Monitoring report form for CDM project activity
(Version 06.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the project activity	Panuco Bagasse Cogeneration Project	
UNFCCC reference number of the project activity	10055	
Version number of the PDD applicable to this monitoring report	04	
Version number of this monitoring report	Version 03	
Completion date of this monitoring report	16/01/2018	
Monitoring period number	First Monitoring Period – From 01/09/2016 to 31/12/2017	
Duration of this monitoring period	From 01/09/2016 to 31/12/2017	
Monitoring report number for this monitoring report	N/A	
Project participants	Ingenio Panuco Sapi de CV (Private entity)	
Host Party	Mexico	
Sectoral scopes	1 - Energy industries (renewable - / non-renewable sources)	
Applied methodologies and standardized baselines	Methodology: ACM0006 - Version 12.1.1	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	--	36,282
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	106,589	

SECTION A. Description of project activity

A.1. General description of project activity

>>

The proposed project is a new bagasse cogeneration project in México, located in the Panuco municipality basin in the Veracruz State which belongs to Pantaleon Group. The new cogeneration plant will be part of the existing sugar mill that process approximately 1,500,000 tonnes of sugar cane per year.

The project aims replace the actual cogeneration plant with installed capacity around of 17 MW to increase the installed capacity of a sugar mill around 117 MW[2].

Prior to the project activity, steam demand for cogeneration purposes is covered by 5 boilers that totalizing an installed capacity of 210 t/h of superheated steam at 23 bar and 331°C. Part of the steam produced by these boilers is delivered to the process and another part to feed 5 steam turbines that totalize an installed capacity of 17MW3. All electricity produced is consumed by the plant processes and there is no surplus of electricity to be exported to the national grid.

Therefore, the purpose of the project activity is to supply electricity and heat to the various processes of the Panuco sugar mill by replacing fossil fuel (Bunker) by biomass combustion only. In addition, the project will also export excess electricity to the grid, further contributing to reduction of greenhouse gas emissions. As per registered PDD, the CDM Project Activiy is composed by two Phases:

- 1st Phase: This phase involves the installation of a new boiler with operational conditions around 83 bar and 538oC and a new back- pressure steam turbine of around 40 MW, which will substitute the current turbines, totalizing an installed capacity of 57MW (17 MW back-up and 40 MW new back-pressure turbine).

- 2nd Phase: This phase involves the installation of another new boiler with operational conditions around 83 bar and 538oC and a new condensing steam turbine of around 60 MW totalizing 117 MW of installed capacity in the cogeneration plant.

The present Monitoring Period is referent only to phase 1 of the CDM Project Activity and the scenario existing prior to the start of the implementation of the Project Activity is as presented in the Figure 1 below.

The scenario existing prior to the implementation of the project activity consisted of 5 low-pressure heat generators using bagasse and bunker C fuel oil as their fuels (around 7% of fuel oil is to co-firing). They have an installed capacity to supply 210 tonnes/hour of steam each at 23 bar and 331°C. The steam is used to run 3 cogeneration steam turbines with 17MW of installed capacity and to mechanical applications of the sugar mill process. The thermal energy provided to the sugar mill was supplied both directly from the heat generators to the steam turbines feeding the mechanical applications (shredding, cutter and milling) requiring medium pressure steam and indirectly by the turbo generators' exhaust. The cogeneration plant and the mechanical steam turbines provided the whole process heat required for the sugar mill process. The steam turbines provided the most of its electricity demand, but it was necessary import electricity of the grid.

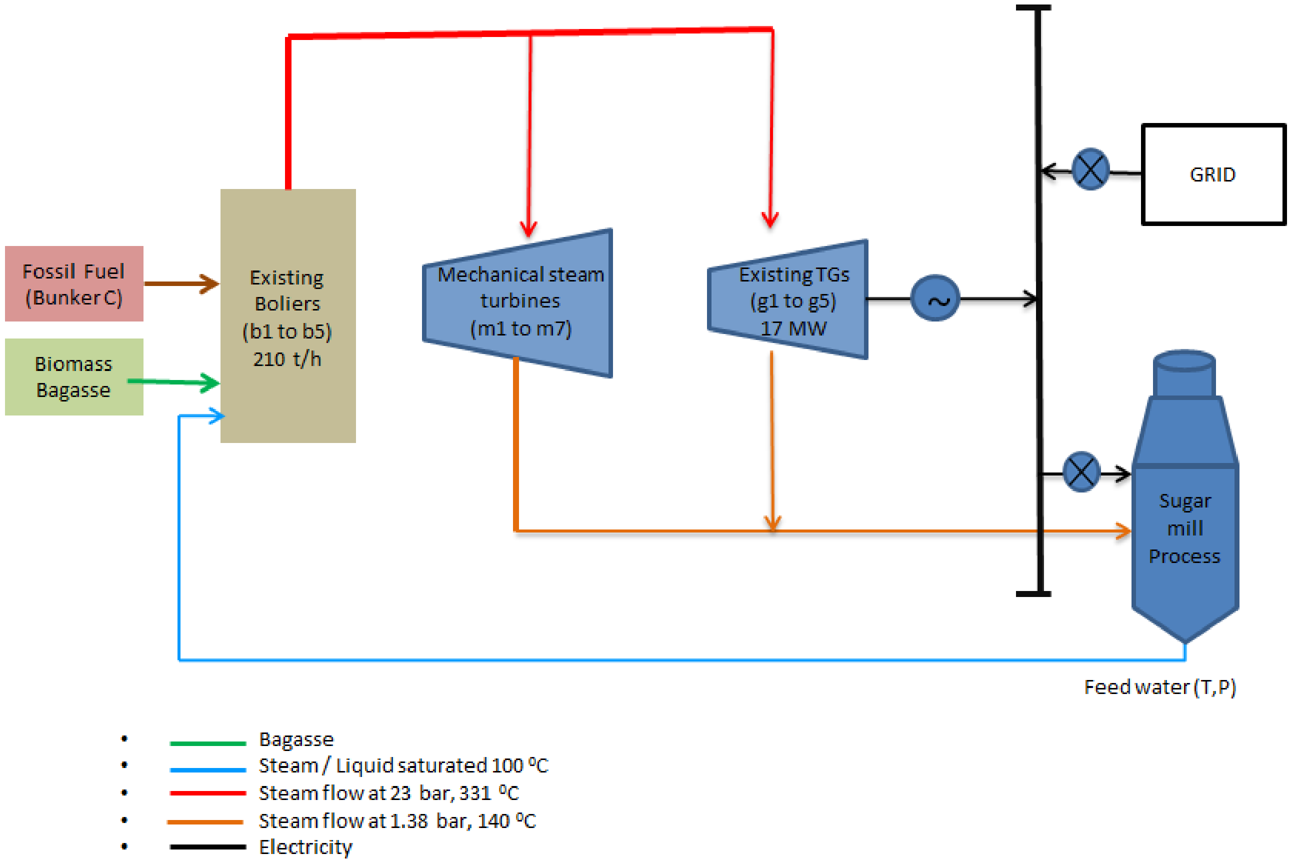

Figure 1 - Scenario existing prior to the start of the implementation of the Project Activity

A.2. Location of project activity

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The Project Activity is located in Mexico, Province of Huasteca Alta Region/Veracruz de Ignacio de la Llave State, at Panuco Municipality. The cogeneration plant is located at coordinates: Latitude:22.050000° and Longitude:-98.183333°, as illustrated by Figure 2

Figure 2 – Location of Project Activity

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Mexico	Ingenio Panuco Sapi de CV (Private entity)	NO

A.4. Reference to applied methodologies and standardized baselines

>>
Approved consolidated baseline methodology ACM0006: Consolidated methodology for electricity and heat generation from biomass - version 12.1.1

The following tools have been used:

- “Tool for the demonstration and assessment of additionality”, version 7.0.0
- “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”, version 01
- “Tool to calculate the emission factor for an electricity system”, version 04.0
- “Tool to determine the remaining lifetime of equipment”, version 01
- “Tool for Project and leakage emissions from transportation of freight”, version 01.1.0
- “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”, version 02
- “Tool to determine the baseline efficiency of thermal or electric Step”, version 01

No standardized baseline was applied in this project activity.

A.5. Crediting period type and duration

>>
The renewable crediting period is from 01/09/2016 to 31/08/2023.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

>>

The project activity involves the installation of a new cogeneration plant. It consists in the installation of a high-pressure boiler that produces 200 tonnes/hour of superheated steam each and a power plant of 100 MW.

The boilers produce 200 t/h of steam at 82.7 bar and 538 ◦C and it will utilize exclusively bagasse from on-site production.

The project activity provides all the heat and all the electricity required by the sugar mill. The turbo generators will have an output, of 255 tonnes steam per hour at 1,38 bar and 140 ◦C which is used at the sugar mill for various mechanical applications such as cutting, shredding and milling.

The output steam of the mechanical applications is used for sugar cane juice evaporation, then, it is condensed and used as feed water for the steam boiler.

The annual average electricity generation of the project is estimated to be 327,454 MWh and the electricity consumption of auxiliary plant is around 33,085 MWh, considering that during the project activity the steam turbines used in the mechanical applications will be replaced by electrical transmission motors. In addition, the mill consumption after the implementation of second stage will be around 164,571 MWh and, it is estimated that around 162,883 MWh of electricity is directly fed to the grid. The project Scenario is presented in Figure 3

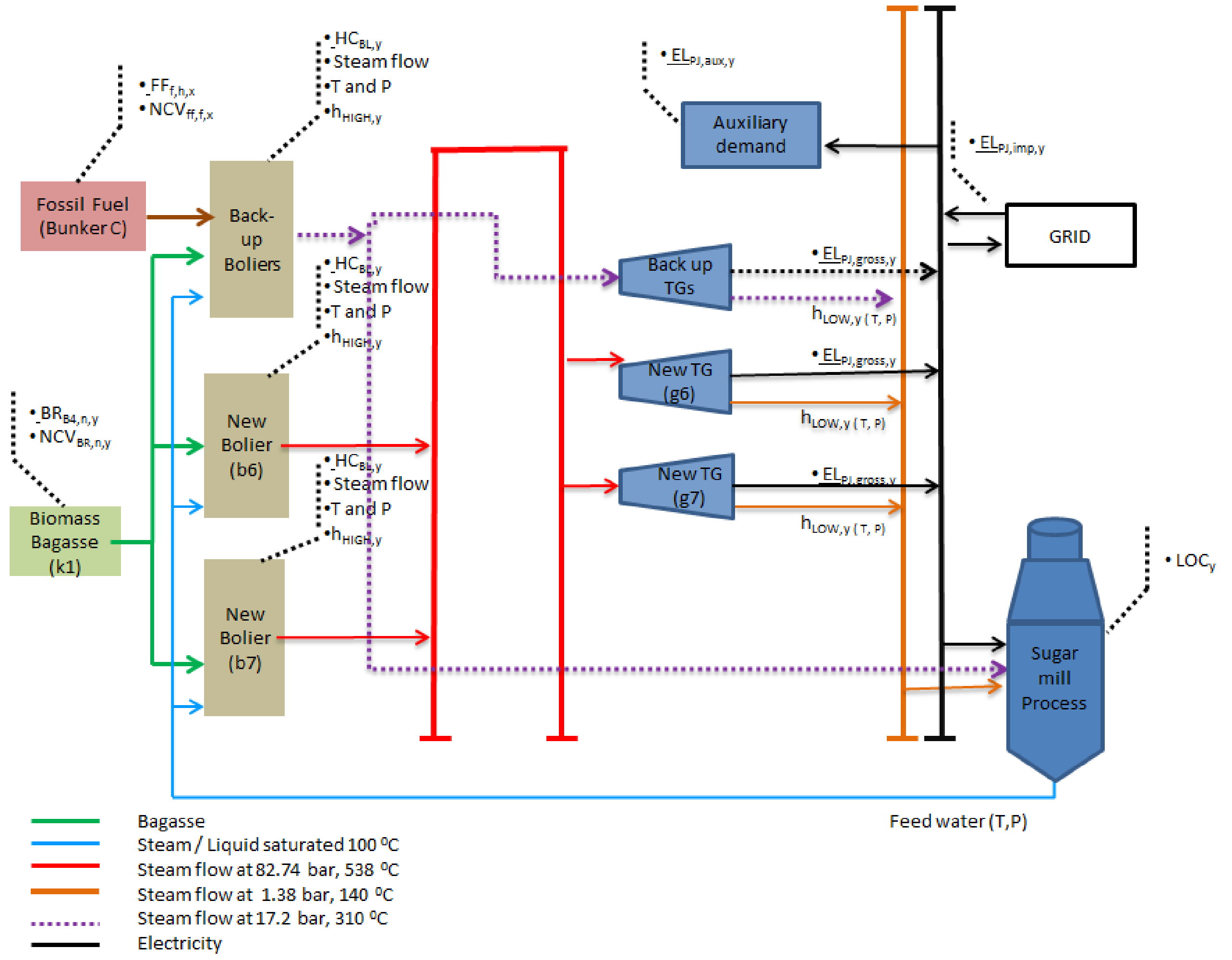

Figure 3 - Figure 3 – Project Activity Scenario

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

>>

Deviations were not applied during this monitoring period

B.2.2. Corrections

>>

Corrections were not applied during this monitoring period

B.2.3. Changes to the start date of the crediting period

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No changes occurred on start date of the crediting period

B.2.4. Inclusion of monitoring plan

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The monitoring plan is described in the registered PDD of "Panuco Bagasse Cogeneration Project", available at http://cdm.unfccc.int/Projects/DB/ICONTEC1413814561.64/view

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

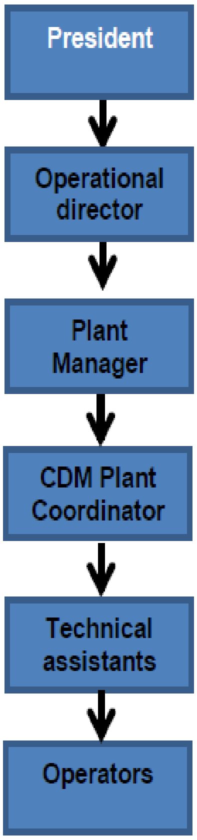
>>
It was not done permanent changes on Registered Monitoring Plan

B.2.6. Changes to project design

>>
No changes occurred in project design

SECTION C. Description of monitoring system

>>
The personnel involved in the Monitoring of CDM project Activity, as per registered PDD is presented below:



Plant Manager and CDM Plant Coordinator are responsible:

- to ensure proper operation and maintenance of the plant by the operators, with the support from the own Technical Team;
- to check the completeness and errors of data recorded;
- ito prepare the monthly monitoring report with the integration of all data, with the support from CDM consultant;
- to execute fast and accurate repair/replacement of any failure equipment;
- to ensure proper calibration and maintenance of monitoring equipment has been carried out as scheduled in the monitoring plan; and
- to make direct communication with the management board.

The Operators are responsible:

- To run the plant as according to the operation manual with the support from technology provider;
- To record all the raw data and build them into spreadsheet; and
- To do the backup of all data into server and external hard drive.

Ingenio Panuco follows strict monitoring procedures, including maintenance, calibration and data security. These procedures follow the CDM requirements and the recommendations of the technology providers of the various meters within the project activity. Ingenio Panuco is responsible for the implementation of these procedures as well as their update as required.

The electricity generated by the project will be measured with a calibrated electricity meter installed at the outlet of the heat engine following the rules established by the Energy Regulatory Commission (CRE) in the resolution called as *“Resolution Energy Regulatory Commission, which issues the General Rules of the National Electrical Interconnection System for generators or permit holders with renewable energy or efficient cogeneration”*

Biomass will be measured using calibrated weight bridges. For bagasse consumption quantities will be cross-checked with logbooks. The steam flow, temperature and pressure will be measure with calibrated meters.

The CDM developer will design a Monitoring Manual for operatives to follow with CDM monitoring instructions. Ingenio Panuco will coordinate information gathering and be in charge of guaranteeing high quality data.

The procedures for data collection and monitoring management will include:

- Assigning a monitoring team;
- Capacity building of the monitoring team;
- Implementation of emission calculations spreadsheets;
- Data collection for the implementation of monitoring plan;
- Data record and storage;
- Emission reduction calculations;
- Monitoring procedures;
- Calibration procedures;
- Monitoring reporting;
- Regular manual update;
- Back-up and emergency case procedures.

In case of emergency of malfunctions in monitoring equipment, proper conservative approach should be taken to measure the emission reductions if the major monitored data cannot be measured.

Internal Auditing

Procedures for internal auditing will be implemented in order to ensure that the monitoring methodology is applied in the correct manner, describing the non-conformities and proposing correctives measures when needed. The person in charge of following these auditing procedures will be determined with the monitoring team. Specific training for the Monitoring Team will be provided prior to power plant's operation.

Data storage

Data will be stored electronically, during the crediting period and at least two years after the last issuance of CER credits for the project activity in the concerning crediting period. Ingenio Panuco will be responsible for storage of data received from the measuring devices, the calibration certificates and the relevant receipts.

Quality assurance and quality control

A high level of accuracy of the measurements will be achieved due to the use of high-precision equipment and due to strict compliance with the recommendations for calibration frequency of the equipment provider. All metering devices will be calibrated. The specification of the meters will be in compliance with the requirements of the host country.

Several key monitoring parameters can be quality-checked with external information. Regarding electricity exports, it is the incentive of Ingenio Panuco and the customers of the company to keep the meters accurate and non-tampered.

The amounts of sugarcane weighed upon arrival to the project site are the base for the invoicing for the sugarcane farmers and self-control. The both the farmers and the project participants have high incentive to keep these measurements accurate.

Most of the monitoring parameters are required by Ingenio Panuco for the orderly and efficient operation of the sugar mill, and therefore high operation standards are applied. Moreover, the plant is certified by ISO 9001 quality system and various other quality standards.

Corrective actions

The staff will log all corrective actions and will report these in the monitoring report. In case when the corrective actions are considered necessary, these actions will be implemented according to internal procedures.

Procedures for monitoring personnel training

The Project Participant will conduct a training and quality control program to ensure that the good management practices are carried out and implemented by all project operating personnel in terms of record-keeping, equipment calibration, overall maintenance, and procedures for corrective action.

Emergency procedures

As a precautionary measure, regularly backups will be carried out to avoid data loss due to power outages. The CMD plant coordinator will check daily the records. In addition, an emergency plan will be developed including other types of emergencies such as fire and work accidents.

Calibration

All the measurement instruments will be subject to regular calibration as per manufacturer's specifications or, in the absence of official standards and when applicable, the calibration

frequency will be defined by the Project Participants based on good practices in the market. Regular cross-check and calibration will be made by the operators and all applicable procedures will be supervised by Ingenio Panuco internal audit.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

<table>
<tr><td>Data/parameter:</td><td>Biomass categories and quantities used for the selection of the baseline scenario selection and assessment of additionality</td></tr>
<tr><td>Unit</td><td>tonnes on dry-basis</td></tr>
<tr><td>Description</td><td>Type (i.e. bagasse, rice husks, empty fruit bunches, etc.);
- Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, from dedicated plantations etc.);
- Fate in the absence of the CDM project activity (scenarios B);
- Use in the project scenario (scenarios P);
- Quantity (tonnes on dry-basis)</td></tr>
<tr><td>Source of data</td><td>On-site historical use of biomass and purchase orders</td></tr>
<tr><td>Value(s) applied)</td><td>
<table>
<tr><th>Category (k)</th><th>Biomass residue type</th><th>Source</th><th>Baseline Scenario Use</th><th>Project Scenario Use</th><th>Quantity (t/year)</th></tr>
<tr><td>K_1</td><td>Bagasse</td><td>On-site production</td><td>Electricity generation on-site (B4:)</td><td>Electricity generation on-site (biomass-only boiler)</td><td>255,992.63</td></tr>
</table>
</td></tr>
<tr><td>Choice of data or measurement methods and procedures</td><td>The information is based on historical and current plant management experience.
The bagasse data is based on historical records of the plant.</td></tr>
<tr><td>Purpose of data</td><td>Biomass categories and quantities is used for the selection of the baseline scenario selection and assessment of additionality</td></tr>
<tr><td>Additional comments</td><td>This parameter is related to the procedure for the selection of the baseline scenario selection and assessment of additionality (Table 1, Section B.4).</td></tr>
</table>

<table>
<tr><td>Data/parameter:</td><td>$BR_{HIST,K1,x}$</td></tr>
<tr><td>Unit</td><td>tonnes on dry-basis</td></tr>
<tr><td>Description</td><td>Quantity of biomass residues of category K1, used for power or heat generation at the project site in year x prior the date of submission of the PDD for validation of the CDM project activity (tonnes on dry-basis) prior the time of submission of the PDD for validation of the CDM project activity</td></tr>
<tr><td>Source of data</td><td>The information is based on historical operation documentation of “Ingenio Panuco” and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013).</td></tr>
<tr><td>Value(s) applied)</td><td>$BR_{HIST,K1,2013}$ 461,903 Tonnes
$BR_{HIST,K1,2012}$ 362,920 Tonnes
$BR_{HIST,K1,2011}$ 390,808 Tonnes</td></tr>
</table>

Choice of data or measurement methods and procedures	The information is based on historical operation documentation. Measurements were made in electronic road scale.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	NA

Data/parameter:	$BR_{K1,h,x}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category k1 used in heat generators (b1 to b5) in year x (tonnes on dry-basis)
Source of data	On-site measurements of “Ingenio Panuco” and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	$BR_{K1,2013}$ 461,903 Tonnes $BR_{K1,2012}$ 362,920 Tonnes $BR_{K1,2011}$ 390,808 Tonnes
Choice of data or measurement methods and procedures	The information is based on historical operation documentation. Measurements were made in electronic road scale.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	As all baseline heat generators are similar in capacity and efficiency, no preference can be identified or justified, and the biomass is assumed to be evenly distributed between the baseline heat generators

Data/parameter:	$FF_{f,h,x}$
Unit	Liter/yr
Description	Quantity of fossil fuel type f fired in heat generator b1 to b5 in year x (mass or volume unit/yr)
Source of data	On-site measurements of “Ingenio Panuco” and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	$FF_{BunkerC,b1-b5,2013}$ 6,385,057 Liters $FF_{BunkerC,b1-b5,2012}$ 5,148,968 Liters $FF_{BunkerC,b1-b5,2011}$ 2,885,782 Liters
Choice of data or measurement methods and procedures	The information is based on historical operation documentation. The data has been estimated in based on purchase invoices.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	As all baseline heat generators are similar in capacity and efficiency, no preference can be identified or justified, and the fossil fuel is assumed to be evenly distributed between the baseline heat generators
Data/parameter:	HGh,x
Unit	GJ
Description	Net quantity of heat generated in heat generators b1 to b5 in year x (GJ/yr)
Source of data	On-site measurements and calculations of “Ingenio Panuco” and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)

Value(s) applied)	HGb1-b5,2013 2,211,224 GJ/yr HGb1-b5,2012 1,364,437 GJ/yr HGb1-b5,2011 1,683,284 GJ/yr
Choice of data or measurement methods and procedures	The information is based on historical operation documentation (tonnes/hour) of steam produced, the operating hours per season and the enthalpy of the heat generated at 331 °C and 23 bar by the generators minus the enthalpy of feed water at 100 °C liquid saturated.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	As all baseline heat generators are identical in capacity and efficiency, no preference can be identified or justified, and the heat generated is assumed to be evenly distributed between the baseline heat generators.

Data/parameter:	$HG_{BR,CG/x,i}$
Unit	GJ
Description	Quantity of heat used in cogeneration heat engines (g1 to g5) in year x (GJ/yr)
Source of data	On-site measurements of “Ingenio Panuco” and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	$HG_{BR,CG,\ 2013}$ 136,145 GJ/yr $HG_{BR,CG,\ 2012}$ 84,008 GJ/yr $HG_{BR,CG,\ 2011}$ 103,640 GJ/yr
Choice of data or measurement methods and procedures	The information is based on: - Historical operation documentation from 2011 to 2013 seasons (tonnes/hour) of the steam generated minus the steam consumed by to the mechanical applications. - The enthalpy of the heat generated by the heat generators at 23 bar and 331 °C minus the enthalpy of feed water at 100 °C liquid saturated.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	As all baseline heat engines are similar in capacity and efficiency, no preference can be identified or justified, and the heat used is assumed to be evenly distributed between the baseline heat engines

Data/parameter:	$HC_{BR,CG/x,i}$
Unit	GJ
Description	Quantity of process heat extracted from the cogeneration type heat engines (g1 to g5) in year x
Source of data	On-site measurements of “Ingenio Panuco” and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	$HC_{BR,CG,2013}$ 947,953 GJ/yr $HC_{BR,CG,2012}$ 584,935 GJ/yr $HC_{BR,CG,2011}$ 721,625 GJ/yr
Choice of data or measurement methods and procedures	The information is based on: - Historical operation documentation of 2011 to 2013 seasons (tonnes/hour) of the steam generated by the heat generators minus the steam consumed by to the mechanical applications. - The enthalpy of the heat generated by the heat generators at 1.38 bar and 140 °C minus the enthalpy of feed water at 100 °C liquid saturated.

Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	As all baseline heat engines are similar in capacity and efficiency, no preference can be identified or justified, and the heat used is assumed to be evenly distributed between the baseline heat engines

Data/parameter:	$EL_{BR,CG,x,i}$
Unit	MWh
Description	Quantity of electricity generated in heat engines (g1 to g5) in year x (MWh)
Source of data	On-site measurements of "Ingenio Panuco" and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	$EL_{BR,CG,2013}$ 20,067 MWh/yr $EL_{BR,CG,2012}$ 15,152 MWh/yr $EL_{BR,CG,2011}$ 19,057 MWh/yr
Choice of data or measurement methods and procedures	The information is based on historical data measured by the electricity meters
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	As all baseline heat engines are similar in capacity and efficiency, no preference can be identified or justified, and the electricity generated is assumed to be evenly distributed between the baseline heat engines

Data/parameter:	$CAP_{HG,b1-b5}$
Unit	GJ/h
Description	Baseline capacity of heat generators (b1 to b5)
Source of data	On-site measurements of "Ingenio Panuco" and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	560.28
Choice of data or measurement methods and procedures	This parameter reflects the design maximum heat generation capacity (in GJ/h) of each baseline heat generator b1 through b5. It is based on the installed capacity of the heat generator, and is determined by the enthalpy difference of the steam and feed water and the capacity in tonne steam per hour: 210 tonnes/h steam produced at 23 bar and 331 °C, water feed is 100 °C at saturated steam conditions For the five heat generators: CAPHG,b1-b5 = 560.28 GJ/h
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	NA

Data/parameter:	$CAP_{EG,CG,g1-g5}$
Unit	MW
Description	Baseline electricity generation capacity of heat engines (g1 to g5)
Source of data	On-site measurements or reference plant design parameters
Value(s) applied)	17
Choice of data or measurement methods and procedures	This parameter reflects the design maximum electricity generation capacity of each baseline heat engine cg8 to cg11. It is based on the installed capacity of the heat engines, as stated by the technology provider. No type j (power only) heat engines exist in the baseline. For the five heat engines: CAPEG,CG, g1-g5 = 17 MW

Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	NA

Data/parameter:	$LFC_{HG,h}$
Unit	Ratio
Description	Baseline load factor of heat generators b1 through b5
Source of data	On-site measurements or reference plant design parameters of "Ingenio Panuco" and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	76%
Choice of data or measurement methods and procedures	This parameter is calculated based on: The baseline (historical) steam production in the last three seasons • Steam Production,2013,b1-b5 = 828,444 tonnes • Steam Production,2012, b1-b5 = 511,912 tonnes • Steam Production,2011, b1-b5 = 630,649 tonnes The baseline (historical) steam production maximum capacity: 210 tonnes of steam per hour (Five heat generators, b1 through b5) The operational hours of heat generators per season • Steam Production capacity,2013,b1-b5 = 942,480 tonnes • Steam Production capacity,2012,b1-b5 = 797,790 tonnes • Steam Production capacity,2011,b1-b5 = 830,760 tonnes The value is based on the maximum value of three years of operation (2011-2013). LFCHG,2011,2012, 2013 = 76% These data is based on the historical information in the most recent three years prior to the CDM project activity, and thus takes into account the actual required operation conditions such as downtime, maintenance and required operation pattern. The data used in the calculation was made available to the validating DOE.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	NA

Data/parameter:	$HPRB_{L,i}$
Unit	Ratio
Description	Baseline heat-to-power ratio of the heat engines (g1 through g5)
Source of data	Historical information from the recent three seasons of "Ingenio Panuco" and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	This parameter is calculated based on: • HCBR,CG,2013 947,953 GJ/yr • HCBR,CG,2012 584,935 GJ/yr • HCBR,CG,2011 721,625 GJ/yr • ELBR,CG,2013 = 20,067.49 MWh /yr • ELBR,CG,2012 = 15,153.89 MWh/yr • ELBR,CG,2011 = 19,057.75 MWh yr The value of HPRBLi, is based on the maximum historical value of the three years: HPRBL,CG,MAX,2011-2013 = 13.12

Choice of data or measurement methods and procedures	This parameter is used for the calculation of baseline emissions
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	NA

Data/parameter:	$LFC_{EG,CG,i}$
Unit	Ratio
Description	Baseline load factor of heats engines (g1 through g5)
Source of data	Historical information from the recent three seasons and reference plant design parameters of “Ingenio Panuco” and this data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	48%
Choice of data or measurement methods and procedures	This parameter is calculated based in: • The electricity generation of the heat engines during the last three seasons ELBR,CG,2013 = 20,067.49 MWh /yr ELBR,CG,2012 = 15,153.89 MWh/yr ELBR,CG,2011 = 19,057.75 MWh yr • The baseline heat engines design capacity: 17 MW (five heat engines) and the operational hours per season. Electricity generation capacity 2013 76,296 MWh /yr Electricity generation capacity 2012 37,990 MWh/yr Electricity generation capacity 2011 39,560 MWh yr The value is based on the maximum value of three years of operation: (48%). These data is based on historical information of the recent three seasons, and thus takes into account the actual required operation conditions such as downtime, maintenance and required operation pattern.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	NA

Data/parameter:	$NCV_{BR,k1,x}$
Unit	GJ/tonnes on dry-basis
Description	Net calorific value of biomass residues of category k1 in year x
Source of data	Measurements by certified laboratory contracted by “Ingenio Panuco” and that data was obtained after the end of the mentioned year crop season (2011, 2012 and 2013)
Value(s) applied)	$NCV_{BR,k1}$,2013 = 14.44 $NCV_{BR,k1}$,2012 = 14.44 $NCV_{BR,k1}$,2011 = 14.44
Choice of data or measurement methods and procedures	Measurements from 2012 carried out by an accredited laboratory following the relevant international standards. The NCV used was based on the boiler manufacturer technical specifications
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	The NCV is to be calculated for wet biomass as used in the heat generator (i.e. deducting the energy used for the evaporation of the water contained in the biomass residues).

Data/parameter:	$NCV_{FF,fuel\ oil,x}$
Unit	GJ/t
Description	Weighted average net calorific value of fossil fuel in year y
Source of data	National Energy Balance (Mexico governmental agency)
Value(s) applied)	NCVaverage = 41.86 $NCV_{fuel\ oil}$, 2013= 41.86 $NCV_{fuel\ oil}$, 2012 = 41.86 $NCV_{fuel\ oil}$, 2011=41.86
Choice of data or measurement methods and procedures	The NCV used was based on the PEMEX (Mexico's state-owned petroleum company) technical publication.
Purpose of data	This parameter is used for the calculation of baseline emissions
Additional comments	NA

D.2. Data and parameters monitored

(Copy this table for each data or parameter.)

Data/parameter:	Biomass categories and quantities used in the CDM project activity
Unit	Sugar cane bagasse obtained from nes crushing in project site
Description	The last column of Table 1 of section B.4.corresponds to the quantity of biomass (tonnes on dry-basis). This quantity will be updated every year of the crediting period as part of the monitoring plan so as to reflect the actual use of biomass in the project scenario. These updated values are used for emissions reductions calculations. Along the crediting period, new categories of biomass (i.e. new types, new sources, with different fate) can be used in the CDM project activity. In this case, a new line will be added to the table. If those new categories are of the type B1, B2 or B3, the baseline scenario for those types of biomass residues should be assessed using the procedures outlined in the guidance provided in the procedure for the selection of the baseline scenario and demonstration of additionality.
Measured/calculated/default	Measured
Source of data	On site measurements
Value(s) of monitored parameter	(see table below)
Monitoring equipment	Use of weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. Data would be monitored continuously and aggregated at least seasonally, to calculate emissions reductions.
Measuring/reading/recording frequency:	The meters will measure data continuously and aggregated daily.
Calculation method (if applicable):	NA

Value(s) of monitored parameter:

Category(k)	**Biomass residue type**	**Source**	**Baseline Scenario Use**	**Project Scenario Use**	**Quantity**
K_1	Bagasse	On-site production	Cogeneration on-site (B4)	Cogeneration on-site(B4)	Measuredex-post

QA/QC procedures:	The weight meters for bagasse are calibrated yearly according to national standards, and are reviewed by the sugar cane unions' representatives. The weighbridge accuracy is at least class IV. Crosscheck the measurements with an annual energy balance that is based on purchased quantities, purchase invoices and stock changes.
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	NA

Data/parameter:	$BR_{PJ,n,y}$
Unit	tonnes on dry-basis
Description	BRPJ,n,y = Quantity of biomass residues of category n used in the CDM project activity in year y (tonnes on dry-basis)
Measured/calculated/default	Measured
Source of data	On site measurements
Value(s) of monitored parameter	NA
Monitoring equipment	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Measuring/reading/recording frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
Calculation method (if applicable):	NA
QA/QC procedures:	The weight meters for biomass residues are calibrated yearly according to national standards. The weighbridge accuracy is at least class IV.
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	NA

Data/parameter:	$BR_{B4,n,y}$
Unit	tonnes on dry-basis
Description	Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline scenario is B4 (tonne on dry-basis)
Measured/calculated/default	Measured
Source of data	On site measurements
Value(s) of monitored parameter	Baseline Scenario B4; Category – k1; Biomass residue Type – sugar cane bagasse; Quantity (dry basis): • 2012 - 177.286,75 • 2013 - 220.328,00 • 2014 - 215.896,08
Monitoring equipment	Use weight bridges. Adjust for the moisture content in order to determine the quantity of dry biomass.
Measuring/reading/recording frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
Calculation method (if applicable):	Quantity of dry biomass is calculated based on humidity, which determined on laboratory applying standard methods
QA/QC procedures:	The weight meters for biomass residues are calibrated yearly according to national standards. The weighbridge accuracy is at least class IV.
Purpose of data:	This parameter is used for the calculation of emissions reductions

Additional comments:	NA

Data/parameter:	$EF_{FF,y,f}$
Unit	t CO2/GJ
Description	CO2 emission factor for fossil fuel type f in year y (t CO2/GJ)
Measured/calculated/default	Measured
Source of data	Values provided by fuel supplier in invoices or national data where available. Where such data is not available, use IPCC default emission factors (country-specific, if available) if they are deemed to reasonably represent local circumstances.
Value(s) of monitored parameter	NA
Monitoring equipment	Choose the value in a conservative manner and justify the choice. In cases values provided by fuel supplier in invoices are not available, IPCC default values limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2. (Energy) of 2006 IPCC guidelines on National GHG Inventories. Any future revision of the IPCC guidelines should be taken into account.
Measuring/reading/recording frequency:	Review the appropriateness of the data annually
Calculation method (if applicable):	NA
QA/QC procedures:	Check consistency of measurements and local/national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	During the monitoring period was not verified fossil fuel consumption by the project activity.

Data/parameter:	$FF_{f,h,x}$
Unit	L/year
Description	Quantity of fossil fuel type f fired in heat generator h in year x
Measured/calculated/default	Measured
Source of data	On-site measurements
Value(s) of monitored parameter	NA
Monitoring equipment	The measurements will be made with appropriate volumetric meter
Measuring/reading/recording frequency:	Data monitored continuously and aggregated as appropriate
Calculation method (if applicable):	NA
QA/QC procedures:	Check consistency of measurements and local/national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	Applicable if back-up existing heat generator is used. No fossil was consumed during the monitoring period

Data/parameter:	$HC_{BL,y}$
Unit	GJ
Description	HCBL,y = Baseline process heat generation in year y (GJ)

Measured/calculated/default	Default, based on thermodynamic tables
Source of data	On-site measurements
Value(s) of monitored parameter	2.339.263,87
Monitoring equipment	This parameter should be determined as the difference of the enthalpy of the process heat (steam or hot water) supplied to process heat loads in the CDM project activity minus the enthalpy of the feed-water, the boiler blow-down and any condensate return to the heat generators. The baseline process heat generation is determined based on: - Steam Production: measured continuously by a flow meter; - Temperature: measured continuously with a thermocouple; - Pressure: In in case of superheated steam measured continuously with a pressure meter. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
Measuring/reading/recording frequency:	The meters will measure data continuously and aggregated as appropriate
Calculation method (if applicable):	Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
QA/QC procedures:	The various meters used to measure flow, temperature and pressure will be maintained and calibrated yearly according to the requirements of the technology provider
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	NA

Data/parameter:	$EL_{PJ,gross,y}$
Unit	MWh
Description	Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh)
Measured/calculated/default	Measured
Source of data	On-site measurements
Value(s) of monitored parameter	2016 – 48.253 2017 – 137.690
Monitoring equipment	The data is collected continuously using an electricity meter. Data monitored continuously and aggregated at least seasonally. The data will be archived throughout the crediting period and two years thereafter.
Measuring/reading/recording frequency:	The meters will measure data continuously and aggregated as appropriate
Calculation method (if applicable):	NA
QA/QC procedures:	The meter are calibrated yearly according to the requirements of the technology provider. The accuracy and uncertainty of the monitoring instrument will be in accordance with manufacturer specifications and may range up to 1.5%. The consistency of metered electricity generation will be cross-checked with the invoices for sold electricity, record of electricity internal consumption and quantity of biomass combusted.
Purpose of data:	This parameter is used for the calculation of emissions reductions

Additional comments:	The electricity generated by the project will be measured with a calibrated electricity meter installed at the outlet of the heat engine following the rules established by the Energy Regulatory Comision (CRE) in the resolution “Resolución por la que la Comisión Reguladora de Energía expide las Reglas Generales de Interconexión al Sistema Eléctrico Nacional para generadores o permisionarios con fuentes de energías renovables o cogeneración eficiente.

Data/parameter:	$EL_{PJ,imp,y}$
Unit	MWh
Description	Project electricity imports from the grid in year y (MWh)
Measured/calculated/default	measured
Source of data	On-site measurement
Value(s) of monitored parameter	2016 – 2739.83 2017 – 9967.23
Monitoring equipment	The data is collected continuously using a bidirectional electrical meter. Data monitored continuously and aggregated at least seasonally. The data will be archived throughout the crediting period and two years thereafter.
Measuring/reading/recording frequency:	The meters will measure data continuously and aggregated as appropriate
Calculation method (if applicable):	NA
QA/QC procedures:	The meter used will be calibrated yearly according to the requirements of the technology provider. The accuracy and uncertainty of the monitoring instrument will be in accordance with manufacturer specifications and may range up to 1.5%. The consistency of metered electricity should be cross-checked with receipts from electricity purchases.
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	NA

Data/parameter:	$EL_{PJ,aux,y}$
Unit	MWh
Description	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh)
Measured/calculated/default	Measured
Source of data	On-site measurement
Value(s) of monitored parameter	2016 – 510 2017 - 552
Monitoring equipment	Use calibrated electricity meters. The data will be archived throughout the crediting period and two years thereafter.
Measuring/reading/recording frequency:	The meters will measure data continuously and aggregated as appropriate
Calculation method (if applicable):	NA
QA/QC procedures:	The consistency of metered electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years).
Purpose of data:	This parameter is used for the calculation of emissions reductions

Additional comments:	EGPJ,aux,y shall include all electricity required for the operation of equipment related to the preparation, storage and transport of biomass (e.g. for mechanical treatment of the biomass, conveyor belts, driers, etc.) and electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.). In case steam turbines are used for mechanical power in the baseline situation and electric motors for the same purpose in the project situation, the electricity used to run these electric motors shall be included in $EL_{PJ,aux,}$

Data/parameter:	$NCV_{BR,n,y}$
Unit	GJ/tonnes of dry matter
Description	Net calorific value of biomass residue of category n in year y (GJ/tonnes on dry-basis)
Measured/calculated/default	Measured
Source of data	On-site measurements
Value(s) of monitored parameter	7.4
Monitoring equipment	Measurements shall be carried out at reputed laboratories and according to relevant international standards. Measure the NCV on dry-basis.
Measuring/reading/recording frequency:	At least every six months, taking at least three samples for each measurement
Calculation method (if applicable):	NA
QA/QC procedures:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass.
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	NA

Data/parameter:	$NCV_{FF,f,x}$
Unit	GJ/l
Description	Net calorific value of fossil fuel type f in year x.
Measured/calculated/default	Measured
Source of data	Values provided by fuel supplier in invoices or national data where available.
Value(s) of monitored parameter	NA
Monitoring equipment	Values should be undertaken in line with national or international fuel standards.
Measuring/reading/recording frequency:	At least every six months
Calculation method (if applicable):	NA
QA/QC procedures:	Verify if the values of NCV is within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC guidelines. If the values fall below this range, additional information will be provided to justify the outcome.
Purpose of data:	This parameter is used for the calculation of emissions reductions.

Additional comments:	Applicable if back-up existing heat generator is used. It was not verified fossil fuel consumption during the monitoring period

Data/parameter:	$h_{LOW,y}$ $h_{HIGH,y}$
Unit	GJ/tonnes
Description	hLOW,y = Specific enthalpy of the heat carrier at the process heat demand side (GJ/tonnes); hHIGH,y = Specific enthalpy of the heat carrier at the heat generator side (GJ/tonnes).
Measured/calculated/default	Default based on thermodynamic tables
Source of data	On-site esurement
Value(s) of monitored parameter	NA
Monitoring equipment	The specific enthalpies should be determined based on the temperatures and, in case of superheated steam, the pressure. Temperature will be measured with a thermocouple and pressure with a pressure meter. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
Measuring/reading/recording frequency:	Data monitored continuously and aggregated as appropriate
Calculation method (if applicable):	NA
QA/QC procedures:	The various meters used to measure temperature and pressure are be maintained and calibrated yearly according to the requirements of the technology provider.
Purpose of data:	This parameter is used for the calculation of emissions reductions.
Additional comments:	The process heat demand side refers to where heat is finally used for heating purposes by end-users and the heat generator side refers to where heat is generated

Data/parameter:	Moisture content of the biomass residues
Unit	% Water content in mass basis in wet biomass residues.
Description	Moisture content of each biomass residues type k.
Measured/calculated/default	Measured
Source of data	On-site measurements
Value(s) of monitored parameter	2012 – 51,2% 2013 – 52,3% 2014 – 52.3%
Monitoring equipment	Measurements are carried out at reputed laboratories and according to relevant international standards. The weighted average should be calculated for each monitoring period and used in the calculations
Measuring/reading/recording frequency:	The moisture content should be monitored for each batch of biomass of homogeneous quality.
Calculation method (if applicable):	NA
QA/QC procedures:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years or relevant data sources.
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	NA

Data/parameter:	LOCy
Unit	hour
Description	Length of the operational campaign in year y (hour)
Measured/calculated/default	Measured
Source of data	On-site measurement
Value(s) of monitored parameter	2012 - 4368 2013 - 5615 2014 - 5424
Monitoring equipment	Record and sum the hours of operation of the CDM project activity facilities during year.
Measuring/reading/recording frequency:	Yearly
Calculation method (if applicable):	NA
QA/QC procedures:	This parameter is measured as part of the established operation procedures of Ingenio Panuco, and it required for the sugar mill's seasonal reports.
Purpose of data:	This parameter is used for the calculation of emissions reductions
Additional comments:	NA

D.3. Implementation of sampling plan

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All parameters of the project with exception of $NCV_{BR,n,y}$, $NCV_{FF,f,x}$ and $EF_{FF,y,f}$, will be monitored continuously and aggregated as appropriate, to calculate emissions reductions

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

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The baseline calculations were based on applied baseline methodology ACM0006 ver. 12 - Consolidated methodology for electricity and heat generation from biomass:

Step 1.1: Determine total baseline process heat generation

The amount of process heat is determined as the difference of the enthalpy process heat produced at 23 bar and 331 °C, minus the enthalpy of the feed-water which is condensate returned to the heat generators at 100 °C, at liquid saturated conditions:

	2015	**2014**	**2013**
Harvest days	226	234	182
LOC_y: Length of the operational campaign in year y (hour)	5.424	5.616	4.368
Steam flow to heat engines- Part 1 (t/h)	89,17		
Steam flow to mechanical steam turbines - Part 2 (t/h)	92,71		
Total baseline process heat generation Part 1 (GJ/h)	1.068.886,54		
Total baseline process heat generation heat generation Part 2 (GJ/h)	1.270.377,34		

HCBL,y Total baseline process heat generation (GJ)	**2.339.263,87**

Step 1.2: Determine total baseline electricity generation

Biomass	Biomass	Biomass	Biomass	Biomass	Biomass residues quantity (tonnes)	Moisture (%)

Year	$EL_{BL,\ y}$ (MWh)	$EL_{PJ,\ GROSS}$ (MWh)	$EL_{PJ,\ IMP,\ Y}$ (MWh)	$EL_{PJ,\ aux}$ (MWh)
2016	46.005,50	48.235,31	510,02	2.739,83
2017	137.690,97	147.106,00	552,20	9.967,23

Step 1.3: Determine baseline capacity of electricity generation
As described in the Section B.6.1 the CAPEG,total,y is calculated with the following equation:

$$CAP_{EG,total,y} = LOC_y \cdot \left[\sum_i \left(CAP_{EG,CG,i} \cdot LFC_{EG,CG,i} \right) + \sum_j \left(CAP_{EG,PO,j} \cdot LFC_{EG,PO,j} \right) \right]$$

Parameter	Value	
LOC_y: Length of the operational campaign in year y (hour)	5.136	hours
$CAP_{EG,CG,i}$ Baseline electricity generation capacity of heat engine i (e1-e5)	17,000	MW
$LFC_{EG,CG,i}$ = Baseline load factor of heat engine *i* (ratio) cogeneration mode	48%	
$CAP_{EG,total,y}$ = Baseline electricity generation capacity in year y (MWh)	42.058,19	MWh

Step 1.4: Determine the baseline availability of biomass residues

Where the baseline scenario includes the use of biomass residues for the generation of power and/or heat, the amount of biomass residues of category n that would be available in the baseline in year y (BRB4,n,y) has to be determined.

					2013	2014	2015	2013	2014	2015
1	Sugar cane Bagase	On-site production	Heat and electricity generation on-site (B4)	Heat and electricity generation on-site (biomass-only boiler)	362.920,68	461.903,57	452.612,32	51,2%	52,3%	52,3%
				Dry biomass residues (tonnes)	177.286,75	220.328,00	215.896,08			
				Px sugar produced (tonnes)	122.089,30	176.290,45	166.073,91			
				Py sugar produced average (tonnes)		176.290,45				

Parameter	Value	
$BR_{B4,n,h,y}$ = Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B4	255.992,63	tones of bagasse (on dry-basis)

Step 1.5: Determine the efficiencies of heat generators, and efficiencies and heat-to-power ratio of heat engines

The efficiency of the heat generators and heat engines is calculated using Option 3 of appliend baseline methodology.

The efficiency for heat generators should be calculated using the following equation:

$$\eta_{BL,HG,BR,b1\text{-}b6} = MAX\left\{\frac{HG_{BR,h,2010}}{\sum_{n} BR_{k1,h,2010} \cdot NCV_{BR,k1,2010}};\frac{HG_{BR,h,2011}}{\sum_{n} BR_{k1,h,2011} \cdot NCV_{BR,k1,2011}};\frac{HG_{BR,h,2012}}{\sum_{n} BR_{k1,h,2012} \cdot NCV_{BR,k1,2012}}\right\}$$

$$\eta_{BL,HG,FF,b1\text{-}b6} = MAX\left\{\frac{HG_{FF,h,2010}}{\sum_{n} FF_{f,h,2010} \cdot NCV_{FF,f,2010}};\frac{HG_{FF,h,2011}}{\sum_{n} FF_{f,h,2011} \cdot NCV_{FF,f,2011}};\frac{HG_{FF,h,2012}}{\sum_{n} FF_{f,h,2012} \cdot NCV_{FF,f,2012}}\right\}$$

Parameter	2013	2014	2015
$FF_{f,h,x}$(L)	5.148.968	6.385.057	-
$EL_{BR,CG,x,i}$ (KWh)	15.152.894	20.067.487	24.016
NCVBR,n,x (GJ/t)		14,44	
$NCV_{FF,f,x}$(GJ/t)		41,86	
$\rho_{fuel\ oil,x}$ (kg/L)		0,99	

Parameter	Value	Source
$\eta_{BL,HG,BR,h}$ = Baseline biomass-based heat generation efficiency of heat generator	0,64	Calculated
$\eta_{BL,HG,FF,h}$ = Baseline fossil-based heat generation efficiency of heat generator h (ratio)	0,64	Calculated

Step 1.6: Determine the emission factor of on-site electricity generation with fossil fuels

Although the baseline turbo generators could operate also on heat produced by combusting fossil fuel (Bunker C), all the capacity of power generation in the project is used in cogeneration mode, and on top of that, consuming biomass residues.

Therefore, no fossil fuel based power generation is identified during the monitored period

Step 1.7: Determine the emission factor of grid electricity generation

The parameter EFEG,GR,y should be determined as the combined margin CO2 emission factor for grid to which the project activity is connected in year y, calculated using the latest approved version of the “Tool to calculate the emission factor for an electricity system” (Version 02.2.1).

$EF_{EG,GR,y} = EF_{grid,CM,y}$ =	0,4183 tCO_2/MWh

Step 2: Determine the minimum baseline electricity generation in the grid

The calculation of the minimum amount of electricity that would be generated in the grid in the baseline is based on the assumption that the amount of electricity generated on-site in the baseline cannot be higher than the installed capacity of power generation available in the baseline scenario. Therefore, the following equation should be used:

$$EL_{BL,GR,y} = \max\left(0, EL_{BL,y} - CAP_{EG,total,y}\right)$$

Year	$EL_{BL,y}$ (MWh)	$CAP_{EG,total,y}$ (MWh)	$EL_{BL,GR,y}$ (MWh)
2016	46.005,50	40.485,92	5.519,58
2017	137.690,97	40.485,92	97.205,05

Step 3.1: Determine the baseline biomass-based heat generation

It is assumed that the use of biomass residues for which scenario B4 has been identified as the baseline scenario (BRB4,n,y) would be prioritized over the use of any fossil fuels in the baseline. From that assumption, the equivalent amount of heat that would be generated with biomass residues (HGBL,BR,y) should be determined.

Parameter	Value
$BR_{B4,n,h,y}$ = Quantity of biomass residues of category n used in the heat generator in year y for which the baseline scenario is B4 tones of bagasse (on dry-basis)	255.993
$NCV_{BR,n,y}$ = Net calorific value of biomass residue of category n in year (GJ/t)	14,4
$\eta_{BL,HG,BR,h}$ = Baseline biomass-based heat generation efficiency of heat generator h (ratio)	64%
$HG_{BL,BR,y}$ = Baseline biomass-based heat generation in year y (GJ)	2.371.889,02
LOC_y = Length of the operational campaign in year y (hour)	5.136
Capacity of heat generator (tonnes /h)	210
$CAP_{HG,h}$ = Baseline capacity of heat generator h (GJ/h)	560,28
$LFC_{HG,h}$ = Baseline load factor of heat generator h (ratio)	0,879
LOC_y *$CAP_{HG,h}$ *$LFC_{HG,h}$ = total capacity of the heat generator (GJ)	2.529.408,71

$$\sum_n \left(\mathrm{BR}_{\mathrm{B4,n,h,y}} \cdot NCV_{BR,n,y} \cdot \eta_{BL,HG,BR,h} \right) \leq LOC_y \cdot CAP_{\mathrm{HG,h}} \cdot LFC_{HG,h}$$

Step 3.2: Determine the baseline biomass-based cogeneration of process heat and electricity and heat extraction.

Parameter	
$HPR_{BL,i}$ = Baseline heat-to-power ratio of the heat engine i (ratio) .	13,122
$GGL_{default}$ = The default value for the losses linked to the electricity generator group (turbine, couplings and electricity generator. Set at 0.05) (ratio)	0,05
$HG_{BL,BR,CG,y,i}$ = Baseline biomass-based heat used in heat engine i in year y (GJ)	134.943,79
$HC_{BL,BR,CG,y}$ = Baseline biomass-based process heat cogenerated in year y (GJ)	124.945,66
$HG_{BL,BR,y}$ = Baseline biomass-based heat generation in year y (GJ)	2.371.889,02
$\sum_i \mathrm{HG}_{\mathrm{BL,BR,CG,y,i}} < HG_{BL,BR,y}$	TRUE
$HC_{BL,y}$ =Baseline process heat generation in year y (GJ)	2.339.263,87
$HC_{BL,BR,CG,y} < \mathrm{HC}_{\mathrm{BL,y}}$	TRUE
EL$_{BL,BR,CG,y}$ = Baseline biomass-based cogenerated electricity in year y (MWh)	2.645

$\eta_{BL,EG,CG,i}$ = Baseline electricity generation efficiency of heat engine i (MWh/GJ)	0,23887391
$\eta_{BL,EG,CG,i}$ * $HG_{BL,BR,CG,y,i}$	32.234,55
LOC_y = Length of the operational campaign in year y (hour)	5.136
$CAP_{EG,CG,i}$ =Baseline electricity generation capacity of heat engine i (MW)	17,00
$LFC_{EG,CG,i}$ = Baseline load factor of heat engine i (ratio)	0,48
LOC_y * $CAP_{EG,CG,i}$*$LFC_{EG,CG,i}$ (MWh)	42.058
$(\eta_{BL,EG,CG,i} \cdot HG_{BL,BR,CG,y,i}) \leq LOC_y \cdot CAP_{EG,CG,i} \cdot LFC_{EG,CG,i}$	TRUE

Case 3.2.4: If Σ>iiy,CG,BR,BL,y,BR,BLHGHG and yCGBRBLyBLHCHC,,,,>, then there would be biomass-based heat in the baseline that could still be used and process heat demand to be met. It is assumed then that this balance of biomass-based heat would be extracted from the heat header and used to meet the process heat demand without cogeneration of power. Three cases should thus be considered

Parameter	
$HG_{BL,BR,y}$ = Baseline biomass-based heat generation in year y (GJ)	2.371.889,02
$HG_{BL,BR,CG,y,i}$ = Baseline biomass-based heat used in heat engine i in year y (GJ)	134.943,79
$HC_{BL,y}$ =Baseline process heat generation in year y (GJ)	2.339.263,87
$HC_{BL,BR,CG,y}$ = Baseline biomass-based process heat cogenerated in year y (GJ)	124.945,66
$h_{HIGH,y}$ = Specific enthalpy of the heat carrier at the heat generator side (GJ/tonnes).	3,088
$h_{LOW,y}$ = Specific enthalpy of the heat carrier at the process heat demand side (GJ/tonnes)	2,75280
$HC_{BL,y}$ - $HC_{BL,BR,CG,y}$ (GJ)	2.214.318
h_{LOW}/h_{HIGH}*($HG_{BL,BR,y}$ -∑ $HG_{BL,BR,CG,y,i}$) (GJ)	1.994.127
	TRUE

$$HC_{BL,y} - HC_{BL,BR,CG,y} > \frac{h_{LOW}}{h_{HIGH}} \cdot \left(HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i} \right)$$

Case 3.2.4.2:

$$HC_{BL,y} - HC_{BL,BR,CG,y} > \frac{h_{LOW,y}}{h_{HIGH,y}} \cdot \left(HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i} \right)$$

Parameter		Source
$HG_{BL,BR,y}$ = Baseline biomass-based heat generation in year y (GJ)	2.371.889,02	See Step 3.1
$HG_{BL,BR,CG,y,i}$ = Baseline biomass-based heat used in heat engine i in year y (GJ)	134.943,79	See Step 3.2
$h_{HIGH,y}$ = Specific enthalpy of the heat carrier at the heat generator side (GJ/tonnes)	3,088	See Step 1.1
$h_{LOW,y}$ = Specific enthalpy of the heat carrier at the process heat demand side (GJ/tonnes)	2,75280	See Step 3.2.4
$HC_{BL,y}$ =Baseline process heat generation in year y (GJ)	2.339.263,87	See Step 1.1
$HC_{BL,BR,CG,y}$ = Baseline biomass-based process heat cogenerated in year y (GJ)	124.945,66	See Step 3.2
$HC_{BL,y}$ - $HC_{BL,BR,CG,y}$	2.214.318	Calculated
$h_{HIGH}/h_{LOW}*(HG_{BL,BR,y} - \sum HG_{BL,BR,CG,y,i})$	1.994.127	Calculated
$HC_{balance,FF,y}$ Balance of process heat demand after cogeneration in year y (GJ)	220.191,65	Calculated
EL$_{BL,y}$ Baseline electricity generation in year y (MWh)	137.691	See Step 1.2
EL$_{BL,GR,y}$ = Baseline minimum electricity generation in the grid in year y (MWh)	97.205	See Step 2
$EL_{BL,BR,CG,y}$ = Baseline biomass-based cogenerated electricity in year y (MWh)	2.645	See Step 3.2
ELbalance,$_{FF,y}$= Balance electricity generation demand that would remain to be met by using fossil fuel in year y (MWh)	37.841	Calculated

Step 4.1: Determine the baseline fossil fuel based cogeneration of process heat and electricity and the remaining process heat demand

Parameter	Value	Source
$HPR_{BL,i}$ = Baseline Heat Power Ratio of heat engine i (ratio)	13,12	See Step 1.5
$GGL_{default}$ = The default value for the losses linked to the electricity generator group (turbine, couplings and electricity generator. Set at 0.05) (ratio)	0,05	According to Step 1.5 of the methodology ACM0006. The default value for the losses linked to the electricity generator group (i.e. turbine/engine, couplings and electricity generator),GGLdefault , is 5%.
$HC_{BL,FF,CG,y}$ = Baseline fossil-fuel-based process heat cogenerated in year y	6.621	Calculated

$HG_{BL,FF,CG,y,i}$ = Baseline fossil-fuel-based heat used in heat engine i in year y (GJ)	7.151	Calculated
$EL_{BL,FF,y}$ =Baseline fossil-based electricity generation in year y (MWh)	504,57	Calculated
$HG_{BL,FF,CG,y}$ = Baseline fossil-fuel-based heat used in heat engine i in year y (GJ)	7.151	
$\sum_i HC_{BL,FF,CG,y,i} \leq HC_{balance,FF,y}$	NO	
$\frac{1}{3.6} \cdot \left((HG_{BL,FF,CG,y,i} + HG_{BL,BR,CG,y,i}) \cdot \frac{1}{(HPR_{BL,i} + 1 + GGL_{default})} \right)$	2.785,17	Calculated
$LOC_y \cdot CAP_{EG,CG,i} \cdot LFC_{EG,CG,i}$	42.058,19	Calculated
$HG_{BL,FF,DHE,y}$ = Baseline fossil-based heat used to meet baseline process heat demand via direct heat extraction in year y (GJ)	239.577	Calculated
$HG_{BL,FF,y}$ = Baseline fossil-based heat generation in year y (GJ)	246.727	Calculated
$EL_{balance,FF,y} \geq EL_{BL,FF,y}$	TRUE	Calculated
$EL_{balance,FF,y} < EL_{BL,FF,y}$	FALSE	Calculated
$EL_{BL,FF/GR,y}$ =Baseline uncertain electricity generation in the grid or on-site in year y (MWh) $EL_{PJ,offset,y} = 0$	37.336,35	Calculated

Calculate baseline emissions

Data:	Value	Units	Source
$EL_{BL,GR,y}$ = Baseline minimum electricity generation in the grid in year y (MWh)	97.205,05	MWh	See step 2
$EF_{EG,GR,y}$ = Emission factor of grid electricity generation	0,42	tCO_2/MWh	See step 1.7
$FF_{BL,HG,y,f}$ = Baseline fossil fuel demand for process heat in year y (GJ)	11.165		See step 4.2
$EF_{FF,y,f}$ = Baseline fossil fuel demand for process heat in year y (GJ)	0,077	tCO2/GJ	IPCC: CO_2 emission factor for residual fuel

			oil (heavy fuel oil (bunker))
$EL_{BL,FF/GR,y}$ = Baseline uncertain electricity generation in the grid or on-site in year y (MWh)	37.336	MWh	Step 4.1
$EF_{EG,FF,y}$ = CO_2 emission factor for electricity generation with fossil fuels at the project site in the baseline in year y (tCO2/MWh)	0,42	tCO_2/MWh	Step 1.7
Then Min($EF_{EG,GR,y}$,$EF_{EG,FF,y}$) =	0,42	tCO_2/MWh	Calculated
$BE_{BR,y}$ = Baseline emissions due to disposal of biomass residues in year y (t CO2e)	0,00		Calculated
BE_y	57.143	tCO_2	Calculated

E.2. Calculation of project emissions or actual net removals

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There is no project emissions associated to “Panuco Bagasse Cogeneration Project”

E.3. Calculation of leakage emissions

>>

There is no leakage emissions associated to “Panuco Bagasse Cogeneration Project”

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	36,282	0	0	--	36,282	36,282

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period ($t\ CO_2e$)	**Amount estimated ex ante ($t\ CO_2e$)**
36,282	106.589

E.6. Remarks on increase in achieved emission reductions

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The main difference on the amount do emission reductions on registered PDD and in this first crediting period is due lower amount of electricity generated by CDM Project Activity in the beginning of its operation

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Document information

Version	Date	Description
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
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 GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, 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).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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