treatment systems equipped with biogas recovery system
GWP_{CH4}-Global warming potential of methane</td></tr>
<tr><td>Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (CFE_{WW})= 0.9</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>Methane emission potential of wastewater treatment systems equipped with biogas recovery system ($MEP_{ww,treatment,y}$)</td><td>$MEP_{ww,treatment,y}$ is calculated as below.

$MEP_{ww,treatment,y} = Q_{WW,y} \times COD_{removal,PJ,k,y} \times MCF_{ww,treatment,PJ,k} \times B_{o,ww} \times UF_{PJ}$

$MEP_{ww,treatment,y} = Q_{WW,y} \times (COD_{ww,untreated,y} - COD_{out,CL}) \times MCF_{ww,treatment,PJ,k} \times B_{o,ww} \times UF_{PJ}$</td></tr>
</table>

<table>
<tr>
<td>Volume of wastewater treated in wastewater treatment system ($Q_{ww,y}$)

<table>
<tr><td>y</td><td>Q_{ww} in M3</td></tr>
<tr><td>2012</td><td>1151588</td></tr>
<tr><td>2013</td><td>1004312</td></tr>
<tr><td>2014</td><td>472555</td></tr>
</table>

(expost data)</td>
<td>The total volume of wastewater is the cumulative of waste water flows through flow meter FM1 (installed at inlet of AFFR system), FM2 (installed at inlet of covered lagoons) and FM3 (installed at inlet of covered lagoons). It is measured continuously and recorded on daily basis as per the validated PD. Daily readings of each meter are calculated from the final reading of the day and initial reading of the day for all the three meters. Yearly reading is cumulative of daily data.</td>
</tr>
<tr>
<td>COD concentration of Influent ($COD_{ww, untreated,y}$)

<table>
<tr><td>y</td><td>$COD_{ww, untreated,y}$</td></tr>
<tr><td>2012</td><td>26422 mg/L</td></tr>
<tr><td>2013</td><td>27829 mg/L</td></tr>
<tr><td>2014</td><td>22524 mg/L</td></tr>
</table>
</td>
<td>It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for project emission calculation, upper bound value is used for the calculation which is considered conservative and hence accepted.
Upper bound value = Mean value + t x standard deviation/count
Where Mean value- Final average
t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1)</td>
</tr>
<tr>
<td>$COD_{out, CLy}$

<table>
<tr><td>y</td><td>$COD_{out, CL}$ in mg/L</td></tr>
<tr><td>2012</td><td>1249</td></tr>
<tr><td>2013</td><td>2202</td></tr>
<tr><td>2014</td><td>1614</td></tr>
</table>
</td>
<td>It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for project emission calculation, upper bound value is used for the calculation which is considered conservative and hence accepted.
Upper bound value = Mean value + t x standard deviation/count
Where Mean value- Final average
t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1)</td>
</tr>
<tr>
<td>Methane correction factor for project wastewater treatment system k ($MCF_{ww, treatment, PJ, k}$)=0.8</td>
<td>It is assumed at the time of validation and it remains same during the entire crediting period.</td>
</tr>
<tr>
<td>Methane producing capacity of COD in wastewater ($B_{o,ww}$) =0.21 kg CH4/Kg COD</td>
<td>It is assumed at the time of validation and it remains same during the entire crediting period.</td>
</tr>
<tr>
<td>Model correction factor to account for model uncertainties – project (UF_{PJ})=1.06</td>
<td>It is assumed at the time of validation and it remains same during the entire crediting period.</td>
</tr>
<tr>
<td>Methane emission potential of wastewater treatment systems equipped with biogas recovery system ($MEP_{ww,treatment,y}$)
<table>
<tr><td>y</td><td>$MEP_{ww,treatment,y}$</td></tr>
</table>
</td>
<td>$MEP_{ww,treatment,y}$ is calculated as below.

$MEP_{ww,treatment,y} = Q_{ww,y} \times (COD_{ww, untreated,y} - COD_{out, CL}) \times MCF_{ww,treatment,PJ,k} \times B_{o,ww} \times UF_{PJ}$</td>
</tr>
</table>

<table><tr><td></td><td>in tonnes</td></tr><tr><td>2012</td><td>5162</td></tr><tr><td>2013</td><td>4583</td></tr><tr><td>2014</td><td>1760</td></tr></table>	
Global warming potential of methane gas. ($GWP_{CH4,y}$) <table><tr><td></td><td>GWP CH4,y</td></tr><tr><td>y=2012</td><td>21</td></tr><tr><td>y=2013</td><td>25</td></tr><tr><td>y=2014</td><td>25</td></tr></table>	PP has considered for the first commitment period upto 2012, as 21 kg CO2/Kg CH4. PP has considered GWP of methane as 25 for the second commitment period which is in accordance with decision 4/CMP 7 as prescribed by the "Standard for application of the global warming potentials to CDM PA and PoA for the second commitment period of the Kyoto protocol" Version 1.0 (EB 69 Annex 3).
Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment system ($PE_{fugitive,ww,y}$) <table><tr><td>y</td><td>PE fugitive,ww,y) in tCO2e</td></tr><tr><td>2012</td><td>10841</td></tr><tr><td>2013</td><td>11458</td></tr><tr><td>2014</td><td>4399</td></tr></table>	$PE_{fugitive,ww,y}$ is calculated as below $PE_{fugitive,ww,y} = (1-CFE_{ww}) \times MEP_{ww,treatment,y} \times GWP_{CH4}$
Fugitive emissions through capture and utilization/combuston/flare inefficiencies in the anaerobic sludge treatment system ($PE_{fugitive,s,y}$)	As per AMS.III.H, $PE_{fugitive,s,y}$ is calculated as follows. $PE_{fugitive,s,y} = (1-CFE_s) \times MEP_{s,treatment,y} \times GWP_{CH4}$ Where $MEP_{s,treatment,y} = S_{PJ,l,y} \times MCF_{s,treatment,PJ,s} \times DOC_s \times UF_{PJ}$, $DOC_F \times F \times 16/12$ Where $S_{PJ,l,y}$ is amount of sludge treated in the project sludge treatment system equipped with biogas recovery system
Amount of sludge treated in the project sludge treatment system equipped with biogas recovery system ($S_{PJ,l,y}$) <table><tr><td>y</td><td>$S_{PJ,l,y}$ in tonnes</td></tr><tr><td>y=2012</td><td>0</td></tr><tr><td>y=2013</td><td>0</td></tr><tr><td>y=2014</td><td>0</td></tr></table>(ex-post parameter)	Since sludge is used only for land application and no sludge treatment envisaged in the project activity and the verification team confirmed that there is no sludge treatment system, it is assumed to be zero during the monitoring period. As per the validated PD, plant manager's approval signature in the log sheets ensures the accuracy of the data. The verification team has observed that there is no sludge generated in this monitoring period.
Fugitive emissions through capture and utilization/combuston/flare inefficiencies in the anaerobic sludge treatment system ($PE_{fugitive,s,y}$) =0 tCO2e	Since no sludge is zero, the emission from anaerobic sludge treatment system is zero.
Fugitive emissions on account of inefficiencies in capture systems ($PE_{fugitive,y}$); <table><tr><td>y</td><td>$PE_{fugitive,y}$ in tCO2e</td></tr><tr><td>2012</td><td>10841</td></tr><tr><td>2013</td><td>11458</td></tr><tr><td>2014</td><td>4399</td></tr></table>	$PE_{fugitive\ y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$
Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery ($PE_{s,treatment,y}$)	As per AMS.III.H v13, Methane emission from the project sludge treatment systems affected by the project activity is calculated as follows. $PE_{s,treatment,y} = Sj,PJ,y \times MCF_{ww,treatment,PJ,j} \times DOC_s \times UF_{PJ} \times DOC_F \times F \times 16/12 \times GWP_{CH4}$
Amount of dry matter in the sludge that would have been treated by the sludge	There was no treatment plant available for sludge in the project activity. Hence amount of sludge is assumed to be

<table>
<tr><td>treatment system j in the baseline scenario ($S_{j,PJ,y}$)

<table><tr><td>y</td><td>$S_{J, PJ,y}$ in tonnes</td></tr><tr><td>y=2012</td><td>0</td></tr><tr><td>y=2013</td><td>0</td></tr><tr><td>y=2014</td><td>0</td></tr></table></td><td>zero as per the validated PD. As per the validated PD, plant manager's approval signature in the log sheets ensures the accuracy of the data. The verification team has observed that there is no sludge generated in this monitoring period.</td></tr>
<tr><td>Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery ($PE_{s, treatment,y}$) =0 tCO2e</td><td>Since no sludge is zero, the emissions from project activity treatment system are zero for the monitoring period.</td></tr>
<tr><td>Emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degrable organic carbon in treated waste water ($PE_{ww,discharge,y}$)</td><td>As per the AMS.III.H v13, the formula used is as follows.
$PE_{ww,discharge,y} = Q_{ww,y} \times GWP_{CH4} \times B_{o,WW} \times UF_{PJ} \times COD_{ww,discharge,PJ,y} \times MCF_{ww, PJ, discharge}$

Where $Q_{ww,y}$ = Volume of treated water discharged into the river</td></tr>
<tr><td>Volume of treated water discharged into the river, lake or sea =0</td><td>In the project activity, the verification team has checked that the treated wastewater is discharged into the existing open lagoons. Hence no treated water is discharged into the river, hence $Q_{ww,y}$ =0.</td></tr>
<tr><td>Emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated waste water ($PE_{ww,discharge,y}$)=0 tCO2e.</td><td>Since there is no treated water discharged into the river/lake or sea, the emissions from degradable organic carbon in treated wastewater discharged in a river, sea or lake in the project activity are also zero.</td></tr>
<tr><td>Emissions from anaerobic decay of the final sludge produced ($PE_{s,final,y}$)</td><td>As per the AMS.III.H, the formula used is as follows.
$PE_{s,final,y} = S_{final,PJ,y} \times DOC_s \times UF_{PJ} \times MCF_{s, PJ,final} \times DOC_F \times F \times 16/12 \times GWP_{CH4}$
Where $S_{final, PJ, y}$ = Amount of dry matter in final sludge generated by the project wastewater treatment systems</td></tr>
<tr><td>Amount of dry matter in final sludge generated by the project wastewater treatment systems

<table><tr><td>y</td><td>$S_{final,PJ,y}$ in tonnes</td></tr><tr><td>y=2012</td><td>0</td></tr><tr><td>y=2013</td><td>0</td></tr><tr><td>y=2014</td><td>0</td></tr></table>= 0 tonne</td><td>In the project activity, the final sludge produced was proposed to be sold to the farmers for soil application. But this term is neglected as it is very small. Amount of sludge is assumed to be zero as per the validated PD. As per the validated PD, plant manager's approval signature in the log sheets ensures the accuracy of the data. The verification team has observed that there is no sludge generated in this monitoring period..</td></tr>
<tr><td>Emissions from anaerobic decay of the final sludge produced ($PE_{s,final,y}$)= 0 tCO2e</td><td>Since no sludge is generated by the project activity is neglected, emissions from anaerobic decay of the final sludge produced is zero.</td></tr>
<tr><td>Emissions due to incomplete flaring ($PE_{flaring,y}$)</td><td>Emissions due to incomplete flaring are calculated as per "Tool to determine project emissions from flaring gases containing methane" using the following formula.
$PE_{flaring,y} = TM_{RG,h} \times (1\text{-}Eff_{flare\text{-}h}) \times GWP_{CH4}$
Where $TM_{RG,h}$ Mass flow rate of methane in the residual gas in the hour
$Eff_{Flare\text{-}h}$ = Flare efficiency
GWP_{CH4} – Global warming potential of methane</td></tr>
</table>

<table>
<tr><td>Mass flow rate of methane in the residual gas ($TM_{RG,h}$) =0
Amount of biogas sent to flare at normal conditions ($BG_{TOFlare,y}$)
(deviation 3)
<table><tr><td></td><td>$TM_{RG,h,y}$</td></tr><tr><td>y=2012</td><td>0 kg/h</td></tr><tr><td>y=2013</td><td>0 kg/h</td></tr><tr><td>y=2014</td><td>0 kg/h</td></tr></table>
(ex-post parameter)</td><td>The volume of biogas flared is measured using the flow meter GM2 located at the inlet of flaring system. As per the validated PD, this parameter is to be monitored daily basis. The correction factor is applied to adjust temperature difference between NM^3 conditions and M^3 is done conservatively as per deviation 3. The verification team has checked the deviation 3 and accepted the approach as correct. Since $BG_{TOFlare,y}$ is zero, mass flow rate of methane in the residual gas is also treated as zero. There was no monitored value as it was found that the flare had never been operated.

As per the validated PD, periodic calibration of every year to be conducted by external agency. But there is no calibration done during the monitoring period. Since there was no flaring done in the monitoring period, the verification team has accepted the same as reasonable.</td></tr>
<tr><td>Temperature of the flame($T_{flare,h}$) =Not available</td><td>Since flare has never been operated, there was no data available for measurement for temperature. As per the validated PD, periodic calibration of every year to be conducted by external agency. But there is no calibration done during the monitoring period. Since there was no flaring done in the monitoring period, the verification team has accepted the same as reasonable.</td></tr>
<tr><td>Flare efficiency ($Eff_{Flare-h}$) =90%</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>Global warming potential of methane gas. ($GWP_{CH4,y}$)
<table><tr><td></td><td>$GWP_{CH4,y}$</td></tr><tr><td>y=2012</td><td>21</td></tr><tr><td>y=2013</td><td>25</td></tr><tr><td>y=2014</td><td>25</td></tr></table></td><td>PP has considered for the first commitment period upto 2012, as 21 kg CO2/Kg CH4. PP has considered GWP of methane as 25 for the second commitment period which is in accordance with decision 4/CMP 7 as prescribed by the “Standard for application of the global warming potentials to CDM PA and PoA for the second commitment period of the Kyoto protocol” Version 1.0 (EB 69 Annex 3).</td></tr>
<tr><td>Emissions due to incomplete flaring ($PE_{flaring,y}$) =0 tCO2e</td><td>$PE_{flaring,y} = TM_{RG,h} \times (1-Eff_{flare-h}) \times GWP_{CH4}$</td></tr>
<tr><td>Emissions from biomass stored under anaerobic conditions (PEbiomass,y)</td><td>As per AMS.III H v13, In case storage of biomass under anaerobic conditions takes place due to the project activity that doesn’t occur in the baseline situation, methane emissions due to anaerobic decay of this biomass shall be considered and be determined as per the procedure in the “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site.</td></tr>
<tr><td>Amount of biomass stored outside under anaerobic conditions =0 tonnes</td><td>As per the validated PD, biomass storage was not envisaged in the project activity.</td></tr>
<tr><td>Emissions from biomass stored under anaerobic conditions ($PE_{biomass,y}$) =0 tCO2e</td><td>Since there is no biomass stored outside, there would be no emission due to decay of biomass.</td></tr>
<tr><td>Project emissions as per AMS.III.H ($PE_{y, AMS.III. H}$)
<table><tr><td></td><td>PEy AMS.III. H</td></tr><tr><td>y=2012</td><td>26243</td></tr><tr><td>y=2013</td><td>44490</td></tr><tr><td>y=2014</td><td>13431</td></tr></table></td><td>$PE_{y\ AMS.III.\ H} = PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww\ discharge\ y} + PE_{s\ final\ y} + PE_{fugitive,y} + PE_{flaring\ y} + PE_{biomass,y}$</td></tr>
<tr><td>Leakage ($LE_{y, AMS.IIII.H}$)</td><td>As per AMS.IIII.H v13, if equipment is transferred from another</td></tr>
</table>

<table><tr><td></td><td>$LE_{y, AMS.III.H}$</td></tr><tr><td>y=2012</td><td>0</td></tr><tr><td>y=2013</td><td>0</td></tr><tr><td>y=2014</td><td>0</td></tr></table>	activity where the technology is used, leakage effects at the site of other activity to be considered. Since this is not the case here, leakage as per AMS.IIII.H is zero.
Emission reductions ($ER_{y, AMS.IIII.H}$) <table><tr><td></td><td>$ER_{y,AMS.IIII.H}$ intCO2e</td></tr><tr><td>y=2012</td><td>61544</td></tr><tr><td>y=2013</td><td>36147</td></tr><tr><td>y=2014</td><td>17277</td></tr></table>	As per para 31 of AMS.IIII.H v13 and validated PD, emission reduction achieved by the project activity is limited to the ex-post calculated baseline emissions minus project emissions using the actual monitored data for the project activity. Emission reductions achieved on any year are the lowest value of the following. $ER_{y, AMS.IIII.H} = \min((BE_{y,AMS.IIII.H} - PE_{y,AMS.III.H} - LE_{y, AMS.IIII.H}), (MD_y - PE_{power,y}, - PE_{biomass,y} - LE_{y,AMS.IIII.H})$
Baseline Emission ($BE_{y,AMS.I.C}$) (Deviation 1)	As per the para 15 of AMS.I.C v15, baseline emissions are estimated based on the amount of heat delivered by the equipment. $BE_{thermal,CO2,y} = (EG_{thermal,y}/Eff_{BL,thermal}) \times EF_{CO2}$. As per the validated PD, monitoring mechanism for EG thermal is not available for the measurement of baseline input/output thermal energy, a conservative approach for calculation of $BE_{thermal,CO2,y}$ has been adopted. For verification, with a quantity of dry starch that is produced during a particular year, a minimum required quantity of fossil fuel can be estimated from the quantity of fossil fuel used per unit of dry starch produced. For the same year, if the consumption of fossil fuel data is available, then the remaining energy might have supplied by biogas. This approach to estimate the fuel oil saved due to biogas generation is accepted by the verification team. It does not impact negatively either the additionality of the project activity or conservativeness of overall emission reductions. The verification team has checked this deviation and found it complies with the VCS requirements. $BE_{thermal,CO2,y} = BE_{y,AMS.I.C} = Q_{startch,y} \times Q_{FO,Starch} - q_{FO,y}) \times D_{FO} \times NCV_{FO} \times EF_{CO2}$ $Q_{startch,y}$ - Quantity of dry starch produced in year $Q_{FO,Starch}$ - Quantity of fossil fuel per unit of dry starch $q_{FO,y}$ – Quantity of fossil fuel consumed in the project activity D_{FO}- Density of fossil fuel NCV_{FO}- Net calorific value of fossil fuel EF_{CO2}- Emission factor of fossil fuel
Quantity of starch produced ($Q_{startch,y}$) <table><tr><td></td><td>$Q_{starch,y}$ in tonnes</td></tr><tr><td>y=2012</td><td>68706</td></tr><tr><td>y=2013</td><td>70318</td></tr><tr><td>y=2014</td><td>33312</td></tr></table>(ex-post parameter)	As per the validated PD, Starch production is recorded by operators on a daily basis. The production data is crosschecked with the sale receipts and found to be correct. As per the validated PD, accuracy of the parameter can assured since it is the main income source due to the project which is accepted by the verification team as reasonable. The verification team has checked production data with the sales records and found it to be satisfactory. Hence there is no calibration record for this parameter which the verification team has accepted as reasonable.
Quantity of fossil fuel per unit of dry starch($Q_{FO,Starch}$) =34.3 litre/tonne of dry starch	It is assumed at the time of validation and it remains same during the entire crediting period.
Quantity of fossil fuel consumed in the project activity($q_{FO,y}$)	As per the validated PD, fossil fuel (fuel oil) is measured continuously and recorded daily. The total volume of fuel oil is summation of oil flows through flow meter OM2 (installed at

	$q_{FO,y}$ in litres
y=2012	72870
y=2013	260997
y=2014	32597

(ex-post parameter)
Calibration record

	OM1	OM2
Serial no of the meter	4624027	20330
Max permissible error	1%	1%
Date of calibration no 1	16th May 2011 (since replaced by OM2)	22nd May 2012
Validity upto	15th May 2014	21st May 2015
Date of calibration no 2	23rd May 2012	23rd May 2012
Validity upto	22nd May 2015	22nd May 2015

inlet of boiler. OM1 is replaced since). It is measured continuously and recorded on daily basis as per the validated PD. Daily readings of each meter are calculated from the final reading of the day and initial reading of the day. Yearly reading is cumulative of daily data. Since the generation of biogas in year 2013 is lower, fossil fuel consumption is significantly higher even as starch production is almost remains the same for both the years.

The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. In addition to this calibration, the verification team has checked the fuel oil purchase records and energy balance maintained at the site which the verification team has checked and found it to be satisfactory. The verification team was able to conclude that QA/QC of the meters is ensured.

Density of fossil fuel (D_{FO})= 0.93 kG/Litre	It is assumed at the time of validation and it remains same during the entire crediting period.
Net calorific value of fossil fuel NCVFO =42.76 GJ/Tonne	It is assumed at the time of validation and it remains same during the entire crediting period.
Emission factor of fossil fuel ($EF_{CO2,fuel\ oil}$) =77.4 tCO2/TJ	It is assumed at the time of validation and it remains same during the entire crediting period.
Baseline Emission ($BE_{y,AMS.I.C}$)	$BE_{thermal,CO2,y} = BE_{y,AMS.I.C} = Q_{startch,y} \times Q_{FO,Starch} - q_{FO,y}) \times D_{FO} \times NCV_{FO} \times EF_{CO2}$

	$BE_{y,AMS.I.C}$
y=2012	7029
y=2013	6620
y=2014	3417

Project emissions ($PE_{y,AMS.I.C}$)	As per the validated PD, deviation 1 does not only estimate baseline emissions on the amount of heat by the boiler, it also takes into account CO2 emissions from the onsite consumption of fossil fuel due to the project activity. The verification team has checked the rationale and accepted as correct.

	$PE_{y,AMS.I.C}$ in tCO2e
y=2012	0
y=2013	0
y=2014	0

(Deviation 1)

Leakage ($LE_{y,AMS.I.C}$)	All the equipment used in the project activity for power and thermal generation is either already existing or brought for purpose of the project activity and there is no shifting of old equipment takes place. Hence there is no leakage either as per AMS.I.D, and AMS.I.C

	$LE_{y,AMS.I.C}$
y=2012	0
y=2013	0

<table>
<tr><td>
<table>
<tr><td>y=2014</td><td>0</td></tr>
</table>
</td><td></td></tr>
<tr><td>Emission reductions ($ER_{y, AMS.I.C}$)
<table>
<tr><td></td><td>$ER_{y,AMS.I.C}$ in tCO2e</td></tr>
<tr><td>y=2012</td><td>7029</td></tr>
<tr><td>y=2013</td><td>6620</td></tr>
<tr><td>y=2014</td><td>3417</td></tr>
</table>
</td><td>Emission reductions achieved is calculated as follows.
$ER_{y, AMS.I.C} = BE_{y,AMS.I.C} - PE_{y,AMS.I.C} - LE_{y, AMS.I.C}$</td></tr>
<tr><td>Baseline Emission ($BE_{y,AMS.I.D}$)</td><td>As per the para 9 of AMS.I.D v14, baseline emissions are MWH produced by the renewable generating unit multiplied by an emission coefficient
$BE_y = EG_y \times EF_y$
EG_y- Quantity of electricity supplied by the project activity
EF_y- Grid emission factor</td></tr>
<tr><td>Quantity of electricity supplied by the project activity (EG_y)
(Deviation a)
<table>
<tr><td></td><td>EG_y in MWh</td></tr>
<tr><td>y=2012</td><td>5741</td></tr>
<tr><td>y=2013</td><td>3072</td></tr>
<tr><td>y=2014</td><td>1945</td></tr>
</table>
(expost parameter)
Calibration record
<table>
<tr><td></td><td>EM1</td><td>EM2</td><td>EM3</td></tr>
<tr><td>Serial no of the meter</td><td>61580000N0050</td><td>HT08051884</td><td>HT09050004</td></tr>
<tr><td>Max permissible error</td><td>1%</td><td>0.5%</td><td>0.5%</td></tr>
<tr><td>Date of calibration no 1</td><td>6th Nov 2010</td><td>Not available</td><td>Not available</td></tr>
<tr><td>Validity upto</td><td>5th Nov 2013</td><td></td><td></td></tr>
<tr><td>Date of calibration no 2</td><td>23rd May 2012</td><td></td><td></td></tr>
<tr><td>Validity upto</td><td>22nd May 2015</td><td></td><td></td></tr>
</table>
</td><td>There are three gas engines as part of the project activity; one of them has a rated capacity of 952 kW and two of them have 500 kW each. As per the validated PD, electricity generated from the three gas engines is measured continuously and recorded daily. The total electricity is summation of electricity recorded from energy meters EM1, EM2 and EM3 (installed at outlet of each of the gas engines). It is measured continuously and recorded on daily basis as per the validated PD. Daily readings of each meter are calculated from the final reading of the day and initial reading of the day. Yearly reading is cumulative of daily data. The electricity supplied from the 4th gas engines (measured through EM4) is not included in the calculation as it is installed after the project got validated.

As per the validated PD, this parameter is to be measured continuously and recorded daily which is being followed in the monitoring period. The verification team has checked the measurement methods and found that plant operators first manually archive the monitored data onto the log sheets then transfer to the computer for electronic storage.

The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. There is no calibration record for meters EM2 and EM3 which is considered to be a project deviation. It does not impact negatively either the additionality of the project activity or applicable conditions and baseline. The verification team has checked this deviation and found it complies with the VCS requirements. The verification team was able to conclude that QA/QC of the meters is ensured.</td></tr>
<tr><td>Emission factor of grid (EF_y)= 0.5057 tCO2/MWh</td><td>It is assumed at the time of validation and it remains same during the entire crediting period.</td></tr>
<tr><td>Baseline Emission ($BE_{y,AMS.I.D}$)
<table>
<tr><td></td><td>BE_y in tCO2e</td></tr>
<tr><td>y=2012</td><td>2903</td></tr>
</table>
</td><td>BEy =EGy x EF y</td></tr>
</table>

y=2013	1554
y=2014	983

Project emissions ($PE_{y,AMS.I.D}$) $PE_{y,AMS.I.D}$ y=2012: 0 y=2013: 0 y=2014: 0 (Deviation 1)	As per para 13 of AMS.I.D v14, for this type of project activity, project emissions is zero.
Leakage ($LE_{y,AMS.I.D}$) $LE_{y,AMS.I.D}$ y=2012: 0 y=2013: 0 y=2014: 0	All the equipment used in the project activity for power and thermal generation is either already existing or brought for purpose of the project activity and there is no shifting of old equipment takes place. Hence there is no leakage as per AMS.I.D.
Emission reductions ($ER_{y, AMS.I.D}$) $ER_{y,AMS.I.D}$ in tCO2e y=2012: 2903 y=2013: 1554 y=2014: 983	Emission reductions achieved is calculated as follows. $ER_{y, AMS.I.D} = BE_{y,AMS.I.D} - PE_{y,AMS.I.D} - LE_{y, AMS.I.D}$
Emission reductions of the project activity (ER_y) ER_y y=2012: 71,476 y=2013: 44,321 y=2014: 21,677 Total: 137,474	Emission reductions achieved is calculated as follows. $ER_y = ER_{y,AMS.III.H} + ER_{y,AMS.I.C} + ER_{y, AMS.I.D}$

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

Refer section 4.2 above for details

4.4 Non-Permanence Risk Analysis

Not applicable for a project applying AMS.III.H, AMS.I.D, AMS.I.C or non-AFOLU projects.

5 VERIFICATION CONCLUSION

EPIC Sustainability Services Private Limited has been engaged by Southpole to perform the fourth periodic verification of the VCS project “Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi)” for the period from 01/01/2012 to 31/07/2014.

The verification was based on the validated PD, the baseline and monitoring methodology, validation reports, previous monitoring reports, previous verification reports, emission reduction spread sheets and other supporting documents made available to EPIC verification team by the project participant. The management of project proponents are responsible for the preparation and reporting of GHG emissions data, and the reported GHG emissions reduction on the basis set out within the project monitoring plan.

It is the responsibility of EPIC verification team to express an independent GHG verification opinion on the GHG emissions from the project for the monitoring period starting from 01st January 2012 to 31st July 2014 and on the calculation of GHG emission reductions from the project based on the verified emissions for the same period.

The verification was carried out in accordance with the requirements of the Validation and Verification standard Version 7.0 and VCS Standard 3.4. As a result of the verification, the verification team confirms that for the reporting period:

- all operations of the project were implemented as described in the registered PD, (project ID 430)
- the monitoring plan is in accordance with the approved monitoring methodologies applied by the project activity.
- the monitoring has been carried out in accordance with the validated PD version 3.1 dated 6th November 2009.
- the monitoring aspects (i.e. additional monitoring parameters, monitoring frequency and calibration frequency) were in place and functional, with the installed equipment essential for generating emission reduction operating appropriately and the calibration of all the equipment had been carried out accordingly and appropriate adjustments had been made when there were delays in the calibration, and
- the GHG emission reductions achieved were calculated correctly on the basis of approved monitoring methodology.

We have verified that the information included in the final monitoring report (version 2.0, dated 1st October 2014 was correct and that the emission reductions achieved had been determined correctly. In our opinion, the GHG emission reductions for the period from 1st January 2012 to 31st July 2014 stated in the latest revised monitoring report (version 2.0, dated 1st October 2014) for the project are fairly stated.

The verifier confirms that the GHG emission reductions were calculated without material misstatements for the whole monitoring period. Our opinion is based on the project's GHG emissions and resulting GHG emission reductions reported, and, to the valid and registered project baseline and monitoring documents. We confirm the following:

Verification period: From [01-January-2012] to [31-July-2014]

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

Year	Emission reduction
Year 2012	71,476 tCO2e
Year 2013	44,321 tCO2e
Year 2014 (upto 31st July 2014)	21,677 tCO2e
Total	137,474 tCO2e

Prepared by :	Approved by:
R. Vijayaraghavan	
(R. Vijayaraghavan) Verification Team Leader	(K. Sudheendra) Head-Operations

Verification checklist

Project name: Chol Charoen Group Wastewater Treatment with Biogas System I (Cholburi) Project ID: 430

TABLE 1: VERIFICATION REQUIREMENTS BASED ON CDM VVS 7.0

	Checklist Questions	Comments by verifier	Conclusion
	Compliance of the project implementation with the registered project design document		
1	Was an on-site visit conducted for this verification? If no, please justify the rationale of the decision. (Refer VVS 262)	The verification team visited physically to the sites and found that project was commissioned and running.	**OK**
2	Are all physical features of the VCS project activity proposed in the registered PDD in place? (Refer 262)	The verification team was able to confirm that all physical features of the proposed project activity matches with that mentioned in the registered PDD. However, CAR 2 is raised as follows. Please provide evidence for the installation of waste water flow meter/evidence.	**~~CAR 2~~**
3	Have the project participants operated the proposed VCS project activity as per the registered PDD or any approved revised PDD? (Refer VVS 262 and 265)	It has implemented and operated the project as per the registered PDD.	**OK**
4	For this monitoring period, what is the status of the implementation of the project? For project activities that consist of more than one site, the DOE shall describe the status of implementation and starting date of operation for each site. (Refer VVS 263 (a)	The project activity was commissioned and being operated from The project activity began on 7th January 2006.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
5	For project activities with phased implementation, what is the progress of the proposed project activity achieved in each phase under verification. If the phased implementation is delayed, describe the reasons and present the expected implementation dates; (Refer VVS 263 (a)	The project activity was commissioned and being operated from The project activity began on 7th January 2006.	**OK**
6	Describe the actual operation of the project activity. (Refer VVS 263 (b)	The project activity involves the installation and operation of a biogas recovery and utilization system (an open anaerobic effluent treatment system). 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, based on Anaerobic Fixed Film Reactor (AFFR) technology. Anaerobic bacteria in the ponds break down organic compounds in the wastewater, resulting in the release of biogas. The resulting biogas is characterized by the chemical oxygen demand of the wastewater. The implementation of AFFR system enables the recovery of biogas that would have been released to the atmosphere in the baseline scenario and the utilization of the recovered biogas for thermal and electricity generation in the project activity. However FAR 1 is raised as follows (carried over from previous verification.) The operational conditions of the dual fuel boiler need to be verified during the subsequent verifications. In case it is found that the existing boiler is replaced with new boiler during any monitoring period, no emission reduction shall be claimed for heat displacement. FAR 2 is raised as follows (carried over from previous verification.) It was observed during the site visit that the flow direction and name of the fluid was indicated on HDPE pipelines. However, the marking is not visible at some of the locations. Therefore, PP is requested to mark the fluid and its direction clearly at all locations for easy traceability. This would be verified during the next periodic verification.	 ~~**FAR 1**~~ ~~**FAR 2**~~
7	Any information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD or any approved revised PDD? (that has caused an	There are five deviation identified by the PP. The verification team has checked and all the deviations are in compliance with VCS requirements. However, CR 4 is raised as follows. Please explain the calculation of $COD_{ww,untreated,y}$, $COD_{out,CL}$, $COD_{out,lagoon.PJ}$	~~**CR 4**~~

	Checklist Questions	Comments by verifier	Conclusion
	increase in estimates of the emission reductions in the current monitoring period or is highly likely to increase the estimates of emission reductions in the future monitoring) (Refer VVS 263 (c)	and W_{CH4} from the daily available values. (Refer VER sheet; tab: ER calculation; Row 49 to 70). In doing so count is only around 170 out of possible 365 days. If in this case, the deviation 5 would come into the picture but the PP does not demonstrate the calculation method in the new monitoring report elaborately. PP has also requested to demonstrate the calculation method W_{CH4} is in line with the deviation 4 CR 5 is raised as follows. Please demonstrate that the calculation of $COD_{ww,untreated,y}$, $COD_{out,CL}$, $COD_{out,lagoon.PJ}$ and W_{CH4} is taken on the conservative manner i.e upper for project emissions and lower for baseline emissions or as the case may be. (Refer VER sheet; tab: ER calculation; Row 49 to 70).	~~CR 5~~
		CR 6 is raised as follows. PP is requested to clarify how conservative approach is followed when assuming ambient temperature of 29.04 deg C while calculating $Q_{biogas, boiler, y}$ (Refer VER sheet; tab: 2012_data; column AC) How the correction factor is being applied to adjust temperature difference Nm3 to M3	~~CR 6~~
		CAR 5 is raised as follows. It is observed at the site methane content of biogas is measured every four hours in a day (total 6 data per day) at before boiler, at the common header and at the entry to gas engines. How the same is converted into for a day in a conservative manner. Please confirm that the data at the three points are recorded at the same time. Please provide the technical specifications of the gas analyser used at those three points and explain why the values are so unstable in nature. Also confirm the actual monitoring of this parameter confirms that agreed in the validated PDD (Refer VCS PD version 3.1 dated 6th November 2009, p.42 of 70).	~~CAR 5~~

	Checklist Questions	Comments by verifier	Conclusion
		Please provide the Off season calibration certificate if any as agreed in the validated PD.(Refer VCS PD version 3.1 dated 6th November 2009, p.42 of 70)	
	Compliance of the monitoring plan with the monitoring methodology including applicable tool(s)		
	The monitoring plan of the proposed VCS project activity shall comply with the applied methodology.		
8	For monitoring aspects that are not specified in the methodology and where applicable the standardized baseline, particularly in the case of small-scale methodologies (e.g. additional monitoring parameters, monitoring frequency and calibration frequency), these should be brought to the attention of the Board issues which may enhance the level of accuracy and completeness of the monitoring plan. (Refer VVS 266)	Not applicable	**OK**
	Compliance of monitoring activities with the registered monitoring plan.		
	Determine whether the monitoring of parameters related to the GHG emissions reductions in the project activity has been implemented in accordance with the monitoring plan contained in the registered PDD or any accepted revised monitoring plan.		

	Checklist Questions	Comments by verifier	Conclusion
9	Is the monitoring plan of the VCS project activity complying with the methodology applied by the registered VCS project activity or an approved revised PDD? (Refer VVS 268)	Yes. Monitoring plan and applied methodology have been properly implemented and duly followed by PP. However, CAR 3 was raised as follows. It is observed at the site flaring of biogas is not monitored even as it is evident that flaring rate is zero. But PP is requested that how the actual monitoring plan conforms to that agreed in the validated PDD (Refer VCS PD version 3.1 dated 6th November 2009 and page no 24 of MR). Please provide when was the last, biogas was sent to flare with evidence to support the same. CR 7 is raised as follows. PP is requested to provide actual GHG performance protocol included for calibration of equipments as described in the PDD (Refer VCS PD version 3.1 dated 6th November 2009, p.46 of 70) CR 8 is raised as follows. Please provide the Log sheets and plant record of sludge removal with plant manager's approval signature. (Refer VCS PD version 3.1 dated 6th November 2009, p.44 of 70)	~~CAR 3~~ ~~CR 7~~ ~~CR 8~~
10	Has the monitoring plan been properly implemented and followed by the project participants? (Refer VVS 269 (a)	Yes. Monitoring plan and applied methodology have been properly implemented and duly followed by PP	**OK**
11	Have all parameters stated in the monitoring plan, and relevant Executive Board decisions been sufficiently monitored and updated as applicable, including: (Refer VVS 269 (b)		

	Checklist Questions	Comments by verifier	Conclusion
	i) project emission parameters	Yes. Project related emissions are calculated as per validated PD. However CAR 1 is raised as follows. PP is requested to provide documents to support the connected load of 139.25 kW installed in the project activity (Refer VER sheet; Tab: nameplate details; Cell E40) and explain factor of 10% accounted in the calculation of Electricity consumption by the wastewater treatment plant. CAR 6 is raised as follows. Please confirm the formula used in the calculation $BE_{ww,\ treatment,\ y}$ for the year 2013 and 2014 with due consideration of GWP of methane assumed for the years 2013 and 2014. (Refer VER sheet; tab: ER calculation; Cell H6 and I6)	~~CAR 1~~ ~~CAR 6~~
	ii) baseline emission parameters	Baseline emission is based on the validated methodology and the verification team concludes that baseline emission is calculated as per requirements. However CR 1 is raised as follows. If data is not available or not measured for (FM1, FM2 and FM3) as observed from the VER sheet for 2012, 2013 and 2014, how the same is estimated for that particular day. How the data is conservatively used in the overall data. CR 3 is raised as follows. It is observed from the onsite that there is no monitoring of COD for some days (for e g. Refer VER sheet; Tab: 2012_data; Columns 4,5,6,7). If in this case, the deviation 5 would come into the picture but the calculation method is not clear by reading the new monitoring report VER sheet.	~~CR 1~~ ~~CR 3~~
	iii) leakage parameters	This parameter was adequately justified in the monitoring report.	**OK**
	iv) Management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan?	It is demonstrated that project management system procedures, including responsibility and authority of monitoring and reporting activities are comply with registered monitoring plan.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
12	Has the equipment used for monitoring is in accordance with section 4 below and is controlled and calibrated in accordance with the monitoring plan, the applied methodology, the applied standardized baseline, the Board guidance, local/national standards, or as per the manufacturer's specification? (Refer VVS 269 (c)	It is found that there is all the meters are calibrated and actual error is less than the permissible level thus QA/QC is assured.	**OK**
13	Are monitoring results consistently recorded as per approved frequency? (Refer VVS 269 (d)	Yes. But the frequency of calibration of Energy meters is mentioned explicitly in the monitoring report.	**OK**
14	Have quality assurance and quality control procedures been applied in accordance with the monitoring plan or revised monitoring plan? (Refer VVS 269 (e)	It is clearly indicated that in the monitoring report the activities related to the project, e.g. Measurement, calculation, reporting complies with the procedures defined in the registered PD and applied methodology	**OK**
	Compliance with the calibration frequency requirements for measuring instruments.		
	Determine whether the calibration of those measuring equipments that have an impact on the claimed emission reductions is conducted by the project participants at a frequency specified in the applied monitoring methodology, the applied standardized baseline and/or the monitoring plan.		
15	Identify if there is any monitoring equipment not calibrated in accordance with the monitoring plan, the applied monitoring methodology, the Board guidance, local/national standards, or as per the manufacturer's specification? (Refer VVS 272)	There is no such meter.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
16	If there is delayed and the calibration has been implemented after the monitoring period in consideration (i.e. the results of delayed calibration are available), has the following conservative approach adopted in the calculation of emission reductions: (a) Applying the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error; or	It is found that there is no calibration due for any of the meter. However CR 2 is raised as follows. Any external lab report (to ensure accuracy) Chemical oxygen demand of wastewater entering the treatment plant as agreed in the PDD. CAR 4 is raised as follows. Please provide the calibration certificates for OM1 for measuring quantity of fossil fuel used in the boiler. And please provide fuel purchase invoices and energy balance also for crosschecking. (Refer VCS PD version 3.1 dated 6th November 2009, p.43 of 70) CAR 7 is raised as follows. PP is not demonstrated in the monitoring report that the actual error of the all the meters found through the calibration is less than the maximum permissible error of the meter	~~CR 2~~ ~~CAR 4~~ ~~CAR 7~~
17	(b) Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment. (Refer VVS 283)	It is found that there is all the meters are calibrated and actual error is less than the permissible level thus QA/QC is assured.	**OK**
18	Confirm that the error has been applied: (a) In a conservative manner, such that the adjusted measured values of the delayed calibration shall result in fewer claimed emission reductions;	It is found that there is all the meters are calibrated and actual error is less than the permissible level thus QA/QC is assured.	**OK**
	(b) For all measured values taken during the period between the scheduled date of calibration and the actual date of calibration. (Refer VVS 283)	It is found that there is all the meters are calibrated and actual error is less than the permissible level thus QA/QC is assured.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
19	In cases where the results of the delayed calibration are not available, or the calibration has not been conducted at the time of verification, the verification team, prior to finalizing verification, shall request the project participants to conduct the required calibration and shall determine whether the project participants have calculated the emission reductions conservatively using the approach mentioned in paragraph 4.2 above. (Refer VVS 275)	It is found that there is all the meters are calibrated and actual error is less than the permissible level thus QA/QC is assured.	**OK**
20	In cases where the verification team determines that it is not possible for the project participants to conduct the calibration at a frequency specified by either the applied methodology, the applied standardized baseline, guidance provided by the Board, and/or the registered monitoring plan due to reasons beyond the control of project participants (For example, due to the contractual terms between the project participant and purchasing/selling entities), the verification team, shall follow the requirements for post registration changes in section of E of the VVS. (Refer VVS 276)	It is found that there is all the meters are calibrated and actual error is less than the permissible level thus QA/QC is assured.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
21	In cases where neither the applied monitoring methodology, where applicable, the applied standardized baseline nor the monitoring plan specify any requirements for calibration frequency for measuring equipments, the verification team shall determine whether the equipments are calibrated either in accordance with the specifications of the local/national standards, or as per the manufacturer's specification. If neither local/national standards nor the manufacturer's specification are available, international standards may be used. Refer to appendix 1 of the VVS for an illustrative example to apply the above requirements. (Refer VVS 277)	It is found that there is all the meters are calibrated and actual error is less than the permissible level thus QA/QC is assured.	**OK**
	Assessment of data and calculation of emission reductions		
	Assess the data and calculations of GHG emission reductions achieved by/resulting from the project activity by the application of the selected methodology and, where applicable, the applied standardized baseline.		
22	If only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, the verification team shall raise a CAR for the project participants to comply with the requirements of Appendix 1 of the Project Standard or submit a request for deviation prior to submitting the request for issuance, if appropriate; (Refer VVS 280 a)	Not applicable	**OK**

	Checklist Questions	Comments by verifier	Conclusion
23	Has information provided in the monitoring report been crosschecked with other sources such as plant log books, inventories, purchase records, laboratory analysis? (Refer VVS 280 b)	It is crosschecked as per the procedures given in validated PD.	**OK**
24	Have calculations of baseline emissions, proposed VCS project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and methods described in the monitoring plan, the applied methodology and where applicable, the applied standardized baseline? (Refer VVS 280 c)	Yes, the calculations of baseline emissions, project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and methods described in the monitoring plan.	**OK**
25	Any assumptions used in emission calculations? If yes, they been justified? (Refer VVS 280 d)	Yes, the calculations of baseline emissions, project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and methods described in the monitoring plan.	**OK**
26	Have appropriate emission factors, IPCC default values and other reference values been correctly applied? (Refer VVS 280 e)	Yes. Appropriate values are assumed with support which is acceptable.	**OK**
27	For a registered VCS project activity using an approved standardized baseline that standardizes baseline emissions, have the standardized value(s) of the parameter(s) are applied using the correct version of the applied standardized baseline in accordance with the Project standard. (Refer VVS 280 f)	Not applicable.	**OK**
	Post registration changes **Temporary deviations from the registered monitoring plan, monitoring methodology and/or standardized baseline**		

	Checklist Questions	Comments by verifier	Conclusion
28	Where the deviation is identified during verification, the DOE shall indicate in the verification report how the monitoring report reflects the application of the approved guidance from the Board regarding the deviation from the provisions of the registered monitoring plan, the applied methodology and /or the applied standard-ized baseline. (Refer VVS 290)	Not applicable	**OK**
29	Where the deviation is identified prior to verification, the DOE shall state its opinion on whether the deviation reflects the application of the approved guidance from the Board regarding the deviation from the provisions of the registered monitoring plan, the applied methodology and /or the applied standard-ized baseline and as per the applicable provisions of the Project Standard. (Refer VVS 291)	Not applicable.	**OK**
	Corrections		
30	If the DOE identifies that the project participants have made corrections to project information or parameters determined at validation, the DOE shall determine whether: (a) The corrected information is an accurate reflection of actual project information; and/or (Refer VVS 293 a)	Not applicable.	**OK**
31	The corrected parameters are in accordance with the applied methodology the monitoring plan and /or the applied standardized base-line. (Refer VVS 293 b)	Not applicable.	**OK**
	Changes to the start date of the crediting period		

	Checklist Questions	Comments by verifier	Conclusion
32	The DOE shall indicate if the requirements in the Project standard have been met and shall submit a request for post registration changes in accordance with the Project cycle procedure. (Refer VVS 296)	Not applicable.	**OK**
	Permanent changes from the registered monitoring plan or monitoring methodology		
33	The DOE shall determine whether the changes to the monitoring plan contained in the registered PDD proposed by the project participants are in compliance with the applied methodology and, where applicable, the applied standardized baseline and do not reduce the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan. (Refer VVS 298)	Not applicable.	**OK**
34	In cases where the proposed changes refer to a later version of the applied methodology and /or the applied standardized baseline in the registered PDD, the DOE shall determine whether the application of any later version of the applied methodology any applicable tool(s) and/or the applied standardized base-line does not impact the conservativeness of the monitoring and verification process, including the related emission reduction calculations. (Refer VVS 299)	Not applicable.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
35	If the DOE identifies that the project participants are unable to implement the monitoring plan contained in the registered PDD and it will not be possible to monitor the registered VCS project activity in accordance with a monitoring plan that would comply with the applied methodology any applicable tools, and, where applicable, the standardized baseline or the relevant provisions of appendix 1 of the Project standard, the DOE shall request guidance from the Board concerning the acceptability of the permanent changes in accordance with the section on post registration changes in the Project cycle procedure. (Refer VVS 300)	Not applicable.	**OK**
36	The DOE shall determine whether the permanent changes are likely to lead to a reduction in the accuracy of the calculation of emission reductions. In cases where the DOE considers that the permanent changes will lead to a reduction in the accuracy of the calculation of emission reductions, the DOE shall request the project participants to apply conservative assumptions or discount factors to the calculations to the extent required to ensure that emission reductions will not be over-estimated as a result of the permanent change. (Refer VVS 301)	Not applicable.	**OK**
	Changes to the project design of a registered project activity		

	Checklist Questions	Comments by verifier	Conclusion
37	If the DOE identifies that the project design in the implementation or operation of the project activity does not conform with the description contained in the registered PDD or the relevant provisions of appendix 1 of the Project standard, the DOE shall request guidance from the Board concerning the acceptability of the proposed or actual changes in accordance with the section on post registration changes in the Project cycle procedure. (Refer VVS 305)	Not applicable.	**OK**
38	In case of actual changes, the DOE shall, by means of an on-site visit and review of the submitted revised PDD by the project participants, which describes the nature and extent of the actual changes, determine whether this description accurately reflects the implementation, operation and monitoring of the modified project activity. (Refer VVS 306)	Not applicable.	**OK**
39	The DOE shall conduct an on-site inspection to assess the impacts of the actual changes on the compliance of the monitoring plan, the level of accuracy of the monitoring activity, the applied monitoring methodology and including applicable tool(s) and/or, where applicable, the applied standardized baseline. (Refer VVS 307)	Not applicable.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
40	The DOE shall, by means of reviewing the revised PDD against applicable additionality and methodological requirements, determine whether the proposed or actual changes would adversely affect the conclusions of the validation report of the registered PDD with regard to: (a) Additionality of the project activity; (b) Scale of the project activity; (c) Applicability and application of the approved baseline methodology and, where applicable, the approved standardized base-line under which the project activity has been registered; or (d) The compliance of the monitoring plan with the applied monitoring methodology and, where applicable, the applied standardized baseline (Refer VVS 308)	Not applicable.	**OK**
41	If the proposed or actual changes affect the additionality of the project activity then the DOE shall confirm that: (a) In the case of investment analysis, project participants have only modified the key parameters in the original spreadsheet calculations affected by the proposed or actual changes to the project activity; (b) In the case where only barriers have been claimed to demonstrate additionality, project participants have demonstrated that the barriers are still valid under the new circumstances. (Refer VVS 309)	Not applicable.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
42	For registered VCS project activity using an approved standardized baseline that standardizes additionality:- If the proposed or actual changes affect the additionality of the project activity then the DOE shall confirm that the project activity complies with the positive list of the applied standardized baseline in the registered PDD. (Refer VVS 309)	Not applicable.	**OK**
43	The DOE shall confirm that the applied methodology including applied tools and/or the applied standardized baseline do not impact the conservativeness of the monitoring and verification process and the related emission reduction calculations in cases where: (a) The proposed or actual changes impact the implementation of the project activity; (b) The original methodology and/or the original standardized baseline would no longer be applicable; and (c) The project participant applies: (i) A later version of the methodology and/or the standardized baseline; or (ii) Another methodology and/or another standardized baseline that is(are) applicable to the project activity. (Refer VVS 310)	Not applicable.	**OK**

	Checklist Questions	Comments by verifier	Conclusion
44	The DOE shall assess whether the revised PDD complies with: (a) The applied methodology, tools and/or standardized baseline; (b) Any later version of the methodology and/or the standardized baseline; or (c) The requirements of another methodology and/or another standardized baseline that is(are) applicable to the project activity. (Refer VVS 311)	Not applicable.	**OK**

Table 2 Resolution of CARs and CRs

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
CAR 1 PP is requested to provide documents to support the connected load of 139.25 kW installed in the project activity (Refer VER sheet; Tab: nameplate details; Cell E40) and explain factor of 10% accounted in the calculation of Electricity consumption by the wastewater treatment plant.	**S.No 11**	**1st response;** As per reference in eq.8 , pg. 53 of the registered PD , *Taking into account the distribution losses, 10% has been added to the total electricity consumption*. The reference for 139.25 is in VER sheet , tab "Nameplate Capacity".	The verification team has reviewed the nameplate provided by the PP. It is assumed that all the electrical appliances are running at full capacity for the entire period. The nameplate details of the electrical load is verified and found to be 139.25 kW. Distribution losses: It is assumed at the time of validation and it remains same during the entire crediting period. Conclusion: CAR 1 is closed.
CR 1 If data is not available or not measured for (FM1, FM2 and FM3) as observed from the VER sheet for 2012, 2013 and 2014, how the same is estimated for that particular day. How the data is conservatively used in the overall data.	**S.No 11**	**1st response;** There is no estimating for unavailable data. The missing data is not in included in the calculation. It is conservative since the reduction of wastewater and biogas quantity , decreased the ER results.	The verification team has accepted the argument that in the absence of data, overall emission reduction would result in a conservative value decrease which is accepted. Conclusion: CR 1 is closed.
CR 2 Any external lab report (to ensure accuracy) Chemical oxygen demand of wastewater entering the treatment plant as agreed in the PD.	**S.No 16**	**1st response;** The test report has been submitted via email on 12-Sep-14.	PP has sent the wastewater samples to external lab to compare the internal readings. The results are found to be satisfactory. Conclusion: CR 2 is closed.
CR 3	**S.No 11**	**1st response on 31 October 2014 ;**	It has to be measured daily as per the validated PD using colorimetric analysis at

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
It is observed from the onsite that there is no monitoring of COD for some days (for e g. Refer VER sheet; Tab: 2012_data; Columns 4,5,6,7). If in this case, the deviation 5 would come into the picture but the calculation method is not clear by reading the monitoring report v 1.0 and VER sheet.		The deviation with explanation in the calculation, together with reference to guideline is provided in MR. This deviation has been also applied in the previous verification.	the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted. Lower bound value = Mean value- t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (nm-1) Conclusion: CR 3 is closed.
CAR 2 Please provide evidence for the installation of waste water flow meter/evidence.	**S. No. 2**	**1st response;** The flow meter has been installed in the since the 2nd monitoring period. There is no evidence since the DOE checked the date at the calibration label on the meters during site visit.	The verification team has accepted the argument of PP. Conclusion: CAR 2 is closed.
CR 4 Pls explain the calculation of $COD_{ww,untreated,y}$, $COD_{out,CL}$, $COD_{out,lagoon.PJ}$ and W_{CH4} from the daily available values. (Refer VER sheet; tab: ER	**S.No. 7**	**1st response;** The deviated approach is clearly explained the calculating steps of deviation 4 for COD and deviation 5 for	$COD_{ww,untreated,y}$: It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
calculation; Row 49 to 70). In doing so count is only around 170 out of possible 365 days. If in this case, the deviation 5 would come into the picture but the PP does not demonstrate the calculation method in the new monitoring report elaborately. PP has also requested to demonstrate the calculation method W_{CH4} is in line with the deviation 4		$W_{CH4.}$ The calculation is the standard statistic calculation , with reference to Annex 13 of EB 48. 1) Calculate sample mean (μ). 2) Calculate the sample standard deviation (σ). 3) Calculate the 95% confidence interval.	calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted. Lower bound value = Mean value- t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (nm-1) $COD_{out,CL}$ & $COD_{out,lagoon.PJ:}$ It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for project emission calculation, upper bound value is used for the calculation which is considered conservative and hence accepted. Upper bound value = Mean value + t x

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
			standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (nm-1) Methane content: As per the validated PD, methane content will be measured continuously. But the readings are not stable when connected online. Hence the monitoring of this parameter is the periodic measurement by the portable gas analyzer at 95% confidence level. The measuring is conducted at three locations (common header, boiler inlet and gas engine inlet). The monitored data is adjusted for 95% confidence level. The verification team has checked the approach and accepted the deviation as it complies with the VCS requirements. (Deviation 4). The readings are measured at three places as mentioned above every four hours and average value is considered for calculation. The final average is adjusted as per deviation 4 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted. Lower bound value = Mean value- t x standard deviation/count Where Mean value- Final average

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
			t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1) Conclusion: CR 4 is closed.
CR 5 Please demonstrate that the calculation of $COD_{ww,untreated,y}$, $COD_{out,CL}$, $COD_{out,lagoon.PJ}$ and W_{CH4} is taken on the conservative manner i.e upper for project emissions and lower for baseline emissions or as the case may be. (Refer VER sheet; tab: ER calculation; Row 49 to 70).	**S.No 7**	**1st response ;** The conservativeness is demonstrated in the justification of the deviated approach in MR. Deviation 4 ; This approach is according to item.36 of AMS III.H version 13 that *"The fraction of methane in the gas should be measured with a continuous gas analyzer , or , alternatively, with periodically measurement at 95% confidence level"* To be inline with conservative principle , the upper bound value is used for project emission calculation. While the lower bound value is used for baseline emission calculation. Deviation 5 ; Refer to table III.H.2 of AMS III.H version16 , for COD parameters : *Average value may be used through sampling with the confidence/precision level 90/10* .	$COD_{ww,untreated,y}$: It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted. Lower bound value = Mean value- t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (nm-1) $COD_{out,CL}$ & $COD_{out,lagoon.PJ}$: It has to be measured daily as per the validated PD using colorimetric analysis at the lab located at the project site. It is not measured daily. The average value is calculated from the available data. The final

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
			average is adjusted as per approach adjusted as per deviation 5 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for project emission calculation, upper bound value is used for the calculation which is considered conservative and hence accepted. Upper bound value = Mean value + t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (nm-1) Methane content: As per the validated PD, methane content will be measured continuously. But the readings are not stable when connected online. Hence the monitoring of this parameter is the periodic measurement by the portable gas analyzer at 95% confidence level. The measuring is conducted at three locations (common header, boiler inlet and gas engine inlet). The monitored data is adjusted for 95% confidence level. The verification team has checked the approach and accepted the deviation as it complies with the VCS requirements. (Deviation 4). The readings are measured at three places as mentioned above every four hours and average value is considered for calculation. The final average is adjusted as per

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
			deviation 4 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted. Lower bound value = Mean value- t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1) Conclusion: CR 5 is closed.
CR 6 PP is requested to clarify how conservative approach is followed when assuming ambient temperature of 29.04 deg C while calculating $Q_{biogas, boiler, y}$ (Refer VER sheet; tab: 2012_data; column AC) How the correction factor is being applied to adjust temperature difference Nm3 to M3	**S.No 7**	**1st response ;** Please refer to deviation 4 in the registered PD or deviation 3 in MR. The deviation was established during the validation and mentioned in the PD which is effective for the whole monitoring period.	Total biogas consumed is summation of biogas consumed in the boiler (measured by flow meter GM1) and generator set (measured by flow meter GM3). The value measured through GM1 is available in M^3 and therefore temperature adjustment as per deviation 3 is required whereas GM3 measures in NM^3 and hence no adjustment is required. Adjustment factor is done as follows V2 = V1 x 273 /(273 +29.04) Where V2 in value in NM3 V1 in value in M3 29.04 refers to ambient temperature The verification team has checked the deviation 3 and accepted the approach as

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
			reasonable. Since the deviation 3 does not affect additionality and conservativeness in the calculation of the overall emission reductions, the verification team has accepted this deviation Conclusion: CR 6 is closed.
CAR 3 It is observed at the site flaring of biogas is not monitored even as it is evident that flaring rate is zero. But PP is requested that how the actual monitoring plan conforms to that agreed in the validated PDD (Refer VCS PD version 3.1 dated 6th November 2009 and page no 24 of MR). Please provide when was the last, biogas was sent to flare with evidence to support the same	**S.No 9**	**1st response ;** The monitoring equipment , flow meter and flame detector has been installed. It can be checked and inspected during site visit. The monitoring record will be available for flare efficiency only when the flare is in operation. Because the flare has never been ignited, so the record is not done.	The volume of biogas flared is measured using the flow meter GM2 located at the inlet of flaring system. As per the validated PD, this parameter is to be monitored daily basis. The correction factor is applied to adjust temperature difference between NM^3 conditions and M^3 is done conservatively as per deviation 3. Adjustment factor is done as follows V2 = V1 x 273 /(273 +29.04) Where V2 in value in NM^3 V1 in value in M^3 29.04 refers to ambient temperature The verification team has checked the deviation 3 and accepted the approach as reasonable. Since the deviation 3 does not affect additionality and conservativeness in the calculation of the overall emission reductions, the verification team has accepted this deviation. On enquiry with the project owner, biogas generated is just sufficient for boiler and gas engines and there is no excess biogas storage system and even if some excess biogas available, it is being stored in covered lagoon 3. Hence

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
			there is no need for flaring. As per the validated PD, this parameter is to be measured continuously and recorded daily which is being followed in the monitoring period. The verification team has checked the measurement methods and found that plant operators first manually archive the monitored data onto the log sheets then transfer to the computer for electronic storage. The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. The verification team was able to conclude that QA/QC of the meters is ensured. Conclusion: CAR 3 is closed.
CAR 4 Please provide the calibration certificates for OM1 for measuring quantity of fossil fuel used in the boiler. And please provide fuel purchase invoices and energy balance also for crosschecking. (Refer VCS PD version 3.1 dated 6th November 2009, p.43 of 70)	**S.No 16**	**1st response ;** It has been agreed with DOE since the 1st verification that the QA/QC of this parameter can be ensured by calibration of meter every 3 years. Because the invoices could not reflected the actual consumption since the stock checking at the storage tank is concerned. This can be checked in the previous MRs. The calibration report has been submitted since 21-Aug in dropbox	The verification team has accepted the argument of PP and accepted. As per the validated PD, fossil fuel (fuel oil) is measured continuously and recorded daily. The total volume of fuel oil is summation of oil flows through flow meter OM2 (installed at inlet of boiler. OM1 is replaced since with OM1). It is measured continuously and recorded on daily basis as per the validated PD. Daily readings of each meter are calculated from the final reading of the day and initial reading of the day. Yearly reading is cumulative of

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
			daily data. The verification team has checked the calibration certificates against meter number, serial number, date of calibration, validity and actual error and found that meters are having sufficient validity covering this monitoring period. The actual error is less than that of maximum permissible error hence accepted. The verification team was able to conclude that QA/QC of the meters is ensured. The verification team has accepted the argument of PP about stocking of fuel and energy balance (for every 1 ton of starch 34.3 litres of fuel is combusted). Conclusion: CAR 4 is closed.
CAR 5 It is observed at the site methane content of biogas is measured every four hours in a day (total 6 data per day) at before boiler, at the common header and at the entry to gas engines. How the same is converted into for a day in a conservative manner. Please confirm that the data at the three points are recorded at the same time. Please provide the technical specifications of the gas analyser used at those three points and explain why the values are so unstable in nature. Also confirm the actual monitoring of this parameter confirms that agreed in the validated PDD (Refer VCS PD version 3.1 dated 6th November 2009, p.42 of	**S.No 7**	**1st response ;** The raw methane data has been submitted via e-mail on 21-Sep , name raw data file. The CH_4 record is in tab Gen-12 , Gen-13 with time of measuring. From PD , *1st verification period: periodical measurements using portable gas analyser at 95% confidence level. Reading is taken by the plant"s operators every four hours at three locations i.e. at common gas header before cleansing, before the boiler and before the gas engine.*	Methane content: As per the validated PD, methane content will be measured continuously. But the readings are not stable when connected online. Hence the monitoring of this parameter is the periodic measurement by the portable gas analyzer at 95% confidence level. The measuring is conducted at three locations (common header, boiler inlet and gas engine inlet). The monitored data is adjusted for 95% confidence level. The verification team has checked the approach and accepted the deviation as it complies with the VCS requirements. (Deviation 4). The readings are measured at three places

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Ref. to checklist question in table 1	Response from project participant	Verification team conclusion
70). Please provide the Off season calibration certificate if any as agreed in the validated PD.(Refer VCS PD version 3.1 dated 6th November 2009, p.42 of 70)		Because the gas analyzer did not work properly due to technical limitation of the equipment. It has been agreed since the 1st verification to continuously apply this approach in the next verification. The calibration certificate and technical sheet for gas analyzer has been submitted via dropbox since 21-Aug.	as mentioned above every four hours and average value is considered for calculation. The final average is adjusted as per deviation 4 through estimation using 95% confidence level. The verification team has checked the rationale and factors used in the calculation of the final adjusted value and accepted. Since this value is used for baseline calculation, lower bound value is used for the calculation which is considered conservative and hence accepted. Lower bound value = Mean value- t x standard deviation/count Where Mean value- Final average t- value from standard t distribution for a confidence level of 95% with degrees of freedom (n_m-1) Conclusion: CR 5 is closed.
CAR 6 Please confirm the formula used in the calculation $BE_{ww,\ treatment,\ y}$ for the year 2013 and 2014 with due consideration of GWP of methane assumed for the years 2013 and 2014. (Refer VER sheet; tab: ER calculation; Cell H6 and I6)	**S.No 11**	**1st response ;** Please review section 3.1of MR , GWP table , explanation is provided ; 2013 : Annex EB 69 ; *STANDARD FOR APPLICATION OF THE GLOBAL WARMING POTENTIALS TO CLEAN DEVELOPMENT MECHANISM PROJECT ACTIVITIES AND PROGRAMMES OF ACTIVITIES FOR THE SECOND COMMITMENT PERIOD OF THE KYOTO PROTOCOL*	PP has considered for the first commitment period upto 2012, as 21 kg CO2/Kg CH4. PP has considered GWP of methane as 25 for the second commitment period which is in accordance with decision 4/CMP 7 as prescribed by the “Standard for application of the global warming potentials to CDM PA and PoA for the second commitment period of the Kyoto protocol” Version 1.0 (EB 69 Annex 3). Conclusion: CAR 6 is closed.
CAR 7	**S.No 16**	**1st response ;**	The verification team has checked the calibration certificates and observed that the

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PP is not demonstrated in the monitoring report that the actual error of the all the meters found through the calibration is less than the maximum permissible error of the meter.		Calibration certificates for all the meters are provided to the verification team.	actual error is less than the maximum permissible error. Conclusion: CAR 7 is closed.
CR 7 PP is requested to provide actual GHG performance protocol included for calibration of equipments as described in the PDD (Refer VCS PD version 3.1 dated 6th November 2009, p.46 of 70)	**S.No 9**	**1st response ;** The document is provided.	The verification team has checked the GHG protocol and accepted the same. Conclusion: CR 7 is closed.
CR 8 Please provide the Log sheets and plant record of sludge removal with plant manager's approval signature. (Refer VCS PD version 3.1 dated 6th November 2009, p.44 of 70)	**S.No.9**	**1st response ;** There is no record because no excess sludge was removed.	The verification team has checked the argument of PP and accepted the same. Conclusion: CR 8 is closed.
FAR 1 (carried from the previous verification period) The operational conditions of the dual fuel boiler need to be verified during the subsequent verifications. In case it is found that the existing boiler is replaced with new boiler during any monitoring period, no emission reduction shall be claimed for heat displacement.	**S. No 6**	**1st response ;** There is no changing in the boiler in this monitoring period.	Since there is no change in the boiler design in this monitoring period, such a case did not occur in this verification period. Conclusion: FAR 1 is closed for this verification period.
FAR 1.1 (carrying over to the next verification period) However, the aspect of FAR 1 may be checked during the next verification period also.	**S. No 6**	**1st response:** PP accepts and would demonstrate operational conditions of the boiler to the next verification period also.	FAR 1.1 is open for the next verification period
FAR 2 (carried from the previous verification period) It was observed during the site visit that the flow direction and name of the fluid was indicated on HDPE pipelines. However, the marking is not visible at some of the locations. Therefore, PP is requested to mark the fluid and its direction clearly at all locations for easy traceability. This would be verified	**S. No 6**	**1st response ;** All the flow direction and name of fluid such as wastewater line, biogas flow line, oil and are clearly marked which was showed to the verification team.	The verification team has checked the lines for wastewater, biogas, fuel oil and direction during the onsite and accepted as satisfactory. However, the same may be checked for regular maintenance during the next verification period also. Conclusion:

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during the next periodic verification.			FAR 2 is closed for this verification period.
FAR 2.1 (carrying over to the next verification period) The visibility of the marking for the flow directions and name of the fluid on the HDPE pipelines needs to be verified for the subsequent verification.	**S. No 6**	PP informs that the markings would be maintained even for next verification period.	FAR 2.1 is open for the next verification period