Monitoring report form
(Version 03.1)

Monitoring report

Title of the project activity	Energeticos Jaremar – Biogas recovery from Palm Oil Mill Effluent (POME) ponds, and heat & electricity generation, Honduras
Reference number of the project activity	1483
Version number of the monitoring report	1
Completion date of the monitoring report	03/08/2013
Registration date of the project activity	08/03/2008
Monitoring period number and duration of this monitoring period	4th monitoring period 01/01/2011 – 31/12/2012
Project participant(s)	Energéticos Jaremar, S.A. de C.V. (private entity) CF Carbon Fund II Limited (private entity)
Host Party(ies)	Honduras
Sectoral scope(s) and applied methodology(ies)	AMS III.H - Methane Recovery in Wastewater Treatment /Version 05_Scope 13_EB31. AMS I.C - Thermal Energy for User with or without electricity/Version 11_Scope 1_EB32.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	**110 377**
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	**126 843**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The project activity involves the recovery and energetic use of biogas. The biogas is originally produced by the palm oil mill effluent (POME) ponds at Agrotor palm oil mill located in Honduras. The effluent waste water treatment system converts the organic content of the waste water to biogas. As part of the biogas, methane is formed and, without this project activity, would have been released into the atmosphere. The CDM-project activity established a biogas recovery system which covers the lagoons with floating plastic membranes. This system captures the biogas, which is then utilised on-site for the production of heat & electricity for internal processes of Agrotor's production facility.

The recovered biogas is primarily fed into several boilers for the production of heat and into the biogas turbine for generation of electricity. Biogas that is not used for the generation of heat and electricity will be flared. Biogas replaces bunker consumption of the boilers at the refinery located near the palm oil mill. The electricity produced by biogas generation system will replace electricity imports from the grid. All electricity generated will be used at the palm oil mill and the refinery.

The total amount of CERs achieved during this monitoring period is **126 843** tCO_2eq.

A.2. Location of project activity

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The project is located at the Tela Community in San Alejo Village, Atlantida Departament in Honduras. The precise coordinates for the project are N 15° 43.41' and W 87°35.4' The project is delineated by mainly African palm plantations, and the San Alejo River.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (as applicable)**	**Indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Honduras (host)	Private entity - Energéticos Jaremar, S.A. de C.V.	No
United Kingdom of Great Britain and Northern Ireland	CF Carbon Fund II Limited	No

A.4. Reference of applied methodology

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Methane recovery

Methodology: AMS III.H

Title: Methane Recovery in Wastewater Treatment

Reference: '*Methane recovery in wastewater treatment'* approved small-scale CDM baseline methodology III.H./Version 05_Scope 13_EB31.

Heat generation

Methodology: AMS I.C

Title: Thermal Energy for User with or without electricity

Reference '*Thermal energy for the user with or without electricity'* approved small-scale CDM baseline methodology I.C./Version 11_Scope 1_EB32.

Main tools

"*Tool to determine project emissions from flaring gases containing methane*". Version 1. EB 28 annex 13. December 15 2006.

A.5. Crediting period of project activity

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08/03/2008 – 07/03/2015 (Renewable)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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The project is fully implemented according to the description in the registered PDD.

I) Methane recovery

The project activity involves the covering of two existing open anaerobic lagoons with a high density polyethylene (HDPE), linear low-density polyethylene (LLDPE), or ethylene propylene dimonomer (EPDM) liner, which resists bad weather and provide a system to evacuate accumulated rainwater. The cover is anchored along the edge of each lagoon to guarantee that they are hermetically sealed. This cover will prevent the release of biogas to the atmosphere. The biogas recovery system is managed in order to establish optimal operation conditions. Before both the lagoons were covered, they were adapted to assure ease of maintenance and steady biological conditions throughout the project's lifetime. Measures under this adaptation include an increase of the treatment capacity, installation of an internal mixing system and a refurbishment of the old sludge removal system. A piping system was installed which serves as a by-pass in case of malfunctions or maintenance. Old pumps and piping are used in the project.

Sludge management: There is no dewatering process for the complete treatment system. A sludge removal unit was installed to avoid the progressive accumulation of sludge at the bottom of the lagoons, which could have affected the methane capture capacity. Surplus sludge is continuously circulated to the digester system and is occasionally removed from the recirculation cycle.

Removed sludge is dried on dedicated fields used as fertilizer. The project proponent uses the sludge for land application to enhance the quality of the soil. The sludge is pumped to nearby fields and all the dried sludge is managed under aerobic and controlled conditions (ID 33).

II) Biogas utilisation

The composition of the captured biogas is typically primarily methane (65%) and carbon dioxide (35%). The biogas distribution system includes PVC piping for the biogas flow and biogas blowers to transport the gas. The piping system further includes: water condensation system (to remove water content), H_2S biological and chemical filters (eliminate impurities), biogas flow measurement, biogas analysis, flare, pressure measurement devices on several points, valves and accessories, sampling points and several blowers to inject biogas into the different combustion units. For safety reasons, and to minimise biogas loss, the biogas pipeline is periodically checked and maintained if necessary.

The biogas is utilised in the following priority:
1) Heat generation in new and existing and boilers: The biogas replaces bunker consumption at the

refinery located near the palm oil mill.
2) Electricity production by a biogas generator system: The produced electricity avoids electricity imports from the grid. All electricity generated is used at the palm oil mill and the refinery.
3) Flaring: If there is an excess of biogas, it is flared by an open candlestick flare.

The biogas utilisation priorities can be restructured. If the grid operator Empresa Nacional de Energía Eléctrica (ENEE) cannot supply the additional electricity required for the operation of the refinery or the mill, electricity generation will be considered as the highest priority for the consumption of biogas (including the possibility to incorporate a new biogas generator). The same is applicable if heat/steam generation is considered as a highest priority.

Technical details for each utilisation unit for biogas can be found below:

1) Heat generation in boilers:

The biogas captured replaces bunker consumption. In order to utilise the captured biogas several boilers are to be used. The specifications of the installed boilers are the following:

· Boiler 1:
- Thermal capacity: 7.36 MWth
- Model: Cleaver-Brooks peritubular boiler
- Purpose: steam production for internal production process at the palm oil refinery.
- Efficiency from Cleaver Brooks Manual (conservative reference on Efficiency): lower value for steam boiler with biogas (81%) and higher value for steam boiler with fuel oil N°5 and N°6 (86%).

· Boiler 2:
- Thermal capacity: 1.17 MWth
- Model: HTT wtö 1.250-30-1-v (vertical). Provided by HTT Energy systems
- Purpose: Energy System for heating thermal oil.
- Efficiency: 85% for any fuel. The technology provider has informed that there are no efficiency differences between bunker and biogas.

· Boiler 3:
- Thermal capacity: 9.802 MWth
- Model: CB600-800
- Purpose: Energy steam production for internal production process at the palm oil refinery.
- According to "Cleaver Brooks Efficiency Facts", when testing the efficiency of a CB600-800 using fuel oil No.6 across a range of operating conditions, the highest value obtained is 87.5%. This value was selected according to paragraph 13 (b) of the methodology comparing the efficiencies of three different providers for similar equipment.
- The efficiency of the boiler using biogas is to be determined during the first verification for which ID.42 will be relevant.

· Boiler 4:
- Thermal capacity: 0.93 MWth
- Model: NUK-HP 930 from GekaKonus
- Purpose: Energy steam production for internal production process at the palm oil refinery.
- Since at the time of the Revision of the Monitoring Plan there was not enough information to support this value in line with paragraph 13 (b) of the methodology, a 100% default value for efficiency has been taken. If more accurate information is available in the future, this value may change.
- The efficiency of the boiler using biogas is to be determined during the first verification for which ID.43 will be relevant.

2) Biogas generator system:

The project activity involves the operation of a 0.848MWe biogas fuelled generator. The generator is sized based on the electricity needs of the complete refinery and palm oil mill in Agrotor and minimize the consumption from the grid. The specifications of the generator are:

- Installed capacity: 0.848MWe
- Model: Jenbacher GenSet JGC316 GS-B.L
- Voltage: 840 Volts
- Frequency: 60 Hz

3) Flaring:

The open flare burns the surplus biogas, to avoid any dangerous accumulation in the covered lagoon of the biogas management system. The technical specifications of the fare are:

Minimum flow: 300 m3/h
Maximum flow: 1500 m3/h
Minimum temperature: 300oC
Maximum temperature: 700oC
Flare efficiency: Open flare, 50%

The project activity is completely operational since the start date of operation on 08/03/2008.

The project is certified under ISO 9001:2008 and ISO 14001[1].

Status of implementation

Date	Milestone
08/08/2008	The project installation is completed according to the description in the PDD and fully operational. The project activity is registered. The crediting period begins.
08/03/2008–31/12/2008	First Monitoring Period. CERs Issued.
26/03/2010	In EB53 Annex 56, the EB decided that the DOE shall submit a request to revise the monitoring plan to comply with the requirement of the methodology MSI.C.v.11 regarding the metering of energy produced, measurement of fossil fuel and comparison between the metered energy and calculated energy using the specific fuel consumption prior to the next request for issuance.
15/05/2010	Start of date of operation of the irrigation system that uses the sludge from the lagoons
12/07/2010	Installation of a second electricity meter for power generation which enables crosschecks
14/09/2010	A new boiler (Gekakonus – Boiler 4) is in operation according to the optional boilers described in the PDD. This boiler replaced an existing one that was no longer operational.
13/10/2010	Another new boiler (Cleaver Brooks – Boiler 3) is in operation according to the optional boilers described in the PDD. This boiler replaced an existing one that was no longer operational.

[1] See the document: Jaremar – ISO 9001.pdf

09/11/2011	Approval of monitoring plan that is relevant for this monitoring period
15/03/2013	A notification of changes to the monitoring plan modifying ID.2 WU, the average water usage per processed ton of fresh fruit.
15/03/2013	Second Monitoring Period. CERs Issued.

Boilers 1 and 2 have not been used during the current monitoring period.

Boilers 3 and 4 started operation on in November 2011.

The thermal energy generated by Boiler 3 (ID 36) started being monitored on the 10th of November 2011. No credits will be claimed for energy generation in that boiler before that date.

The thermal energy generated in Boiler 4 has also been operating for the past years (see gas flow records), nonetheless, the technical specificities of the thermal oil heater do not allow for appropriate monitoring of the thermal energy in line with the monitoring plan so the project will not claim credits for thermal energy generation from that boiler.

Special events log

The main operational events registered in the project log are related with the continuous blackouts and disruption of electricity supply by the public company ENEE. Such disruptions occasionally affect the operation of the metering equipment and the SCADA system. A list of the minor technical events has been included in the Emission Reductions Workbook.

The most relevant events are presented below:

Description	Initial date / time	End date / time	Remarks
Generator stopped	01/06/2011	01/07/2011	Reason: insufficient biogas flow
Boiler 4 was not working but the Scada reported a positive biogas input value.	12/06/2011	15/06/2011	Falcon Engineering made a repair and their report has been made available to the DOE.
Maintenance of the SCADA system	17/02/2012	19/02/2012	Falcon Engineering made maintenance of the SCADA.
Programmed maintenance	05/04/2012	08/04/2012	
Maintenance of the generator	27/04/2012	27/04/2012	

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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N/A

B.2.2. Corrections

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N/A

B.2.3. Permanent changes from registered monitoring plan or applied methodology

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N/A

B.2.4. Changes to project design of registered project activity

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N/A

B.2.5. Changes to start date of crediting period

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N/A

B.2.6. Types of changes specific to afforestation or reforestation project activity

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N/A

SECTION C. Description of monitoring system

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Roles and responsibilities

The project owner is Energéticos Jaremar. The company is therefore responsible for the operation and the monitoring of the project activities. Energéticos Jaremar is supported by the CDM-consultant SQ Consult.

Trainings

The technical team of Energéticos Jaremar has been introduced to the system by the Belgian technology provider, Biotec, and an Austrian gas engine manufacturer, Jenbacher. Orbeo consultants gave training concerning CDM-monitoring.

Data processing and archiving

Data handling was carried out according to the description in the PDD (see B.7 of the PDD) and additionally according to the experience accumulated during the project operation and the previous verification.

The monitored data is read by the PLC (programmable logic controllers) and stored in a data management system directly connected to the PLC which is called SCADA. SCADA is the main interface of the monitoring system. This system is located in the control room of the project and

there is an operator constantly controlling its correct operation. A backup copy of the data is made weekly in an external hard drive which works as a backup. The system also has a UPS to avoid data loss in case of a power cut.

There are some exceptions - groups of variables that do not directly send a signal to the SCADA system - detailed below:

a) The methane fraction of the gas (ID.22) is measured with a portable meter. Initially, it was considered to control this variable through SCADA and use on-line metering but the high cost of the device and its technical problems made the PO opt for a portable meter.
b) The use of the sludge (ID 33) is also not monitored through the SCADA and the fertirrigation operation logbooks can be checked on site.
c) The density of bunker oil (ID.44) will be evaluated once per monitoring period based on fossil fuel provider's information or default values.

The above-mentioned exceptions might be, in the future, improved to enable remote and/or improved monitoring.

Regarding ID.40 and ID.41, the volume of fossil fuel that the two new boilers will use will be measured by volume flow meters which store their readings in a PLC that sends a wireless signal to the SCADA system.

These procedures are detailed in the operation procedures. The data are also collected manually in a daily data collection form at 6:00a.m., which includes readings directly from the instruments, is kept in the project's file.

All project data are sent daily by the Energeticos Jaremar Plant Manager (Evelyn Rodriguez) who completes the excel file called CDM Workbook; to the Jaremar Plant Manager who does a quality check. The workbook has a standard format. In order to incorporate the variables related to the new boilers in operation, this format was updated in November 2011.

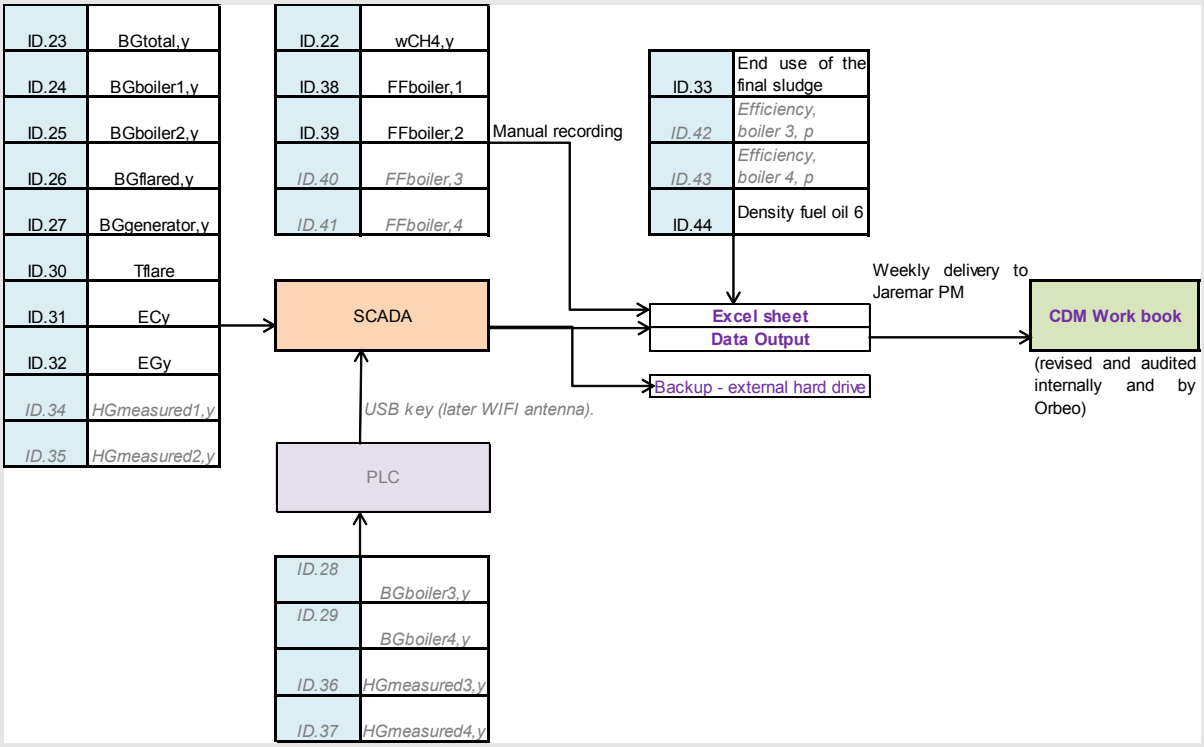

Figure 1. Data flow scheme

Involvement of third parties

Support and consultancy regarding the CDM obligations is provided by SQ Consult.

Internal audits and control measures

The reliability of the data collected is assured through high quality metering and regular cross-checks (there is a total recovered biogas meter and meters at the different applications).

As mentioned above, the project manager fills in the CDM Workbook with the data sent from the control room on a weekly basis. Furthermore, there are monthly audits of the management system include review of the data collected and the reports written according to this manual, to confirm that indeed the data is gathered and processed as required. SQ Consult does a final quality check of the data before including them in the Monitoring Report.

Agrotor and the Jaremar Group are certificated according the international quality standard ISO 9001 and ISO 14001. Internal audits and control measures are known for improving workflows and ensuring quality standards.

Troubleshooting procedures

In case of emergency cases or failures of the data recording system or the PLC the operating staff will switch to manual readings of all meters. This procedure is well defined and trained to the people since manual readings as backup for the computerized data readings are part of the normal operation during the starting period of this project. Furthermore, a log-book will be written and all the time where observations and all other information necessary to document are included. In this way jumps or periods with not normal operating conditions can be identified and explained.

In cases where no data are available due to failures of the monitoring equipment the responsible for the monitoring decides as soon as possible which actions will be undertaken to minimise the amount of not registered GHG emission reduction. In this case the CDM-consultant will be consulted.

Diagram

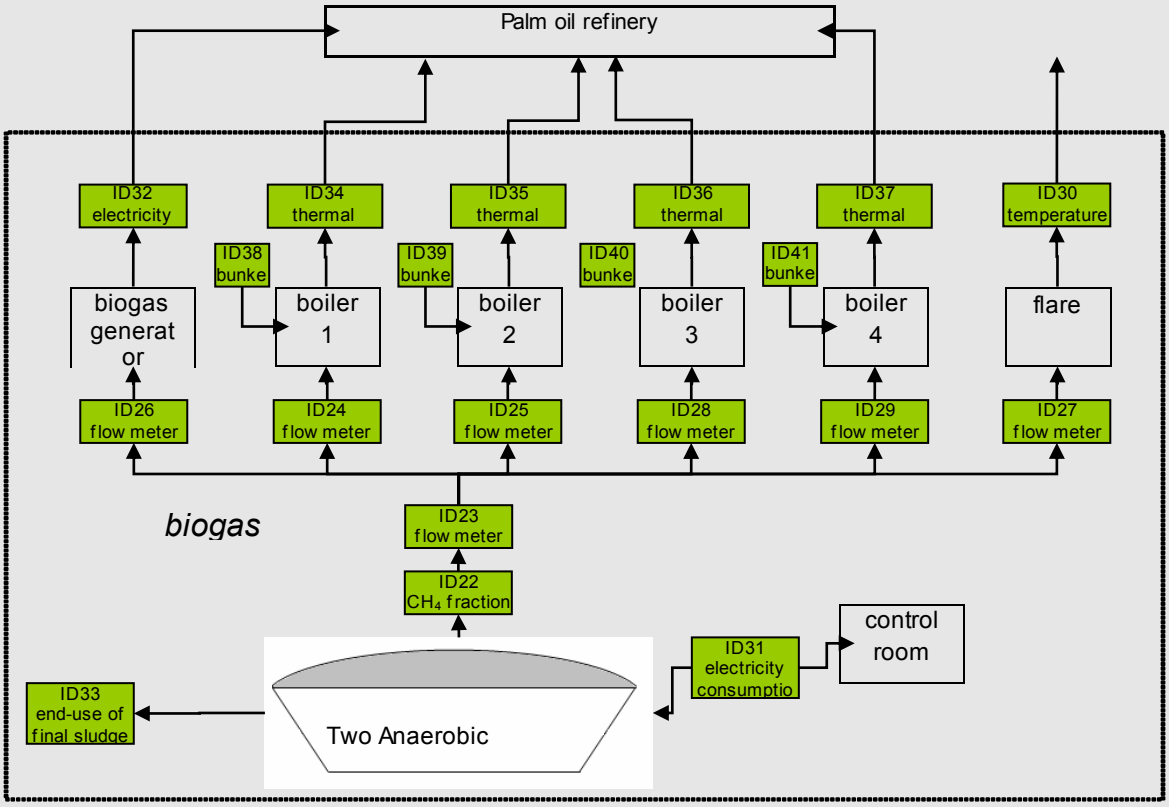

Figure 2. Monitoring variables of the project[2]

Open Issues from the previous verification

To be completed once the 3rd verification is closed.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data / Parameter:	**GWP_{CH4}**
Unit:	-
Description:	Global Warming Potential, value for methane
Source of data:	IPCC 2006 Guidelines
Value(s) applied):	21
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 6: EF_{grid}**
Unit:	tCH_4/m^3CH_4
Description:	Grid Emission Factor, Honduras
Source of data:	Determined ex-ante in PDD using ENEE data

[2] Variables ID.42 and ID.43 and ID.44 are not included in this graph since they are not monitored continuously.

Value(s) applied):	**646**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 11: EF_{CO2}**
Unit:	tCO_2/TJ
Description:	Carbon emission factor of residual fuel oil (bunker)
Source of data:	IPCC 2006 Guidelines
Value(s) applied):	**77.4**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 12: NCV_{biogas}**
Unit:	TJ/Gg
Description:	NCV of methane
Source of data:	IPCC 2006 Guidelines
Value(s) applied):	**50.4**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 15: D_{CH4}**
Unit:	tCH_4/m^3CH_4
Description:	Density of methane at STP (273.15 K and 1,013 bar)
Source of data:	IPCC 2006 Guidelines
Value(s) applied):	**0.0007168**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 17: η_{SB}**
Unit:	%
Description:	Efficiency of the steam boiler using bunker
Source of data:	Manufacturer value
Value(s) applied):	**86**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 18: η_{SP}**
Unit:	%
Description:	Efficiency of the steam boiler using biogas
Source of data:	Manufacturer value
Value(s) applied):	**81**

Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 19: η_{thB}**
Unit:	%
Description:	Efficiency of the thermal oil heater using bunker
Source of data:	Manufacturer value
Value(s) applied):	**85**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 20: η_{thP}**
Unit:	%
Description:	Efficiency of the thermal oil heater using biogas
Source of data:	Manufacturer value
Value(s) applied):	**85**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 21: η_{flare}**
Unit:	%
Description:	Flare efficiency
Source of data:	methodology tool
Value(s) applied):	**50**
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 42: $\eta_{3,b}$**
Unit:	%
Description:	Efficiency of the thermal oil heater using biogas (boiler 3)
Source of data:	Manufacturer value
Value(s) applied):	83.1%
Purpose of data:	BE
Additional comment:	

Data / Parameter:	**ID 43: $\eta_{4,b}$**
Unit:	%
Description:	The efficiency of high-pressure boiler 4 using biogas
Source of data:	Manufacturer value
Value(s) applied):	86%
Purpose of data:	BE

Additional comment:	

Data / Parameter:	**ID 45 / $\eta_{3,b}$**
Unit:	%
Description:	The efficiency of boiler 3 using bunker that would have been used in the absence of the project activity.
Source of data:	Paragraph 13. AMS-I.C (version 11), Option b. Value chosen: Cleaver Brooks Efficiency Facts, page 18. Table. Guaranteed fuel-to-steam efficiencies No.6 Oil. The document "Cleaver Brooks Efficiency Facts", indicates that when testing the efficiency of a CB600-800 using fuel oil No.6 across a range of operating conditions, the highest value obtained is 87.5%. This value has been selected according to paragraph 13 (b) of the methodology comparing the efficiencies of three different providers for similar equipment.
Value(s) applied):	87.5
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 45 / $\eta_{3,b}$**
Unit:	%
Description:	The efficiency of boiler 3 using bunker that would have been used in the absence of the project activity.
Source of data:	Paragraph 13. AMS-I.C (version 11), Option b. Value chosen: Cleaver Brooks Efficiency Facts, page 18. Table. Guaranteed fuel-to-steam efficiencies No.6 Oil. The document "Cleaver Brooks Efficiency Facts", indicates that when testing the efficiency of a CB600-800 using fuel oil No.6 across a range of operating conditions, the highest value obtained is 87.5%. This value has been selected according to paragraph 13 (b) of the methodology comparing the efficiencies of three different providers for similar equipment.
Value(s) applied):	87.5
Purpose of data:	BE+PE
Additional comment:	

Data / Parameter:	**ID 46 / $\eta_{4,b}$**
Unit:	%
Description:	The efficiency of high-pressure boiler 4 using bunker that would have been used in the absence of the project activity.
Source of data:	Paragraph 13: AMS- I.C (version 11)
Value(s) applied):	100

Purpose of data:	BE+PE
Additional comment:	Since insufficient information was available at the time of submission of this request for revision of the Monitoring Plan to fulfil the requirements of options (a) and (b) paragraph 13 of AMS-I.C (version 11), a default value - option (c) – has been adopted. The project owner will be able to use a more realistic (lower) efficiency value if sufficient information is provided at verification to support a change according to the requirements of AMS- I.C (version 11), paragraph 13.

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	**ID 22: w_{CH4}**
Unit:	m^3CH_4/m^3BG
Description:	Fraction of methane in the biogas in the year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Portable meters registered in logbooks.
Value(s) of monitored parameter:	0.59 (2011) 0.60 (2012)
Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency</th><th>Recent calibration</th></tr><tr><td>Sewerin</td><td>SR2-DO</td><td>046 03 000553</td><td>Yearly</td><td>07/05/2012</td></tr><tr><td></td><td></td><td></td><td>Yearly</td><td>01/08/2011</td></tr><tr><td></td><td></td><td></td><td>Yearly</td><td>27/11/2010</td></tr><tr><td>Sewerin</td><td>SRCC11-120</td><td>066 11 000343</td><td>Yearly</td><td>02/02/2011</td></tr><tr><td></td><td></td><td></td><td>Yearly</td><td>08/08/2011</td></tr><tr><td></td><td></td><td></td><td>Yearly</td><td>24/07/2012</td></tr><tr><td>Gasdata</td><td>GAM416</td><td>304376 10941</td><td>Yearly</td><td>08/11/10</td></tr><tr><td></td><td></td><td></td><td>Yearly</td><td>18/07/12</td></tr><tr><td>Sewerin</td><td>SR2-DO</td><td>046 03 000398</td><td>Yearly</td><td>16/05/2011</td></tr></table> Precision/class: 3%
Measuring/ Reading/ Recording frequency:	Manual, measured with a frequency to satisfy a 95%/10% confidence level and at least quarterly (See sampling plan section).
Calculation method (if applicable):	-
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider.

Purpose of data:	BE
Additional comment:	

Data / Parameter:	**ID 23: BG_{Total}**
Unit:	Nm^3/year
Description:	Flow of the total biogas recovered in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	ID 23 through 27, all connected to the data management system.
Value(s) of monitored parameter:	13,316,580
Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency[3]</th><th>Recent calibration</th></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-01-001</td><td>Every 3 years</td><td>08/11/07</td></tr><tr><td></td><td></td><td></td><td>1 year</td><td>17/05/11</td></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-04-001</td><td>Every 3 years</td><td>14/06/12</td></tr></table> Precision/class: 1% The first meter TA2-618962-01-001 was installed from the beginning of the monitoring period until the 1/09/12, when it was replace by a second meter (TA2-618962-04-001) until the end of the period.
Measuring/ Reading/ Recording frequency:	Continuously monitored, data aggregated every second by the data management system.
Calculation method (if applicable):	The flow measured by the total flow meter and the sum of the different meters are compared. The difference between both is below the maximum permissible error of the meters and the different transmitters involved.
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. Cross checks of the sum of all sub flow meters will be made with the total biogas recovered. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider. A total flow meter was installed and is used as QC for this value.
Purpose of data:	BE

[3] Magnetrol does only require calibration in case of technical problems and states that tests have proven that the calibration is still valid after 10 years of operation. The calibration frequency has been introduced to comply with the General guidelines to SSC CDM methodologies.

Additional comment:	There are two gaps in the calibration of the total flow meter device but the delayed calibrations showed no problems. From: 8/11/10 – 17/05/11 From: 17/05/12 – 14/06/12 Since the calibration done after this gap showed no deviation, the maximum permissible error has been discounted for the dates for which the meter lacked a valid calibration certificate in line with the "Guidelines for assessing compliance with the calibration frequency requirements" (version 1).

Data / Parameter:	**ID 24: $BG_{boiler1}$**
Unit:	Nm^3/year
Description:	Flow of biogas combusted in boiler 1 in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Mass flow meter connected to the data management system
Value(s) of monitored parameter:	0 *This variable was not monitored during the monitoring period because Jaremar does not use this boiler any longer.*
Monitoring equipment:	**Manufacturer** / **Model** / **Serial no.** / **Calibration Frequency**[4] / **Recent calibration** Magnetrol / TA2 (Biogas) / 618962-05-001 / Every 3 years / 5/11/07 Magnetrol / TA2 (Biogas) / 618962-05-001 / 1 year / 17/05/11 Precision/class: 1%
Measuring/ Reading/ Recording frequency:	Continuously monitored, data aggregated every second by the data management system
Calculation method (if applicable):	-
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. Cross checks of the sum of all sub flow meters will be made with the total biogas recovered. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	BE
Additional comment:	

[4] Magnetrol does only require calibration in case of technical problems and states that tests have proven that the calibration is still valid after 10 years of operation. The calibration frequency has been introduced to comply with the General guidelines to SSC CDM methodologies.

Data / Parameter:	ID 25: $BG_{boiler2}$
Unit:	Nm^3/year
Description:	Flow of biogas combusted in boiler 2 in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Mass flow meter connected to the data management system
Value(s) of monitored parameter:	0 *This variable was not monitored during the monitoring period because Jaremar does not use this boiler any longer.*
Monitoring equipment:	**Manufacturer**: Magnetrol; **Model**: TA2 (Biogas); **Serial no.**: 618962-04-001; **Calibration Frequency**[5]: every 3 years; **Recent calibration**: 06/11/07 Precision/class: 1%
Measuring/ Reading/ Recording frequency:	Continuously monitored, data aggregated every second by the data management system.
Calculation method (if applicable):	-
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. Cross checks of the sum of all sub flow meters will be made with the total biogas recovered. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	BE
Additional comment:	

Data / Parameter:	ID 26: $BG_{generator}$
Unit:	Nm^3/year
Description:	Flow of biogas combusted in generator in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Mass flow meter connected to the data management system
Value(s) of monitored parameter:	**3,781,199**

[5] Magnetrol does only require calibration in case of technical problems and states that tests have proven that the calibration is still valid after 10 years of operation. The calibration frequency has been introduced to comply with the General guidelines to SSC CDM methodologies.

Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency[6]</th><th>Recent calibration</th></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-02-001</td><td>Every 3 years</td><td>05/11/07</td></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-02-001</td><td>1 year</td><td>17/05/11</td></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-05-001</td><td>Every 3 years</td><td>14/12/11</td></tr></table> Precision/class: 1% The meter TA2- 618962-02-001 was installed at the generator until 01/03/12, when it was replaced by TA2-618962-05-001.
Measuring/ Reading/ Recording frequency:	Continuously monitored, data aggregated every second by the data management system.
Calculation method (if applicable):	-
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. Cross checks of the sum of all sub flow meters will be made with the total biogas recovered. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	BE
Additional comment:	There is a small gap in the calibration of the total flow meter device between the following dates: <table><tr><td>From</td><td>To</td></tr><tr><td>05/11/10</td><td>17/05/11</td></tr></table> Since the calibration done after this gap showed no deviation, the maximum permissible error has been discounted for the dates for which the meter lacked a valid calibration certificate in line with the "Guidelines for assessing compliance with the calibration frequency requirements" (version 1).

Data / Parameter:	**ID 27: BG_{flare}**
Unit:	Nm^3/year
Description:	Flow of biogas combusted in flare in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Mass flow meter connected to the data management system

[6] Magnetrol does only require calibration in case of technical problems and states that tests have proven that the calibration is still valid after 10 years of operation. The calibration frequency has been introduced to comply with the General guidelines to SSC CDM methodologies.

Value(s) of monitored parameter:	**639,783**
Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency[7]</th><th>Recent calibration</th></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-06-001</td><td>Every 3 years</td><td>05/11/07</td></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-04-001</td><td>1 year</td><td>17/05/11</td></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-06-001</td><td>Every 3 years</td><td>20/12/11</td></tr></table> Precision/class: 1% The device TA2-618962-06-001was installed in the flare from the beginning of the crediting period up to the 01/08/11 and from the 1/03/12. Between those two dates, it was replaced by the device TA2-618962-04-001.
Measuring/ Reading/ Recording frequency:	Continuously monitored, data aggregated every second by the data management system
Calculation method (if applicable):	-
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. Cross checks of the sum of all sub flow meters will be made with the total biogas recovered. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	BE
Additional comment:	

Data / Parameter:	**ID 28: $BG_{boiler3,y}$**
Unit:	Nm^3/year
Description:	The flow of biogas consumed in boiler 3 in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Mass flow meter
Value(s) of monitored parameter:	**7,916,910**

[7] Magnetrol does only require calibration in case of technical problems and states that tests have proven that the calibration is still valid after 10 years of operation. The calibration frequency has been introduced to comply with the General guidelines to SSC CDM methodologies.

Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency[8]</th><th>Recent calibration</th></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>650444-01-001</td><td>Every 3 years</td><td>09/09/09</td></tr><tr><td></td><td></td><td></td><td>1 year</td><td>17/05/11</td></tr></table> Precision/class: 1%
Measuring/ Reading/ Recording frequency:	Continuously monitored, data aggregated every second by the data management system
Calculation method (if applicable):	-
QA/QC procedures:	QA: The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. Cross checks of the sum of all sub flow meters will be made with the total biogas recovered. QC: There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	BE
Additional comment:	There is a small gap in the calibration of the total flow meter device between the following dates: <table><tr><td>From</td><td>To</td></tr><tr><td>17/05/12</td><td>01/01/13</td></tr></table> Since the calibration done after this gap showed no deviation, the maximum permissible error has been discounted for the dates for which the meter lacked a valid calibration certificate in line with the "Guidelines for assessing compliance with the calibration frequency requirements" (version 1).

Data / Parameter:	**ID 29: $BG_{boiler4,y}$**
Unit:	Nm^3/year
Description:	The flow of biogas consumed high pressure boiler 4 in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Mass flow meter
Value(s) of monitored parameter:	**1,452,339**

[8] Magnetrol does only require calibration in case of technical problems and states that tests have proven that the calibration is still valid after 10 years of operation. The calibration frequency has been introduced to comply with the General guidelines to SSC CDM methodologies.

Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency[9]</th><th>Recent calibration</th></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>650444-02-001</td><td>Every 3 years</td><td>09/09/09</td></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>650444-02-001</td><td>1 year</td><td>17/05/11</td></tr><tr><td>Magnetrol</td><td>TA2 (Biogas)</td><td>618962-02-001</td><td>Every 3 years</td><td>15/06/12</td></tr></table> Precision/class: 1% The meter TA2-650444-02-001 was installed until the 01/09/12. Then, it was replaced by TA2-618962-02-001.
Measuring/ Reading/ Recording frequency:	Continuously monitored, data aggregated every second by the data management system.
Calculation method (if applicable):	-
QA/QC procedures:	QA: The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. Cross checks of the sum of all sub flow meters will be made with the total biogas recovered. QC: There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	BE
Additional comment:	There is a small gap in the calibration of the total flow meter device between the following dates: <table><tr><td>From</td><td>To</td></tr><tr><td>17/05/12</td><td>01/09/12</td></tr></table> Since the calibration done after this gap showed no deviation, the maximum permissible error has been discounted for the dates for which the meter lacked a valid calibration certificate in line with the "Guidelines for assessing compliance with the calibration frequency requirements" (version 1).

Data / Parameter:	**ID 30: T_{flare}**
Unit:	°C
Description:	Temperature in the exhaust gas of the flare
Measured/ Calculated / Default:	Measured to detect if the flare is operational
Source of data:	Flare thermocouple connected to the data management system

[9] Magnetrol does only require calibration in case of technical problems and states that tests have proven that the calibration is still valid after 10 years of operation. The calibration frequency has been introduced to comply with the General guidelines to SSC CDM methodologies.

<table>
<tr><td>Value(s) of monitored parameter:</td><td>Various</td></tr>
<tr><td>Monitoring equipment:</td><td>
<table>
<tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency</th><th>Recent calibration</th></tr>
<tr><td>Siemens (1)</td><td>Siprom T</td><td>AZB/U9007276</td><td>3 years</td><td>10/03/08</td></tr>
<tr><td>Dyer</td><td>type K, 18’</td><td>5K151-2121-010-000-016-004</td><td>1 year</td><td>30/11/11</td></tr>
</table>
Precision/class (1): 22.8 mA
Precision /class (2): 1.5%

The Siemens temperature meter was installed from the beginning of the crediting period until the 03/01/12. Since then, the Dyer meter was installed.
</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Continuously monitored.
If $T_{flare} > 300$, the flow to the flare is used for the calculations, otherwise the flow is ignored, assuming no ER for this day[10].</td></tr>
<tr><td>Calculation method (if applicable):</td><td>-</td></tr>
<tr><td>QA/QC procedures:</td><td>QA: The flare has a back up thermocouple sensor in case of failure. The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider.
QC: There will be strict compliance to maintenance schedule recommended by the technology provider.</td></tr>
<tr><td>Purpose of data:</td><td>PE</td></tr>
</table>

[10] ACCORDING TO REQUEST FOR CLARIFICATION 199 OF THE SSC-WG.

Additional comment:	The ER calculation spreadsheet includes the flare temperature measurement taken at 6:00 a.m. of every day. Due to this reason, there are some cases in which there is a biogas flow in the flare but BE are estimated to be zero because the flare temperature value taken at 6:00 a.m. is lower than 300°C. To ensure conservativeness, the PP agrees to give up the ER corresponding to the destruction of methane at the flare during those days. --- There is a small gap in the calibration of the temperature meter of the flare from Siemens (1) between the following dates: From: 09/03/11 — To: 03/01/12 Since this meter was replaced by a new one with no further calibration, no emission reductions from flaring will be requested for that period. There is a small gap in the calibration of the temperature meter of the flare from Dyer (2) between the following dates: From: 29/11/12 — To: 31/12/12 Since the calibration done after this gap showed no deviation, the maximum permissible error has been discounted for the dates for which the meter lacked a valid calibration certificate in line with the "Guidelines for assessing compliance with the calibration frequency requirements" (version 1).

Data / Parameter:	**ID 31: EC_y**
Unit:	GWh/year
Description:	Electricity consumption of the project activity in year "y"
Measured/ Calculated / Default:	Measured
Source of data:	Electricity meter/s connected to the data management system
Value(s) of monitored parameter:	0.75504 GWh in the monitoring period

Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency</th><th>Recent calibration</th></tr><tr><td>Siemens</td><td>9200</td><td>SX07080157403</td><td>Never</td><td>29/07/09</td></tr><tr><td>Siemens</td><td>9200</td><td>SX07080157403</td><td>Never</td><td>07/12/2011</td></tr><tr><td>Siemens</td><td>9200</td><td>SX07080157403</td><td>Never</td><td>01/10/2012</td></tr><tr><td>Siemens</td><td>9200</td><td>SX07080157703</td><td>Never</td><td>29/07/09</td></tr><tr><td>Siemens</td><td>9200</td><td>SX07080157703</td><td>Never</td><td>07/12/2011</td></tr><tr><td>Siemens</td><td>9200</td><td>SX07080157703</td><td>Never</td><td>12/07/2011</td></tr></table> Precision/class: both class 0.5s The manufacturer has indicated that no calibration is needed for this equipment, however, Energeticos Jaremar is performing regular verifications tests of this equipment[11]. The meter Siemens 9200 - SX07080157403 is located in the area of the wastewater treatment and the Siemens 9200 - SX07080157703 is located in the biogas plan.
Measuring/ Reading/ Recording frequency:	The frequency for reading the parameter value is at least weekly and relies on accumulated values of electricity consumption, which are continuously measured.
Calculation method (if applicable):	-
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	PE
Additional comment:	Emissions from the sludge management area are to be neglected according to the MP but the PO keeps records of the electricity consumption of the fertirrigation system to demonstrate that it can be neglected.

Data / Parameter:	**ID 32: EG_y**
Unit:	GWh/year
Description:	Net electricity production by the project activity
Measured/ Calculated / Default:	Measured
Source of data:	Electricity meter connected to the data management system
Value(s) of monitored parameter:	7.89 GWh in the monitoring period

[11] See document: Siemens 9200 – Calibration Frequency.

Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency</th><th>Recent calibration</th></tr><tr><td>Schneider Electric</td><td>PM800</td><td>26072154</td><td>Every 10 years</td><td>13/04/10</td></tr><tr><td>Schneider Electric</td><td>PM800</td><td>26072154</td><td>Every 10 years</td><td>07/12/11</td></tr><tr><td>Schneider Electric</td><td>PM800</td><td>26072154</td><td>Every 10 years</td><td>6th/1/13</td></tr><tr><td>Jenbacher Engine</td><td>JGC 316 GS-B.L</td><td>542199 1</td><td>Never</td><td>30/06/08[12]</td></tr></table> Precision/class: 0.5% (fundamental accuracy) The Electricity generation data reported in this workbook come from JGC 316 GS-B.L in 2011 and from 26072154 in 2012. The main meter is the one at the Jenbacher engine and the Schneider meter has been installed for cross checks.
Measuring/ Reading/ Recording frequency:	The net electricity production will be measured continuously. A high level of accuracy of the measurements will be achieved due to the use of high-precision equipment. The monitored data is automatically recorded and stored in the monitoring systems' interface, SCADA (Supervisory Control And Data Acquisition). The frequency for reading the parameter value is at least weekly and relies on accumulated values of electricity production, which are continuously measured.
Calculation method (if applicable):	-
QA/QC procedures:	*QA:* The device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. *QC:* There will be strict compliance to maintenance schedule recommended by the technology provider.
Purpose of data:	BE
Additional comment:	

Data / Parameter:	**ID 33: End use of final sludge**
Unit:	-
Description:	Use of final sludge
Measured/ Calculated / Default:	Measured.
Source of data:	Fertirrigation operation logbooks
Value(s) of monitored parameter:	Aerobic utilisation on fields

[12] Factory calibration. The project is in operation since 08/08/2008.

Monitoring equipment:	A pumping system is used for to send the sludge for fertirrigation. The project's sludge is used as soil application so its emissions can be neglected in line with paragraph 13 of the methodology.
Measuring/ Reading/ Recording frequency:	Continuous
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	PE
Additional comment:	

Data / Parameter:	**ID 34: $HG_{measured,1,y}$**
Unit:	TJ/yr
Description:	The directly measured total quantity of thermal energy supplied by steam boiler 1 during the year y
Measured/ Calculated / Default:	Calculated using ID.24.
Source of data:	Mass flow meter.
Value(s) of monitored parameter:	*This variable was not monitored during the monitoring period because Jaremar does not use this boiler any longer.* *As a result, ER from thermal energy generation will not be claimed for this period.*
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	The operation conditions of the boilers are known so the mass flow (measured) will be converted to energy using standard steam tables.
QA/QC procedures:	*QA:* The device will be subject to regular maintenance and calibration according to the technology provider. *QC:* This parameter will be cross checked with $HG_{1,}$ calculated according to equation 18 of the PDD using the amount of biogas combusted. The lower of these two values is used in the ER calculation, as the methodology requires.
Purpose of data:	BE
Additional comment:	

Data / Parameter:	**ID 35: $HG_{measured,2,y}$**
Unit:	TJ/yr
Description:	The directly measured total quantity of thermal energy supplied by thermal oil heater (boiler 2) during the year y

Measured/ Calculated / Default:	Calculated using ID.25.
Source of data:	Mass flow meter.
Value(s) of monitored parameter:	*This variable was not monitored during the monitoring period because Jaremar does not use this boiler any longer.*
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	The operation conditions of the boilers are known so the mass flow (measured) will be converted to energy using standard steam tables.
QA/QC procedures:	*QA:* The device will be subject to regular maintenance and calibration according to the technology provider. *QC:* This parameter will be used to cross checked with $HG_{2,}$ calculated according to equation 19 of the PDD using the amount of methane destroyed. The lower of these two values is used in the ER calculation, as the methodology requires.
Purpose of data:	BE
Additional comment:	

Data / Parameter:	**ID 36: $HG_{measured3,y}$**
Unit:	TJ/yr
Description:	The directly measured total quantity of thermal energy supplied by high pressure boiler 3 during the year y
Measured/ Calculated / Default:	Measured
Source of data:	The volume of the generated steam will be measured with a specialized steam meter.
Value(s) of monitored parameter:	26.32 This variable has only been measured since the 10th of November 2011. As a result, no ER from thermal energy from this boiler will be claimed before that date.
Monitoring equipment:	**Manufacturer**: Yokogawa; **Model**: Digital Yewflow Vortex Flowmeter; **Serial no.**: U1KC01669_25464; **Calibration Frequency**: Never; **Recent calibration**: 12/06/10 Precision: ±1%
Measuring/ Reading/ Recording frequency:	Continuous

Calculation method (if applicable):	The operation conditions of the boilers are pre-set by the refinery process and known (Saturated steam 150 psi and 180 C), so the flow of steam is converted into energy using this information and the enthalpy from standard steam tables.
QA/QC procedures:	-QC: The device will be subject to regular maintenance and calibration according to the technology provider. QA: The value will be used to cross check HG3, calculated according to equation 21 of the updated MP, which is calculated using the amount of methane destroyed. The lower of these two values is used in the ER calculation, as the methodology requires.
Purpose of data:	Data is used to calculate the baseline emissions.
Additional comment:	

Data / Parameter:	**ID 37: $HG_{measured4,y}$**
Unit:	TJ/yr
Description:	The directly measured total quantity of thermal energy supplied by high pressure boiler 4 during the year y
Measured/ Calculated / Default:	Measured
Source of data:	The volume of the generated steam will be measured with a specialized steam meter.
Value(s) of monitored parameter:	0 *This variable was not monitored during the monitoring period because Jaremar does not use this boiler any longer.* *As a result, ER from thermal energy generation will not be claimed for this period.*
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	Continuous
Calculation method (if applicable):	-
QA/QC procedures:	-QC: The device will be subject to regular maintenance and calibration according to the technology provider. QA: The value will be used to cross check HG4, calculated according to equation 21 of the updated MP, which is calculated using the amount of methane destroyed. The lower of these two values is used in the ER calculation, as the methodology requires.
Purpose of data:	Data is used to calculate the baseline emissions.
Additional comment:	

Data / Parameter:	**ID 38: $FF_{boiler,1}$**
Unit:	Gg/y

Description:	Bunker fuel consumption by boiler 1
Measured/ Calculated / Default:	Measured
Source of data:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker.
Value(s) of monitored parameter:	0 *This variable was not monitored during the monitoring period because Jaremar does not use this boiler any longer.* *As a result, ER from thermal energy generation will not be claimed for this period.*
Monitoring equipment:	
Measuring/ Reading/ Recording frequency:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker. There will be at least monthly recording of the volume consumed. The volume data will be archived electronically.
Calculation method (if applicable):	
QA/QC procedures:	The measurement equipment used will be of high quality. The measurements will be logged and documented. The result will be used, together with the thermal energy produced, to crosscheck the biogas consumption. The device's calibration and maintenance schedules will strictly follow the technical provider's specifications and the General Guidelines to SSC CDM methodologies. Its monitoring will be integrated in the plant's operational procedures. If the volume flow meter data are temporarily unavailable for technical reasons, internal fuel inventories will be used to calculate the fuel consumed. In such a case, internal inventories' procedures will be detailed in the monitoring report.
Purpose of data:	PE
Additional comment:	

Data / Parameter:	**ID 39: $FF_{boiler,2}$**
Unit:	Gg/y
Description:	Bunker fuel consumption by boiler 2
Measured/ Calculated / Default:	Measured
Source of data:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker.

Value(s) of monitored parameter:	0 *This variable was not monitored during the monitoring period because Jaremar does not use this boiler any longer.* *As a result, ER from thermal energy generation will not be claimed for this period.*
Monitoring equipment:	
Measuring/ Reading/ Recording frequency:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker. There will be at least monthly recording of the volume consumed. The volume data will be archived electronically.
Calculation method (if applicable):	
QA/QC procedures:	The measurement equipment used will be of high quality. The measurements will be logged and documented. The result will be used, together with the thermal energy produced, to crosscheck the biogas consumption. The device's calibration and maintenance schedules will strictly follow the technical provider's specifications and the General Guidelines to SSC CDM methodologies. Its monitoring will be integrated in the plant's operational procedures. If the volume flow meter data are temporarily unavailable for technical reasons, internal fuel inventories will be used to calculate the fuel consumed. In such a case, internal inventories' procedures will be detailed in the monitoring report.
Purpose of data:	PE
Additional comment:	

Data / Parameter:	**ID 40: $FF_{boiler,3}$**
Unit:	Gg/y
Description:	Bunker fuel consumption by boiler 3
Measured/ Calculated / Default:	Measured
Source of data:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker.
Value(s) of monitored parameter:	0 There was no consumption of fuel during this period. 3 gallons were used for maintenance trials. This variable has only been measured since the 10th of November 2011. As a result, no ER from thermal energy from this boiler will be claimed before that date.

Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency</th><th>Recent calibration</th></tr><tr><td>Kobold</td><td>DOM A20H N41H00</td><td>30074</td><td>Every 5 years</td><td>06/10/11</td></tr></table> Precision: 0.5%
Measuring/ Reading/ Recording frequency:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker. There will be at least monthly recording of the volume consumed. The volume data will be archived electronically.
Calculation method (if applicable):	
QA/QC procedures:	The measurement equipment used will be of high quality. The measurements will be logged and documented. The result will be used, together with the thermal energy produced, to crosscheck the biogas consumption. The device's calibration and maintenance schedules will strictly follow the technical provider's specifications and the General Guidelines to SSC CDM methodologies. Its monitoring will be integrated in the plant's operational procedures. If the volume flow meter data are temporarily unavailable for technical reasons, internal fuel inventories will be used to calculate the fuel consumed. In such a case, internal inventories' procedures will be detailed in the monitoring report.
Purpose of data:	PE
Additional comment:	

Data / Parameter:	**ID 41: $FF_{boiler,4}$**
Unit:	Gg/y
Description:	Bunker fuel consumption by boiler 4
Measured/ Calculated / Default:	Measured
Source of data:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker.
Value(s) of monitored parameter:	0 There was no consumption of fuel during this period. This variable has only been measured since the 10th of November 2011. As a result, no ER from thermal energy from this boiler will be claimed before that date.

Monitoring equipment:	<table><tr><th>Manufacturer</th><th>Model</th><th>Serial no.</th><th>Calibration Frequency</th><th>Recent calibration</th></tr><tr><td>Kobold</td><td>DOM A20H N41H00</td><td>30075</td><td>Every 5 years</td><td>06/10/11</td></tr></table> Precision: 0.5%
Measuring/ Reading/ Recording frequency:	The volume of bunker used will be continuously monitored. The mass of the consumed fuel will be determined by using the volume flow measured and multiplying it by the density of bunker. There will be at least monthly recording of the volume consumed. The volume data will be archived electronically.
Calculation method (if applicable):	
QA/QC procedures:	The measurement equipment used will be of high quality. The measurements will be logged and documented. The result will be used, together with the thermal energy produced, to crosscheck the biogas consumption. The device's calibration and maintenance schedules will strictly follow the technical provider's specifications and the General Guidelines to SSC CDM methodologies. Its monitoring will be integrated in the plant's operational procedures. If the volume flow meter data are temporarily unavailable for technical reasons, internal fuel inventories will be used to calculate the fuel consumed. In such a case, internal inventories' procedures will be detailed in the monitoring report.
Purpose of data:	PE
Additional comment:	

Data / Parameter:	**ID 44: $\rho_{fuel\ oil\ 6}$**
Unit:	kg /m'
Description:	Density of fossil fuel no.6 (bunker)
Measured/ Calculated / Default:	Measured
Source of data:	At each monitoring period, Jaremar's fossil fuel suppliers are asked to provide the specifications of the bunker provided. The maximum density among the values provided has been chosen to ensure conservativeness. In this case, the maximum value measured came from the provider: Unopetrol.
Value(s) of monitored parameter:	997.3
Monitoring equipment:	NA
Measuring/ Reading/ Recording frequency:	Per monitoring period

Calculation method (if applicable):	Maximum density of the different local providers used
QA/QC procedures:	At each monitoring period, Jaremar's fossil fuel suppliers will be asked to provide the specifications of the bunker provided. The maximum density among the values provided will be chosen to ensure conservativeness.
Purpose of data:	BE
Additional comment:	Since there was no consumption in 2011 or 2012; 2010 data have been reported. This does not affect ER calculations.

D.3. Implementation of sampling plan

>>

The fraction of methane in the biogas is one of the main parameters to determine the baseline emissions and subsequently the emission reductions. The PDD and the methodology define require that these measurements have to be carried out at least quarterly and should meet a confidence level of at least 95%. The project followed the defined requirement throughout the monitoring period, and the measurements have been carried out periodically as the PDD requires. The confidence level required for the data is 95% according to the methodology, and the precision range of the measurements was taken as ±10%, according to the relevant tool[13].

The fraction of methane in the biogas was determined through a sampling effort taking place continuously year round. The amount of measurements required was estimated using measurements from previous monitoring periods to evaluate the process characteristics.

The detail calculation of the sample size (n) to determine the methane content of the biogas is determined as follows:

$$n = \frac{Z_{\alpha}^2 \cdot DE^2}{d^2}$$

Were:

n = sample size

Z_{α} = confidence interval

d = precision/accuracy

DE = standard deviation

Hence, based on this formula the PP has calculated the sample size required for the project activity as follows:

- Z_{α} = As per the applicable methodology, the confidence interval shall be of 95%. Therefore, the applied Z_{α} is of 1.96. This value is a default statistics parameter.
- D = As per the gas analyzer the accuracy of the measurements is 3%. Hence, the value of 3% given by the equipment technical data was used.
- DE = The standard deviation was calculated based on the measurements taken during the monitoring period.

In 2011, a total of 54 samples were taken, from these samples the resulting standard deviation is of 0.031 so the sample size necessary to reach the required confidence level is 4.

[13] EB 50, General Guidelines1 For Sampling And Surveys For Small-Scale CDM Project Activities. Available at: http://cdm.unfccc.int/EB/050/eb50_repan30.pdf (last accessed 06.01.12)

In 2012, a total of 46 samples were taken with a standard deviation of 0.036 so the required sample size is 6.

Therefore, the sample size required for the determination of the methane content at a 95% confidence interval during the monitoring period has been met for both years.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

Ex-post determination of methane combusted and destroyed

According to the PDD, the small scale methodology Type III.H (version 5) and the "Tool to determine project emissions from flaring gases containing methane" provides the way to calculate the emission reduction resulting from avoided methane emissions. The actual achieved emission reduction is calculated according to the equations presented below.

The amount of methane combusted and destroyed is determined by adding the amount of methane fed into the two boilers, the generator and the flare minus the amount of emission resulting from incomplete combustion at the flare.

$$ER_{MD,y} = (\Sigma_i MD_{boiler,i,y} + \Sigma_i MD_{generator,y} + MD_{flared,y}) \times GWP_{CH4}$$

Where:

$ER_{MD,y}$ = Emission reductions from the CH_4 combusted and destroyed as fuel and flared in tCO_{2eq}/y

$MD_{boiler,i,y}$ = Amount of CH_4 combusted in boiler i in t_{CH4}/y

$MD_{generator,y}$ = Amount of CH_4 combusted in generator in t_{CH4}/y

$MD_{flared,y}$ = Amount of CH_4 combusted in flare in t_{CH4}/y

GWP_{CH4} = Global warming potential for CH_4 (value of 21 used)

The amount of CH4 combusted by the boiler i is calculated according to:

$$MD_{boiler,i,y} = BG_{boiler,i,y} \times w_{CH4,y} \times D_{CH4}$$

Where:

$BG_{boiler,i,y}$ = The quantity of biogas fed into boiler i in Nm^3/y

$w_{CH4,y}$ = The average CH_4 fraction of the biogas as measured and expressed as a fraction in m^3_{CH4}/m^3

D_{CH4} = The CH_4 density in $t_{CH4}/m3_{CH4}$

The amount of CH4 combusted by the biogas generator is calculated according to:

$$MD_{generator,i,y} = BG_{generator,y} \times w_{CH4,y} \times D_{CH4}$$

Where:

$MD_{generator,i,y}$ = *Amount of CH4 combusted in generator in tCH4/y*

$BG_{generator,y}$ = *The quantity of biogas fed into the generator in Nm^3/y*

$w_{CH4,y}$ = *The average CH4 fraction of the biogas as measured and expressed as a fraction in m^3 CH4/m^3*

The amount of CH_4 destroyed by the flare is calculated according to:

$MD_{flared,y} = BG_{flare,y} \times w_{CH4} \times D_{CH4} \times \eta_{flare}$

Where:
$MD_{flared,y}$ = *Amount of CH_4 combusted in flare in t_{CH4}/y*
$BG_{flare,y}$ = *The quantity of biogas fed into the flare in year "y" in Nm^3/y*
$w_{CH4,y}$ = *The average CH4 fraction of the biogas as measured and expressed as a fraction in m^3 $CH4/m^3$*
η_{flare} = *Flare efficiency (open flare, 50%)*

Emissions due to incomplete combustion of biogas occur at the flare. The project uses an open flare, and therefore the flare efficiency cannot be measured in a reliable manner and a default value of 50% is used, as requested by the applicable small scale methodology.

Ex-post emission reduction from heat generation

The following equations are included to estimate the thermal energy delivered and the emission reductions from the replacement of bunker. The energy delivered is first estimated using the amount of biogas fed into the boilers, followed by a comparison of this value with the actual measured delivered thermal energy. The lower value is then used in the emission reduction calculation.

Evaluation of supplied thermal energy using methane destroyed:
For the steam boiler (boiler 1):

$$HG_{1,y} = MD_{boiler,1,y} \cdot NCV_{biogas} \cdot \eta_{s,p} \cdot \frac{1}{1000}$$

$HG_{1,y}$ = *The net quantity of biogas associated thermal energy supplied by the steam boiler to the process in the project activity during the year y in TJ/year.*
$\eta_{s,p}$ = *The efficiency of the steam boiler using biogas.*
$MD_{boiler,1,y}$ = *Amount of CH_4 consumed by the steam boiler in year "y" in tonnes CH_4/year*
NCV_{biogas} = *Calorific value of biogas in TJ/Gg.*

For the Thermal oil heater (boiler 2):

$$HG_{2,y} = MD_{boiler,2,y} \cdot NCV_{biogas} \cdot \eta_{th,p} \cdot \frac{1}{1000}$$

Where:

$HG_{2,y}$ = *The net quantity of biogas associated thermal energy supplied by the thermal oil heater to the process in the project activity during the year y in TJ/year.*
$\eta_{th,p}$ = *The efficiency of the thermal oil heater using biogas.*
$MD_{boiler,2,y}$ = *Amount of CH_4 consumed in year "y" by boiler 2 in tonnes CH_4/year*
NCV_{biogas} = *Calorific value of biogas in TJ/Gg.*

For the steam boiler (boiler 3):

$$HG_{3,y} = MD_{boiler,3,y} \cdot NCV_{biogas} \cdot \eta_{3,p} \cdot \frac{1}{1000}$$

Where:

$HG3,y$ = *The net quantity of biogas associated thermal energy supplied by the steam boiler to the process during the year y in TJ/year.*
$\eta_{3,p}$ = *The efficiency of the steam generation unit using biogas.*
$MD_{boiler,3,y}$ = *Amount of CH_4 consumed in year "y" by boiler i in tonnes CH4/year.*
NCV_{biogas} = *Calorific value of biogas in TJ/Gg.*

For the high pressure steam boiler (boiler 4):

$$HG_{4,y} = MD_{boiler,4,y} \cdot NCV_{biogas} \cdot \eta_{4,p} \cdot \frac{1}{1000}$$

Where:

$HG_{4,y}$ = *The net quantity of biogas associated thermal energy supplied by the high pressure steam boiler to the process during the year y in TJ/year.*
$\eta_{4,p}$ = *The efficiency of the steam generation unit using biogas.*
$MD_{boiler,4,y}$ = *Amount of CH_4 consumed in year "y" by boiler i in tonnes CH_4/year.*
NCV_{biogas} = *Calorific value of biogas in TJ/Gg.*

The use of bunker as an auxiliary fuel does not need to be monitored or subtracted from total emission reductions, since emission reductions from heat generation will be based on biogas flow and not in the total heat generation.

Comparison of estimated with measured thermal energy:

For the all boilers the heat generation estimation using biogas inflow will be compared to the measured heat generated by the boiler, and the lower value will be used for the calculations:

$$HG_{\min,i,y} = \min(HG_{i,y}, HG_{measured,i,y} - \frac{FF_{i,y}}{SFC_i})$$

Where:
$HG_{min,i,y}$ = *The conservative quantity of biogas associated thermal energy supplied by boiler i to the process in the project activity during the year y in TJ/year.*
$HG_{i,y}$ = *The net quantity of biogas associated thermal energy supplied by boiler i during the year y in TJ/year.*
$HG_{measured,i,y}$ = *The directly measured total quantity of thermal energy supplied by boiler i during the year y in TJ/year.*
$FF_{i,y}$ = *The amount of fossil fuel used in boiler i in Gg/y*
SFC_i = *Specific fuel consumption for fossil fuel in boiler i in Gg/TJ*

Where:

$$SFC_i = \frac{1}{NCV_{FF} \cdot \eta_{i,p}}$$

NCV_{FF} = *Calorific value of the fossil fuel in TJ/Gg.*
$\eta_{i,p}$ = *Efficiency of project boiler i.*

Emission reduction for thermal energy generation:

The emission reductions related to the heat/steam generation component are calculated as follows:

$$ER_{thermal,y} = \left(\frac{HG_{min,1,y}}{\eta_{s,b}} + \frac{HG_{min,2,y}}{\eta_{th,b}} + \frac{HG_{min,3,y}}{\eta_{3,b}} + \frac{HG_{min,4,y}}{\eta_{4,b}}\right) \cdot EF_{CO_2}$$

Where:

$ER_{thermal,y}$ = *The total baseline emissions from steam/heat displaced by the project activity during the year y in tonnes CO_2eq/year.*
$HG_{min,1,y}$ = *The conservative quantity of biogas associated thermal energy supplied by the steam boiler 1 to the process in the project activity during the year y in TJ/year.*
$HG_{min,2,y}$ = *The conservative quantity of biogas associated thermal energy supplied by the thermal oil heater 2 to the process in the project activity during the year y in TJ/year.*
$HG_{min,3,y}$ = *The conservative quantity of biogas associated thermal energy supplied by the steam boiler 3 to the process in the project activity during the year y in TJ/year.*
$HG_{min,4,y}$ = *The conservative quantity of biogas associated thermal energy supplied by the high pressure steam boiler 4 to the process in the project activity during the year y in TJ/year.*
EF_{CO2} = *The CO_2 emission factor per unit of energy of bunker that would have been used in the baseline plant in tonnes CO_2 / TJ.*
$\eta_{s,b}$ = *The efficiency of the steam boiler using bunker that would have been used in the absence of the project activity.*
$\eta_{th,b}$ = *The efficiency of the thermal oil heater using bunker that would have been used in the absence of the project activity.*
$\eta_{3,b}$ = *The efficiency of steam boiler 3 using bunker that would have been used in the absence of the project activity.*
$\eta_{4,b}$ = *The efficiency of high pressure steam boiler 4 using bunker that would have been used in the absence of the project activity.*

As mentioned above, boilers 1, 2 and 4 have not been operating in the current monitoring period and therefore will be neglected in the ER calculations.

Boiler 3 has been operating and the all the relevant variables monitored since the 10th of November 2011.

Ex-post emission reductions from electricity generation (AMS-I.C)

$ER_{power,y} = (EG_y - EC_y) \times EF_{grid}$

Where:
EG_y = *Net amount of electricity produced by the project activity in GWh/y*
EC_y = *Electricity consumption of the project activity in year "y" in GWh/y*
EF_{grid} = *Emission factor of the Honduran grid, determined ex ante in tCO_{2eq}/GWh*

The net amount of electricity generated will include the electricity delivered by the 0.848 MW_{el} generator plus any future installed generator which operates on the captured biogas.

Actual values:

Baseline emissions during this monitoring period according to AMS-III.H

Month	ID24: CH4 comb. Boiler 1	ID25: CH4 comb. Boiler 2	ID26: CH4 comb. Generator	ID27: CH4 comb. Flare	ID 23: CH4 total meter - ID 27 CH4 comb. Flare	Flow of biogas considered	Baseline emission CH4 comb. AMS III.H
	[Nm³]	[Nm³]	[Nm³]	[Nm³]	[Nm³]	[Nm³]	[tCO_{2eq}]
Jan 2011	0	0	229 457	60 732	77 339	0	3 277,90
Feb 2011	0	0	155 108	67 856	51 701	0	2 449,68
Mar 2011	0	0	184 498	57 139	120 833	0	3 232,79
Apr 2011	0	0	220 660	53 401	94 220	0	3 284,62
May 2011	0	0	351 269	65 883	58 078	25	4 238,48
Jun 2011	0	0	378 671	40 037	154 583	15 692	5 113,06
Jul 2011	0	0	325 540	69 642	189 253	15 906	5 212,45
Aug 2011	0	0	421 474	51 420	240 764	52 166	6 364,96
Sep 2011	0	0	449 598	67 276	250 834	28 655	6 847,02
Oct 2011	0	0	425 420	63 448	256 666	65 296	6 649,26
Nov 2011	0	0	326 115	42 079	211 699	38 663	5 171,94
Dec 2011	0	0	262 329	56 250	104 573	0	3 774,00
Jan 2012	0	0	246 732	69 621	74 077	1	3 537,99
Feb 2012	0	0	277 695	51 964	115 784	0	4 036,51
Mar 2012	0	0	294 065	59 503	159 206	516	4 647,74
Apr 2012	0	0	285 769	51 309	86 017	92 720	4 184,22
May 2012	0	0	392 897	48 484	109 748	43 097	5 143,87
Jun 2012	0	0	273 815	46 463	171 438	44 908	4 578,23
Jul 2012	0	0	403 870	70 046	240 184	8 434	6 472,60
Aug 2012	0	0	439 199	63 014	224 768	8 704	6 587,75
Sep 2012	0	0	359 224	79 982	156 035	34 157	5 548,22
Oct 2012	0	0	444 181	59 166	213 265	96 621	6 867,10
Nov	0	0	476 914	86 047	226 319	44 233	7 352,70

2012							
Dec 2012	0	0	292 409	71 576	193 815	48 963	5 276,52
Sum	**0**	**0**	**7 916 910**	**1 452 339**	**3 781 199**	**638 757**	**119 850**

Baseline emissions during this monitoring period according to AMS-I.C

Month	ID31: Electricity generation [GWh]	ID36: HG measured 3,y TJ	Baseline emission Heat gen. [tCO2eq]	Baseline emission Electr. Gen. [tCO2eq]	Baseline emission Total AMS-I.C [tCO2eq]
Jan 2011	0,17	0,00	0,00	109,4	**109,4**
Feb 2011	0,11	0,00	0,00	72,0	**72,0**
Mar 2011	0,25	0,00	0,00	125,4	**125,4**
Apr 2011	0,19	0,00	0,00	76,4	**76,4**
May 2011	0,12	0,00	0,00	210,7	**210,7**
Jun 2011	0,33	0,00	0,00	251,2	**251,2**
Jul 2011	0,39	0,00	0,00	314,7	**314,7**
Aug 2011	0,49	0,00	0,00	314,7	**314,7**
Sep 2011	0,55	0,00	0,00	354,8	**354,8**
Oct 2011	0,57	0,00	0,00	367,5	**367,5**
Nov 2011	0,47	1,43	122,56	300,8	**423,4**
Dec 2011	0,23	1,42	125,61	146,3	**271,9**
Jan 2012	0,15	1,39	122,39	98,2	**220,6**
Feb 2012	0,26	1,54	135,88	165,2	**301,1**
Mar 2012	0,34	1,73	152,71	219,8	**372,5**
Apr 2012	0,16	1,56	137,76	101,9	**239,7**
May 2012	0,20	2,09	184,88	129,7	**314,6**
Jun 2012	0,35	1,62	143,70	227,1	**370,8**
Jul 2012	0,48	2,29	202,37	307,9	**510,3**
Aug 2012	0,44	2,58	228,12	286,7	**514,8**
Sep 2012	0,30	1,88	166,46	195,7	**362,2**
Oct 2012	0,42	2,43	215,11	268,9	**484,0**
Nov 2012	0,45	2,63	228,80	287,9	**516,7**
Dec 2012	0,35	1,74	153,83	229,3	**383,1**
Sum	**7,75**	**26,32**	**2 320,16**	**5 162,22**	**7 482,38**

The total baseline emissions are summarized as follows:

Baseline emissions AMS-III.H	**119 850**	[t CO_2eq]
Baseline emissions AMS-I.C	**7 482**	[t CO_2eq]
Total Baseline emissions	**127 331**	[t CO_2eq]

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

Ex-post project emission from electricity consumption (AMS-III.H)

$PE_{power,y} = EC_y \times EF_{grid}$

Where:
EC_y = Electricity consumption of the project activity in GWh/y

Actual values:

Month	ID30: EC_y [GWh]	Project emission - AMS-III.H [tCO_{2eq}]
Jan 2011	24,35	15,7
Feb 2011	18,87	12,2
Mar 2011	21,99	14,2
Apr 2011	21,10	13,6
May 2011	25,30	16,3
Jun 2011	27,57	17,8
Jul 2011	27,22	17,6
Aug 2011	33,81	21,8
Sep 2011	36,23	23,4
Oct 2011	35,36	22,8
Nov 2011	26,77	17,3
Dec 2011	21,50	13,9
Jan 2012	21,64	14,0
Feb 2012	23,50	15,2
Mar 2012	26,27	17,0
Apr 2012	27,34	17,7
May 2012	35,13	22,7
Jun 2012	34,53	22,3
Jul 2012	45,06	29,1
Aug 2012	48,07	31,1
Sep 2012	45,59	29,4
Oct 2012	47,49	30,7
Nov 2012	42,67	27,6
Dec 2012	37,68	24,3
Sum	**755,05**	**487,8**

The total amount of Project Emissions during this monitoring period is therefore **488 t CO_2eq**

Sludge removed from the system is used as soil application (fertilizer) to the surrounding land (ID 33. This procedure is adequately recorded to demonstrate that there are no additional project emissions from the use of the final sludge.

E.3. Calculation of leakage

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Since the used technology does not involve equipment transferred from another activity and the existing equipment is not transferred to another activity, no leakage needs to be considered.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	127 331	488	0	126 843

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	110 377	126 843

E.6. Remarks on difference from estimated value in registered PDD

>>
The CER performance of the project is linked to the amount of biogas captured (which in turn determines the energy generation and auxiliary consumption). The difference between expected and achieved ERs lies in the calculation methods to quantify the amount of biogas captured used ex-ante and ex-post.

In the ex-ante estimation, the total methane generation potential (BE_y) is estimated using the IPCC model. Combining equations 2, 3 and 4 of the PDD we obtain:

$$BE_{y,methane} = (WU*TFF_y *COD_{y,wwun,treated} * B_{0ww}* MCF_{treatment}) * GWP\_CH_4$$

Where:

WU	= Average water usage per processed ton of fresh fruit in m^3/ton of fresh fruit	Stable value around 1.13m3/ton
TFF_y	= Tonnes of fresh fruit consumed as input in year y	This value is slightly above the tonnes expected in the PDD – 257 143 tonnes for 2011 and 262 857 for 2012.
COD_y	= chemical oxygen demand of the untreated wastewater in year y (tonnes/m^3)	The COD was around expected values 0.0642 t/m3.
B_{0ww}	= methane generation capacity of the untreated wastewater ($kgCH_4$/kgCOD)	Fixed IPCC
$MCF_{treatment}$	= methane correction factor for the wastewater treatment system that will be equipped with methane recovery equipment	Fixed IPCC
GWP_{CH4}	= Global warming potential for CH_4 (value of 21 is used)	Fixed IPCC

In the ex-post calculation, the value of how much biogas is captured and utilized ($ER_{md,y}$) is directly

measured (mass-flow meters).

Therefore, the ER calculated ex-ante and ex-post differ although monitored values have remained within reasonable ranges and both calculation methods are in accordance to the methodology. Indeed, the proposed ex-ante model has proven to predict lower methane capture values than the realized in the past.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks ($t CO_2e$)	**126 843 (4th PV)**	N/A

All the ERs achieved belong to the first monitoring period.

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Document information

Version	*Date*	*Description*
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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