MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	Switching of fuel from coal to palm oil mill biomass waste residues at Industrial de Oleaginosas Americanas S.A. (INOLASA).
Reference number of the project activity	1314
Version number of the monitoring report	1
Completion date of the monitoring report	19/10/2012
Registration date of the project activity	30/11/2007
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 6 Duration: 01/10/2011 – 30/09/2012 (first and last days included)
Project participant(s)	1. Industrial de Oleaginosas Americanas S.A. (INOLASA) 2. KfW
Host Party(ies)	Costa Rica
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1: Energy industries (renewable - / non-renewable sources Applied methodology: *"Thermal energy for the user with or without electricity"*, AMS-I.C, version 10, May 18th, 2007
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	41,971 TCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	40,817 TCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity comprises the installation of a biomass fuelled boiler to supply steam for internal production processes, displacing a coal-fired boiler. Coal is replaced by palm kernel shells (PK shells) and empty fruit bunches (EFB), saving coal consumption and consequently reducing carbon emissions.

Biomass fuel is mainly purchased from three nearby palm oil mills, called Palo Seco, Naranjo and Coto. The first two mills are located in Quepos and the last one in Golfito, in the province of Puntarenas. The biomass is transported from the palm oil plants using trucks with a capacity of 25-28 tons each, making approximately 2-3 trips per day.

The project activity replaced the current boilers with a new biomass boiler. This new boiler has a capacity to produce 35 tons of steam/hour with a design pressure of 35 bars. However, during the first years it will only produce 20 tons of steam/hour with a pressure of 12 bars.

The boiler is combusting biomass in a mixture of approximately 85% palm kernel (PK) shells and 15% empty fruit branches (EFB). The quantity of PK shells that the plant needs is approximately 20,000 tons per year. The combustion of biomass results in a low amount of ash production, corresponding to 3-4% of the feeding mass. These ashes are used as an aggregate for cement and concrete mixtures.

The boiler was installed and commissioned on April 15, 2007 and April 24, 2007 respectively.

The total emission reductions achieved during this monitoring period are: **40,817 tCO_2e**

A.2. Location of project activity

Costa Rica
Province of Puntarenas, District of Barranca.
Coordinates: 454.5-459 North; 217.5-217.9 East.
Latitude of Barranca is N 09, 59', 23.5" and longitude is W 084, 42', 36.9". The altitude is sea level.

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)
Costa Rica (host)	Industrial de Oleaginosas Americanas S.A. (INOLASA) (private entity)	No
Germany	KfW	No

A.4. Reference of applied methodology

The small scale project activity is registered under the following methodology:

"Thermal energy for the user with or without electricity", AMS-I.C, version 10, May 18th, 2007

A.5. Crediting period of project activity

Type: 7 years renewable crediting period

The crediting period of the project activity is from 30/11/2007 to 29/11/2014

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

The project is fully implemented and operational as explained in the previous verification processes and the PDD.

The boiler was installed and commissioned on April 15, 2007 and April 24, 2007 respectively. The CDM project activity was registered and started the first crediting period on 30 November 2007. From this date onward, the project was completely implemented and operational, as shown during the 1st, 2nd, 3rd, 4th and 5th Periodic Verifications.

The boiler installed is a bi-drum water-tube boiler with membrane design wall and a rated capacity of 35,000 kg steam per hour. It has a designed pressure of 35.0 bars, but is currently used on 12.0 bars. The overall efficiency is given with 80%. Table 1 shows more technical specifications of the biomass boiler.

Biomass residues from the palm oil are used as fuel; these biomasses are empty fruit bunches and palm kernel shells. The boiler is used for the generation of process steam for an onsite soybean refinery plant. Figure 1 provides a process scheme.

Figure 1 – Process Scheme

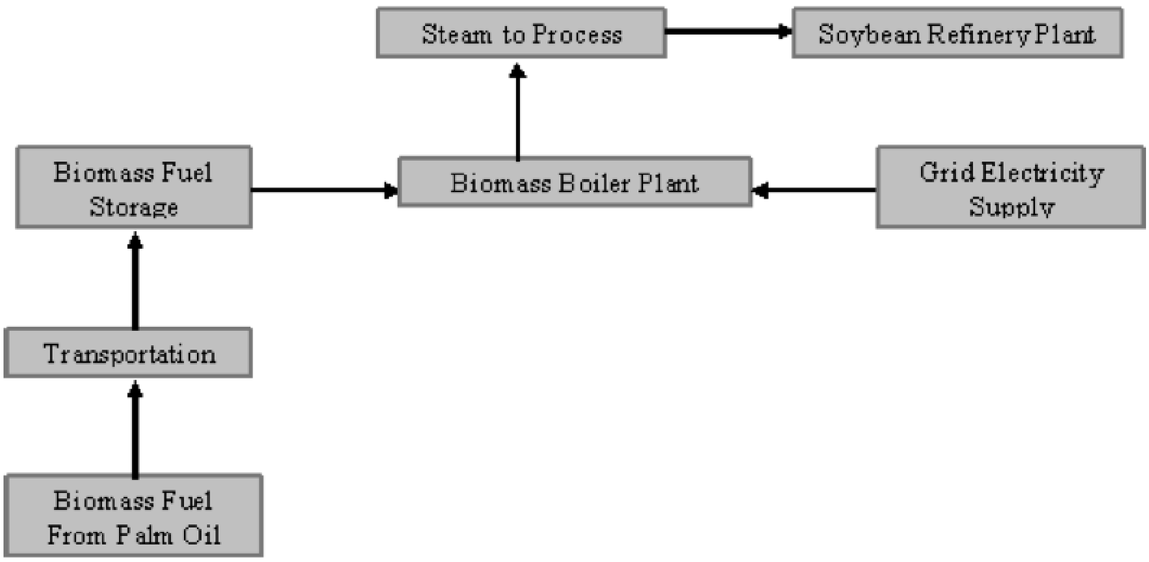


Table 1 - Technical specifications of Boiler

Technical Design Specification of Biomass Boiler	
Boiler Type	Fraser II Bi-Drum Watertube Boiler, Membrane wall design
Boiler Capacity	35,000 Kg/Hr
Boiler Model	FR 16/49
Boiler working pressure	12.0 bar resp. 31.0 bar
Design pressure	35.0 bar
Steam Temperature	192°C (Saturated) resp. 275°C (40° Superheated)
Feed water temperature	120°C +/- 5% (Economizer Water outlet temperature)
Air temperature at F.D Fan	220°C to 240°C (pre-heater air outlet temperature)
Actual steam evaporation	35,000 Kg/Hr.
Draught system	Balance Draught
Burning method	Reciprocating Step Grate; water cooled; hydraulically operated; grate material with high allow content.
Fuel to be used:	85% PK shells with Max 15% EFB (45% moisture)
Dust Emissions	<=100 mg/ nm³
Overall efficiency on Gross Calorific Value of Fuel	80%

During this monitoring period the following special events were recorded:

Table 2 – Event log

Date	Event description
24/10/2011 - 25/10/2011	Biomass boiler unemployed at 2 a.m. the 24/11/2011 by problems in the main drag, and started again at 3 p.m. on 25/11/2011.
02/11/2011 - 04/11/2011	Boiler stopped for maintenance and cleaning.
24/12/2011 - 12/03/2012	Boiler stopped for maintenance and cleaning; low availability of biomass (Mayor maintenance was done within this period).
04/04/2012 - 07/04/2012	Shut down for Easter Week.
08/04/2012 - 16/04/2012	Boiler stopped for cleaning.
27/05/2012 - 29/05/2012	Boiler stopped for maintenance and cleaning.
06/08/2012 - 08/08/2012	Boiler stopped for cleaning.
23/09/2012 - 26/09/2012	Boiler stopped for maintenance and cleaning.

The cleaning of the biomass boiler is programmed for each one and a half months, and is based on an agreement between the Costa Rican Ministry of Health and INOLASA. This maintenance, involving cleaning equipment and the boiler, normally takes around a week.

There were no incidences or situations during the Monitoring Period which may impact the applicability of the methodology.

One additional source of emissions was detected during the present monitoring period, which comes from the use of 40 trucks (overall) bringing biomass (PK Shells) from Cukra palm oil mill in Río Escondido (Nicaragua), a site located 840 km from the project site. These trucks were used as they would have returned empty from Río Escondido after delivering fertilizer from “Grupo Fertica” (Fertilizer Company)

located also in Puntarenas, 10 Km from INOLASA (the project site). Notice that as the use of these trucks would have occurred anyway, this actually *reduces* project emissions by lowering the amount of trucks coming from Quepos and Coto (the locations from which the project obtains its biomass). Nevertheless, emissions from these trucks are assessed using the same criteria used for parameter $PE_{trans,y}$ for conservativeness.

B.2. Post registration changes

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

There were no temporary deviations from the registered monitoring plan or applied methodology during this monitoring period.

B.2.2. Corrections

There were corrections from the registered monitoring plan or applied methodology during this monitoring period.

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

The monitoring plan has been revised and has been approved on 31/05/11.

During the 4th verification it was concluded that no co-incineration using coal would be possible in the future and that consequently bunker fuel would be used permanently during periods with low availability of biomass or if the equipment is out for maintenance. Hence a request of revision of the monitoring plan was filed and approved, in order to reflect in the PDD the actual monitoring activity.

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

No changes to project design have been made.

B.2.5. Changes to start date of crediting period

No changes to the start date of the crediting period have been approved during this monitoring period or submitted with this monitoring report.

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

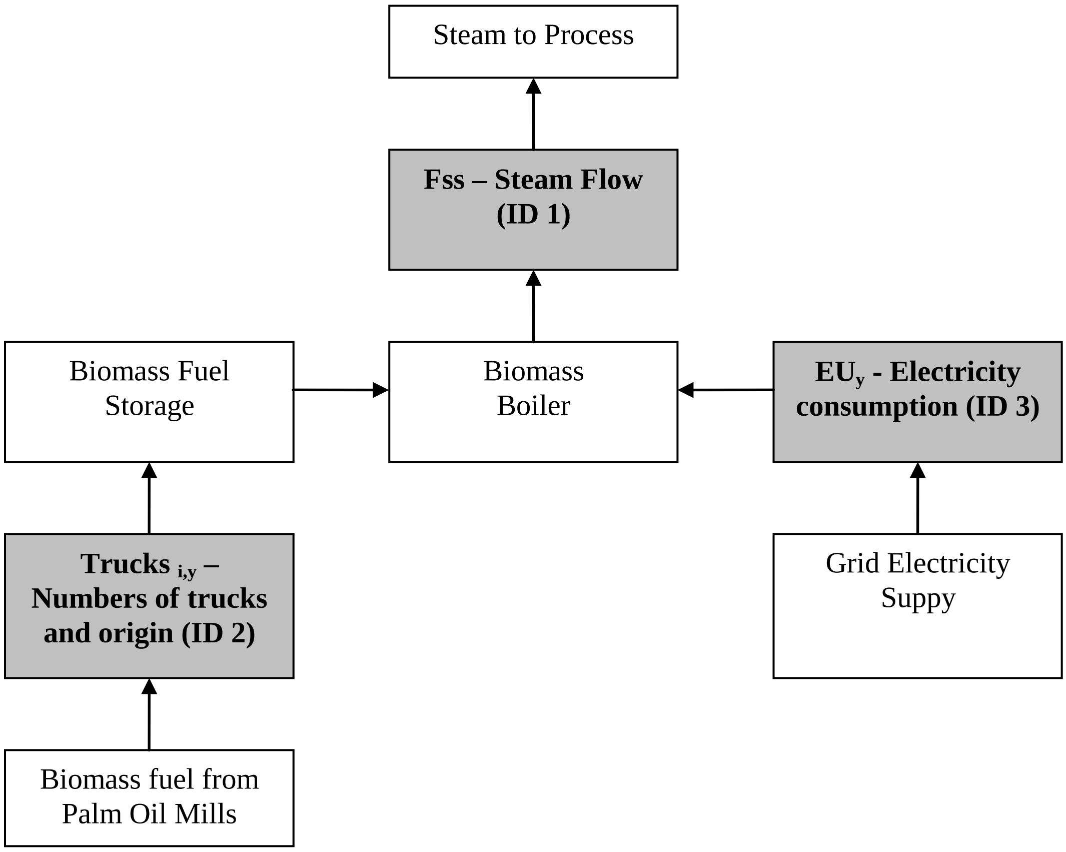
Not applicable.

SECTION C. Description of monitoring system

Metering scheme:

The main metering points relevant for this project can be schematically interpreted from Figure 2 below.

Figure 2 – Metering scheme



Further information on the relevant parameters that are monitored is readily available in Section D below.

Roles and responsibilities:
The Project owner is Industrial de Oleaginosas Americanas S.A. (INOLASA). INOLASA is therefore responsible for the operation and the monitoring of the project activities. INOLASA has appointed one person to be responsible for monitoring, Mr. Domingo Vásquez Vásquez. The operational staff, the Superintendent of Production and the Superintendent of Maintenance, report to him.

Data collection and procedures:
The Superintendent of Production collects data on a daily basis, and transfers these data to weekly and final monthly reports, which are submitted to the responsible for monitoring. The Superintendent of Maintenance saves the steam flow data digitally, which he regularly crosschecks with the manual data. In addition, crosschecks of the final reports against the daily data are performed for quality assurance.

Emission reduction calculation: The CDM spreadsheet is prepared from the original data. It comprises monthly summary sheets that contain the daily data for easy control and comparison of these against other sources. The data sheets are compiled by the person responsible for monitoring, and signed by the plant manager.

Trainings:

During the crediting period internal trainings are performed. If trainings are performed during this monitoring period, receipts of these internal trainings will be available on-site.

Involvement of Third Parties:
Support and consultancy regarding the CDM obligations is provided by the company Geo Ingeniería Ingenieros Consultores S.A. During operation, the technical team of INOLASA is supported, if necessary, by the technology provider PETRA.

Documentation from the authorised boiler inspector during his yearly on-site visit will be available during the on-site visit.

A third party check of the electricity meter has been performed and the documentation will be available to the DOE.

Troubleshooting procedures:
In case of unforeseen problems or failures of the data recording system, the operating staff will switch to manual readings of all meters. This procedure is well defined and trained by the staff, since manual readings as back-up for the computerised data readings have been a part of the normal operation since the starting period of this project. Furthermore, a logbook will be maintained, recording all deviations from normal operation, including observations and all other information necessary to document. In this way, jumps or periods where operating conditions are out of range can be identified and explained.

SECTION D. Data and parameters

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

Data/Parameter	**ID.5 / Km_i**
Unit	**km**
Description	Distance from palm oil mill i to the biomass boiler
Source of data	This information is provided by the contracted transport company.
Value(s) applied	Km – distance Coto 47 to Barranca: 340 Km – distance Quepos to Barranca: 133 Km – distance Rio Escondido to Barranca: 840
Purpose of data	Project emission calculation
Additional comment	Distance was determined by the readings of the mileage counter of a representative truck. It was cross checked by measuring the distance on a 1:50,000 map. Distances values expressed above are one way only; thus, they are multiplied by two in order to obtain the round-trip distance. Palo Seco and Naranjo palm mills are both located at Quepos; only Coto palm mill is located in Coto 47.

Data/Parameter	ID.6 / VF_{cons}
Unit	**l/km**
Description	Vehicle fuel consumption in litres per kilometre
Source of data	This information is provided by the contracted transport company.
Value(s) applied	0.6
Purpose of data	Project emission calculation
Additional comment	It relies on specific truck data based on the contracted transport company´s fleet of trucks

Data/Parameter	ID.7 / CVdiesel
Unit	**MJ/kg**
Description	Calorific value of the fuel
Source of data	Diesel reference value for Costa Rica
Value(s) applied	45.91
Purpose of data	Project emission calculation
Additional comment	This reference is considered as a fixed value, and based on the fuel provider´s specifications (Refinadora Costarricense de Petróleo, S.A.)

Data/Parameter	ID.8 / Ddiesel
Unit	**kg/l**
Description	Diesel density
Source of data	The fuel density of Diesel in Costa Rica
Value(s) applied	0.85
Purpose of data	Project emission calculation
Additional comment	National specifications for Diesel fuel in Costa Rica

Data/Parameter	ID.9 / EFdiesel
Unit	**tCO_2/MJ**
Description	Emission factor Diesel
Source of data	IPCC
Value(s) applied	20.2 tC/TJ x 44/12 = 74.1 tCO_2/TJ = 0.0000741 tCO_2/MJ
Purpose of data	Project emission calculation
Additional comment	The reference comes from the latest IPCC guidelines, and has been considered as representative for the current emission reduction calculation

Data/Parameter	ID.10 / EUy
Unit	**GWh**
Description	Electricity consumption of baseline boiler annually.
Source of data	Quotations from boiler technology provider
Value(s) applied	1.07
Purpose of data	Baseline emission from electricity consumption
Additional comment	Baseline boiler: including a two week maintenance period.

Data/Parameter	ID.11 / EFgrid
Unit	tCO_2/GWh
Description	Emission factor Costa Rican grid
Source of data	This factor has been calculated using ICE data and available info from other sources. See Annex 3 of the PDD
Value(s) applied	62.86
Purpose of data	Project emissions calculation
Additional comment	This baseline emission factor was calculated ex-ante in a transparent and conservative manner as the average of the "approximate operating margin" and the "build margin"

Data/Parameter	ID 12 / η_{th}
Unit	%
Description	Energy efficiency of the boiler in the baseline scenario
Source of data	The energy efficiency of the boiler that would be used in absence of the project activity is based upon the manufacturer's information
Value(s) applied	78
Purpose of data	Baseline emission calculation
Additional comment	The efficiency is considered as a fixed value and based on the manufacturer´s information for coal

Data/Parameter	ID.13 / η_p
Unit	%
Description	Energy efficiency of the boiler in the project scenario
Source of data	Is based upon the manufacturer´s information
Value(s) applied	80
Purpose of data	Baseline emission calculation
Additional comment	The efficiency is considered as a fixed value, and based on the manufacturer's information for biomass fuels

Data/Parameter	ID.14 / $NCV_i = NCV_c$
Unit	TJ/kt
Description	Is the net calorific value of the fossil fuel type i
Source of data	Based on tests done to Colombian coal
Value(s) applied	A default value of 10,887 BTU/lb will be considered based on tests done to Colombian coal (equivalent 25.73 TJ/kt)
Purpose of data	Baseline emission calculation
Additional comment	The net calorific value of the fossil fuel is determined by means of analytical results at the 'Laboratory of Puerto Bolivar, La Guajira', in accordance with the applicable ASTM standards. The resulting 'Screen Analysis Certificate' was developed by the 'Inspectorate Colombia Ltda.'

Data/Parameter	**ID.15 / $COEF_i$**
Unit	**tCO_2/kt**
Description	Is the CO_2 emission factor of the fossil fuel type i fired in the boiler in the absence of the project activity
Source of data	Reference from Colombian provider of coal
Value(s) applied	2.38 tCO_2/t
Purpose of data	Baseline emission calculation
Additional comment	Carbon percentage of the Colombian coal that would have been used is stated as 64.9%

Data/Parameter	**ID.16 / Hss_i**
Unit	**kJ/kg**
Description	Is the enthalpy of the saturated steam at 12 bar
Source of data	Set as default value provided from saturated steam table
Value(s) applied	2782.73
Purpose of data	Baseline emission calculation
Additional comment	This is considered as a fixed value and will be used for emission reduction calculations

D.2. Data and parameters monitored

Data/Parameter	**ID.1 / Fss_i**
Unit	**kg/yr**
Description	Is the steam flow monitored, during year y
Measured/Calculated /Default	Measured
Source of data	Project owner, flow meter
Value(s) of monitored parameter	127,580,000 kg (for the entire period)
Monitoring equipment	Type: Mass Flow Transmitter Make/Model: Rosemount 3095M Accuracy class: +/-1% Serial number: 0217271 Calibration frequency: According to *"General Guidelines to SSC CDM methodologies"*, version 14.1, para. 17.(c) at least every three years. However, the manufacturer assures 10 year stability of +/-0.25% Date of last calibration: 26.09.2012 Validity: At least until 25.09.2015 Location: The flow meter is installed in the steam output flow of the biomass boiler.
Measuring/Reading/ Recording frequency	Continuous measurement, daily reading and monthly recording
Calculation method (if applicable)	Flow of steam in tonnes/yr is converted to TJ by calculation.
QA/QC procedures	The meters automatically present values in mass units (i.e. the equipment internally accounts for temperature and pressure of the gas). Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy (see table in Annex 4 to the PDD).
Purpose of data	Baseline emission calculation
Additional comment	

Data/Parameter	**ID.2 / $trucks_{i,y}$**
Unit	**Number**
Description	Number of trucks and origin
Measured/Calculated /Default	Measured
Source of data	Project owner, logbook
Value(s) of monitored parameter	757 trucks arrived from Quepos 629 trucks arrived from Coto 40 trucks arrived from Rio Escondido
Monitoring equipment	Not applicable
Measuring/Reading/ Recording frequency	Measured at each delivery and subsequently recorded
Calculation method (if applicable)	Not applicable
QA/QC procedures	The recorded data will be crosschecked on a regular basis with the invoices from the transportation service provider
Purpose of data	Project emission calculation
Additional comment	

Data/Parameter	**ID.3 / EU_y**
Unit	**GWh/year**
Description	Electricity consumption biomass boiler in the project scenario
Measured/Calculated /Default	Measured
Source of data	Project owner,
Value(s) of monitored parameter	1.83924 GWh (for the entire period)
Monitoring equipment	Type: Electricity meter Make/Model: Schneider Electric CM3250 Accuracy class: IEC 687 0.5 class Serial number: 15000219 Calibration frequency: 15 years stability according to manufacturer. But according to *"General Guidelines to SSC CDM methodologies"*, version 14.1, para. 17. (c) at least every three years. Date of last calibration: 24.05.2011 Validity: At least until 30.12.2014 Location: The electricity meter is installed in an electric substation located at the biomass boiler.
Measuring/Reading/ Recording frequency	Measured continuously, reading daily, recorded monthly
Calculation method (if applicable)	Not applicable
QA/QC procedures	The electricity meter will be recalibrated periodically by the supplying firm
Purpose of data	Project emission calculation
Additional comment	

D.3. Implementation of sampling plan

Not applicable

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

Please note that the references used for the parameters, namely 'IDs', are defined in chapter D above and are applicable for all following chapters.

The baseline emissions can be calculated with the following equation:

$$BE_y = BE_{heat,y} + BE_{boiler,y}$$

Where :

$BE_{heat,y}$ Emissions due to coal combustion. In absence of the project the heat would be generated by a coal boiler.

$BE_{boiler,y}$ Emissions caused by grid electricity consumption (coal boiler).

The emissions due to coal combustion are determined by dividing the amount of generated heat during the project activity by the net calorific value of coal and the efficiency of the coal boiler. This is multiplied with a CO_2 emission factor for the displaced fossil fuel (coal):

$$BE_{heat,y} = \frac{Q_y}{\eta_{th} \cdot NCV_i} \cdot COEF_i$$

Where:

$BE_{heat,y}$ the baseline emissions for fossil fuels during the year y in tons of CO_2eq.
Q_y is the quantity of heat generated in the project plant using renewable resources only, that displaces heat generation in the fossil fuel fired boiler during the year y in TJ. This is the same variable mentioned in AMS.I-C ver. 10 as HG_y (original notation in approved monitoring plan used for clarity).
η_{th} is the energy efficiency of the boiler that would be used in absence of the project activity. (**ID.12, fixed**)
NCV_i is the net calorific value of the fossil fuel type i per TJ/kt. In the baseline scenario, the plant only uses coal as fuel. (**ID.14, fixed**)
$COEF_i$ is the CO_2 emission factor of the fossil fuel type i fired in the boiler in the absence of the project activity in tCO_2/kt – in the project activity only coal. (**ID.15, fixed**)

The total quantity of heat generated in the project plant using renewable sources (Q_y), is to be based on the following equation:

$$Q_y = h_{ssi} \cdot F_{ssi} \cdot 10^{-9}$$

Where
Q_y is the total quantity of heat generated in the project plant using renewable resources, during year y, in TJ.
h_{ss} is the enthalpy of the saturated steam at 12 bar (2782.73 MJ/t set as a default value) (**ID.16, fixed**).
F_{ss} is the steam flow monitored, during year y (t/year) (**ID.1, to be monitored**)

The emissions resulting from electricity consumption by the boiler are determined by:

$$BE_{boiler,y} = EU_y \cdot EF_{grid}$$

Where:
$BE_{boiler,,y}$ Baseline emissions resulting from electricity usage in year ‘y’
EU_y Electricity Usage in year ‘y’ (**ID.10, fixed**)
EF_{grid} Emission factor of the Costa Rican grid. (**ID.11, fixed**)

	ID.1 F_{ss}	BE_{heat}	BE_{boiler}	BE_{total}
Month	[t]	[tCO_2e]	[tCO_2e]	[tCO_2e]
Oct-11	14,832.00	4894.56	5.71	4,900.27
Nov-11	12,284.00	4053.72	5.34	4,059.06
Dec-11	10,720.00	3537.60	4.24	3,541.84
Jan-12	0.00	0.00	0.00	0.00
Feb-12	0.00	0.00	0.00	0.00
Mar-12	9,262.00	3056.46	3.69	3,060.14
Apr-12	9,427.00	3110.91	3.50	3,114.41
May-12	13,191.00	4353.03	5.34	4,358.37
Jun-12	12,991.00	4287.03	4.98	4,292.00
Jul-12	15,697.00	5180.01	5.71	5,185.72
Aug-12	14,029.19	4629.63	5.34	4,634.97
Sep-12	15,146.81	4998.44	5.16	5,003.60
Total	**127,580.00**	**42,101.37**	**49.02**	**42,150.39**

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

The project emissions can be calculated with the following equation:

$PE_y = PE_{trans,y} + PE_{boiler,y}$

Where :
$PE_{trans,y}$ Project emissions resulting from transportation of the biomass in year ‘y’
$PE_{boiler,,y}$ Project emissions resulting from electricity usage in year ‘y’

The CO_2 emissions from a biomass load are calculated from the quantity and the specific CO_2-emission factor of the fuel used by the trucks.

$$PE_{trans,y} = \sum trucks_{i,y} \cdot TransCOEF_i$$

Where:
$PE_{trans,y}$ Project emissions resulting from transportation of the biomass in year ‘y’
$trucks_{i,y}$ Number of trucks supplying the biomass originating from palm oil mill i in year ‘y’ (**ID.2, to be monitored**)
$TransCOEF_i$ Coefficient for the CO_2 emissions from 1 truck load of biomass originating from palm oil mill i

$$TransCOEF_i = km_i \cdot VF_{cons} \cdot CV_{diesel} \cdot D_{diesel} \cdot EF_{diesel}$$

Where:
Km_i Distance from palm oil mill i to the biomass boiler (km) (**ID.5, fixed;** double of the values reported in D.1 are considered in order to account for a round-trip.)
VF_{cons} Vehicle fuel consumption in litres per kilometre (l/km) (**ID.6, fixed**)
CV_{diesel} Calorific value of the fuel (MJ/kg) (**ID.7, fixed**)
D_{diesel} Diesel density (kg/l) (**ID.8, fixed**)
EF_{diesel} Emission factor diesel (tCO_2/MJ) (**ID.9, fixed**)

For the transportation of biomass trucks with a load capacity of 28 tonnes are used. To be conservative, $TransCOEF_i$ is determined based on a full truck load. The trucks use 0.6 litre of diesel per kilometre, the calorific value of the fuel is 45.91 MJ/kg, the fuel density of diesel in Costa Rica is 0.85 kg/l and the emission factor of the fuel is 74.1 tCO_2/TJ.

The project emissions resulting from electricity consumption by the boiler are determined by:

$$PE_{boiler,y} = EU_y \cdot EF_{grid}$$

Where:

$PE_{boiler,,y}$	Project emissions resulting from electricity usage in year 'y'
EU_y	Electricity Usage in year 'y' (**ID.3, to be monitored**)
EF_{grid}	Emission factor of the Costa Rican grid. (**ID.11, fixed**)

	ID2 number of trucks			PE_{trans}	ID3 EU_y	PE_{boiler}	PE_{total}
Month	**Quepos**	**Coto**	**Rio Escondido**	**[tCO_2e]**	**[MWh]**	**[tCO_2e]**	**[tCO_2e]**
Oct-11	90	56	2	113	198	12	125.87
Nov-11	68	30	10	96	178	11	107.09
Dec-11	85	31	6	93	152	10	102.86
Jan-12	65	40	1	80	14	1	80.99
Feb-12	81	32	0	75	14	1	76.04
Mar-12	43	64	0	95	130	8	103.52
Apr-12	33	49	0	73	120	8	80.59
May-12	29	56	0	79	165	10	89.81
Jun-12	31	60	2	91	183	12	102.45
Jul-12	59	85	5	142	226	14	156.31
Aug-12	96	74	8	155	233	15	169.60
Sep-12	77	52	6	114	225	14	128.52
Total	**757**	**629**	**40**	**1,208.04**	**1,839.24**	**115.61**	**1,323.65**

Other emissions occurring within CDM project activity

A bulldozer for on-site transportation of biomass was used. The vessel consumed 20,213 litres of diesel.

Table 3 - Other project emissions

Fuel consumed by on-site bulldozer	20,213	lts
calorific value of diesel (CV_{diesel})	45.91	MJ/kg
Density of diesel (D_{diesel})	0.85	kg/l
Emission factor diesel (EF_{diesel})	0.0000741	tCO_2 / MJ
Additional Project Emissions	58.45	tCO2
as % of ERs claimed	0.14	%

The overall amount of emissions arising from this source is 58.45 tCO2, around 0.14% of the emission reductions claimed for this period (40,817 tCO_2 – see E.5 below). In accordance with the CDM Validation and Verification Manual (paragraph 77), only emissions which are expected to contribute more than 1% of the emission reductions should be addressed.

E.3. Calculation of leakage

According to the registered PDD no sources of leakage are identified. Therefore leakage is considered zero.

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

The total emission reductions can be easily calculated with the results of the above described equations. The emission reduction is equal to the baseline emissions minus project emissions and leakage emissions. Leakage emissions in this project are considered to be zero. The general equation is as follows:

$ER_y = BE_y - (PE_y + L_y)$

ER_y = Emission $reduction_{year}$
BE_y = Baseline $emissions_{year}$
PE_y = Project $emissions_{year}$
L_y = $Leakage_{year} = 0$

The table below summarizes the results presented above, however baseline emissions are conservatively presented after rounding down and project emissions after rounding up[1].

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	42,146	1,329	0	40,817

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 (tCO_2e)	41,971[2]	40,817

The achieved emission reductions are 3% lower than the proportional ex-ante estimate.

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

As shown above, the emissions reductions achieved during this crediting period are actually smaller than the proportional equivalent from the registered PDD.

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[1] As shown in ER calculation excel file, sheet "SUMMARY"
[2] 10,104 [obtained as (92/366) x 40,197 for 2011] + 31,867 [obtained as (274/366 x 42,567 for 2012] = 41,971

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History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Form **Business Function**: Issuance		