MONITORING REPORT

VIÑALES BIOMASS POWER PLANT

arauco

Document Prepared by Arauco Bioenergia S.A.

Project Title	*Viñales biomass power plant*
Version	*04*
Report ID	*Identification number of this document*
Date of Issue	*28/09/2017*
Project ID	*1186*
Monitoring Period	01-January-2015 to 31-December-2016
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Viñales power plant, located in the Viñales sawmill site of Celulosa Arauco y Constitución S.A. (from now on, Arauco)) consists of a 41 MW condensing-extracting turbo generator machine and a biomass fluidized-bed boiler of 210 ton/hr of high pressure steam capacity: The heat is used in the Viñales sawmill for wood-drying and part of the electric power is used in Viñales sawmill. The remaining electric power is injected in the SIC (Central interconnected system) grid for sale.

The project activity is designed to use own and third party biomass for steam and electric power generation. Biomass from industrial and forestry operations in Chile would be normally dumped in piles for natural decay.

The used technology for generating megawatt (MW) levels of electricity from biomass is the steam-Rankine cycle which involves heating pressurized water, with the resulting steam expanding to drive a turbine, and then condensing back to water for partial or full recycling to the boiler. A heat exchanger is used in some cases to recover heat from the flue gases to preheat combustion air, and a deaerator must be used to remove dissolved oxygen from water before it enters the boiler.

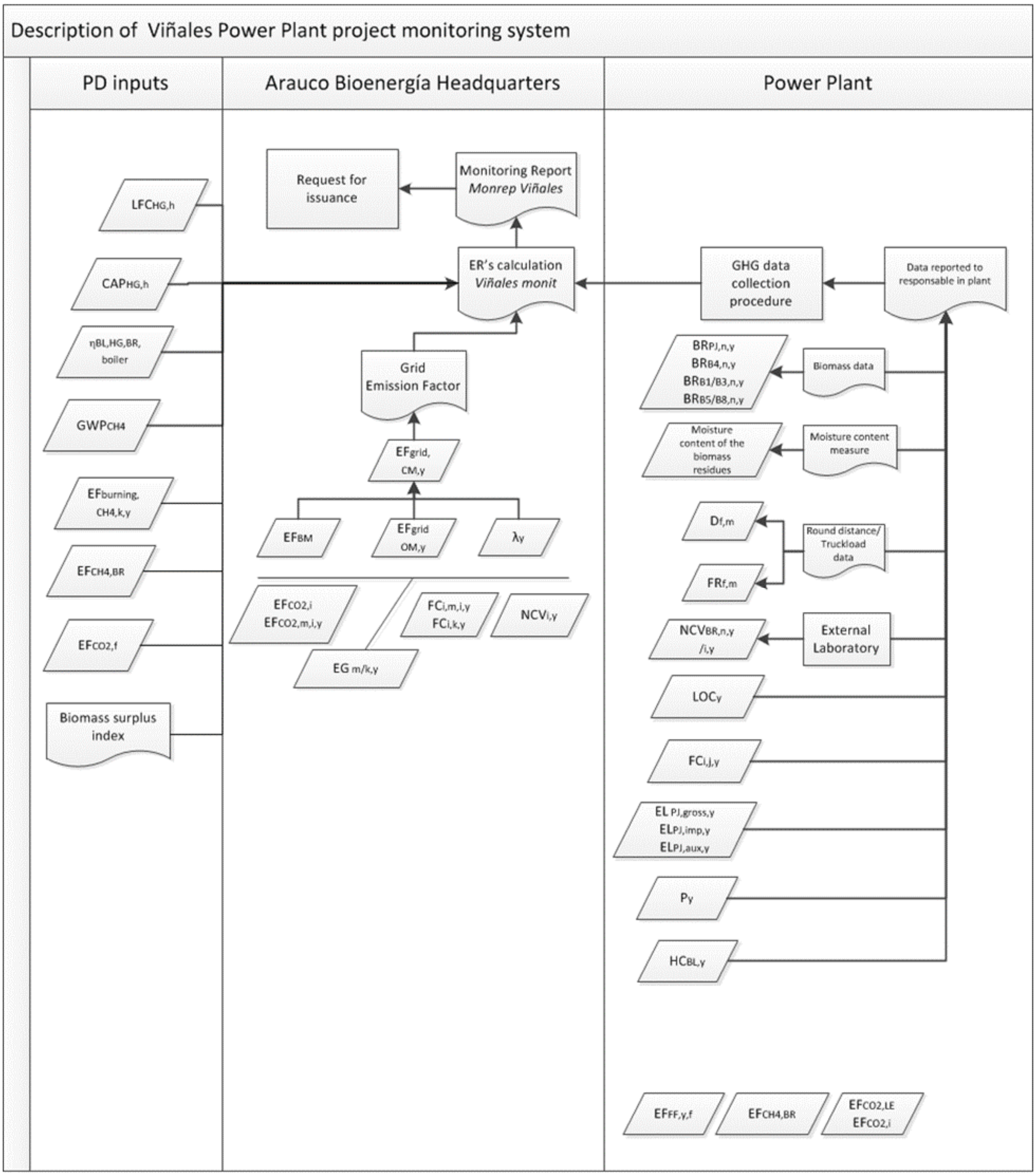
The project activity assists Chile's sustainable growth by providing electricity to the Viñales sawmill and to the SIC through biomass power generation, which is a clean and renewable energy source. Using the available natural resources in a rational way, the Viñales project activity helps promote the development of renewable energy sources in Chile, in particular the use of biomass generated as a byproduct of the forestry industry, which has a significant potential in the country. The project activity is a good example to demonstrate the viability of electricity generation as a source of revenue not only in the Plywood and Sawmill industries, but in all forest-related industries.

Relevant dates for the project activity:

Date (DD/MM/YY)	Key events
January, 2010	Construction start date
July, 2012	Commissioning date
01/07/2014 to 31/12/2014	The 1st monitoring period
01/01/2015 to 31/12/2016	The 2nd monitoring period

During the first monitoring period, Project Participant presented a deviation to change the starting date of the crediting period due to a delay in the implementation of the Viñales on-site laboratory to monitor the moisture content of the different biomass types, which started to measure from July 2014. The total net emission reductions claimed in the 2nd monitoring period (from January 1st 2015 to December 31th 2016) are 506,775 tCO_2e.

The Project Participant, has implemented monitoring procedures per the monitoring methodology chosen for this project activity. This monitoring methodology accounts for emission reductions in an accurate and conservative manner. The following diagram includes data collection procedure as: Data Parameters as $HC_{BL,y}$, $EL_{PJ,gross,y}$, $EL_{PJ,imp,y}$, $EL_{PJ,aux,y}$, $D_{f,m}$, $FC_{i,j,y}$, $BR_{PJ,n,y}$, $BR_{B4,n,y}$, $BR_{B1/B3,n,y}$ and $BR_{B5/B8,n,y}$ are aggregated in excel files to obtain a monthly value that is reported in the emission reductions calculation file. All data is recorded in electronic tapes and archived two years following the end of the crediting period as is specified in the defined monitoring plan.



Even though during this monitoring period there were no emergency situations, the monitoring data management system defined in all the procedures the possibility of emergency occurrences (for example, IT failure system). The on-site personnel were instructed to inform opportunely any inconvenient with the monitoring system or the monitoring instrument. Viñales power plant counts with a qualified electronic control area, which were the responsible of the continuity operation of the monitoring instruments.

No net harm and stakeholder's communication on-going programs are described in Appendix B of this report.

1.2 Sectoral Scope and Project Type

The Viñales biomass power plant is a renewable energy supply side grid-connected project activity. It involves reduction of emission of greenhouse gases in the sector; more specifically, reduction of greenhouse gas emission sources from fuel combustion in energy industries, according to the list of sector/source categories indicated in Annex A of the Kyoto Protocol. The Viñales project activity is not a grouped project activity.

1.3 Project Proponent

Organization name	Celulosa Arauco y Constitución S.A.
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1.4 Other Entities Involved in the Project

In 2014 Arauco included a new host party: United Kingdom of Great Britain and Northern Ireland. Project Participant opened two trading accounts under the EU ETS in the UK, so Arauco was requested to obtain a LoA (Letter of Approval) through the UK DNA (Environment Agency). For this reason, now Arauco (Celulosa Arauco y Constitución S.A.) appears as a Project Participant under Chile and UK. There are no other entities involved in the Viñales project activity.

Organization name	N/A
Role in the project	N/A
Contact person	N/A
Title	N/A

Address	N/A
Telephone	N/A
Email	N/A

1.5 Project Start Date

19/05/2012

This is the date in which the Viñales power plant started generating electric power.

1.6 Project Crediting Period

The current PD indicates that the project crediting period start date is 01/01/2014. The first crediting period will last for 10 years, until 31/12/2023, and will be renewed 2 times, adding up to 30 years in total (3 x 10 years).

Due to logistic and administrative issues, Viñales project took some time to implement a laboratory on-site to monitor the moisture content of the different biomass types, which started to measure from July 2014. For that reason, the Project Participant presented a Project Description Deviation to change crediting period starting date from 01/01/2014 to 01/07/2014. Details of this deviation are explained in section 2.2.2 of the present Monitoring Report.

1.7 Project Location

The project activity is located in Km. 5 of the M-50 road to Chanco, commune of Constitución in Maule Region. The nearest city is Constitución, located 3 Km. away from the new power plant.

The project activity coordinates in decimals are provided the table below:

Latitude	Longitude
-35.371°	-72.412°

1.8 Title and Reference of Methodology

The name of the approved baseline methodology applied to the proposed project activity is:

ACM0006 (Version 12.1.1): “Consolidated methodology for electricity and heat generation from biomass”.

The baseline methodology of the project activity also relies on the following methodological tools:

- “Tool to calculate the emission factor for an electricity factor for an electricity system (Version 03.0.0)”

- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02)"

- "Tool to determine the baseline efficiency of thermal or electric energy generation systems (Version 01)"

- "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 for project and leakage emissions from transportation of freight (Version 1.1)".

1.9 Other Programs

- Emissions Trading Programs and other Bindings Limits: The emission reductions associated to the Viñales project have not been used for compliance in any other emission trading program or to meet any kind of binding limits on GHG emissions during the current verification process.
- Other Forms of Environmental Credit: The Viñales project is not involved to any other form of GHG-related environmental credit for GHG emission reductions or removals other than the VCS Program.
- Participation under Other GHG Programs: The Viñales project participated in the ERNC market, created under the Law N°20.257, April, 2008 and therefore generated non-conventional energy certificates. Law N°20.257, to promote the non-conventional renewable energy in Chile, requires that from the beginning of the year 2010 the energy companies of our country with installed capacity of over 200 MW must certify that an amount of energy equivalent to 10% of their own consumption in each year has been injected by non-conventional renewable generation sources, these may be their own or contracted. The law allows an energy company to transfer its surplus to another energy company, and it may be even among companies of different electrical systems.

  As is possible to observe Law N°20.257 and the non-conventional energy certificates are referenced to energy consumption and transferences between energy companies is a non-GHG related environmental mechanism, so there are no double-counting issues involved with the VCS program in this case.

1.10 Sustainable Development

Chilean government has adopted a non-conventional renewable energies promotion policy, including enhanced electric reliability, security and affordability as well as increased economic benefits with the progressive diversification of the energy matrix of the country. The renewable energy sources have the advantage to be a local resource and contribute to the security supply avoiding dependence on imported sources, increase the diversity of our energy matrix and at the same time, generate significant lower environmental impacts compared with conventional energy sources.

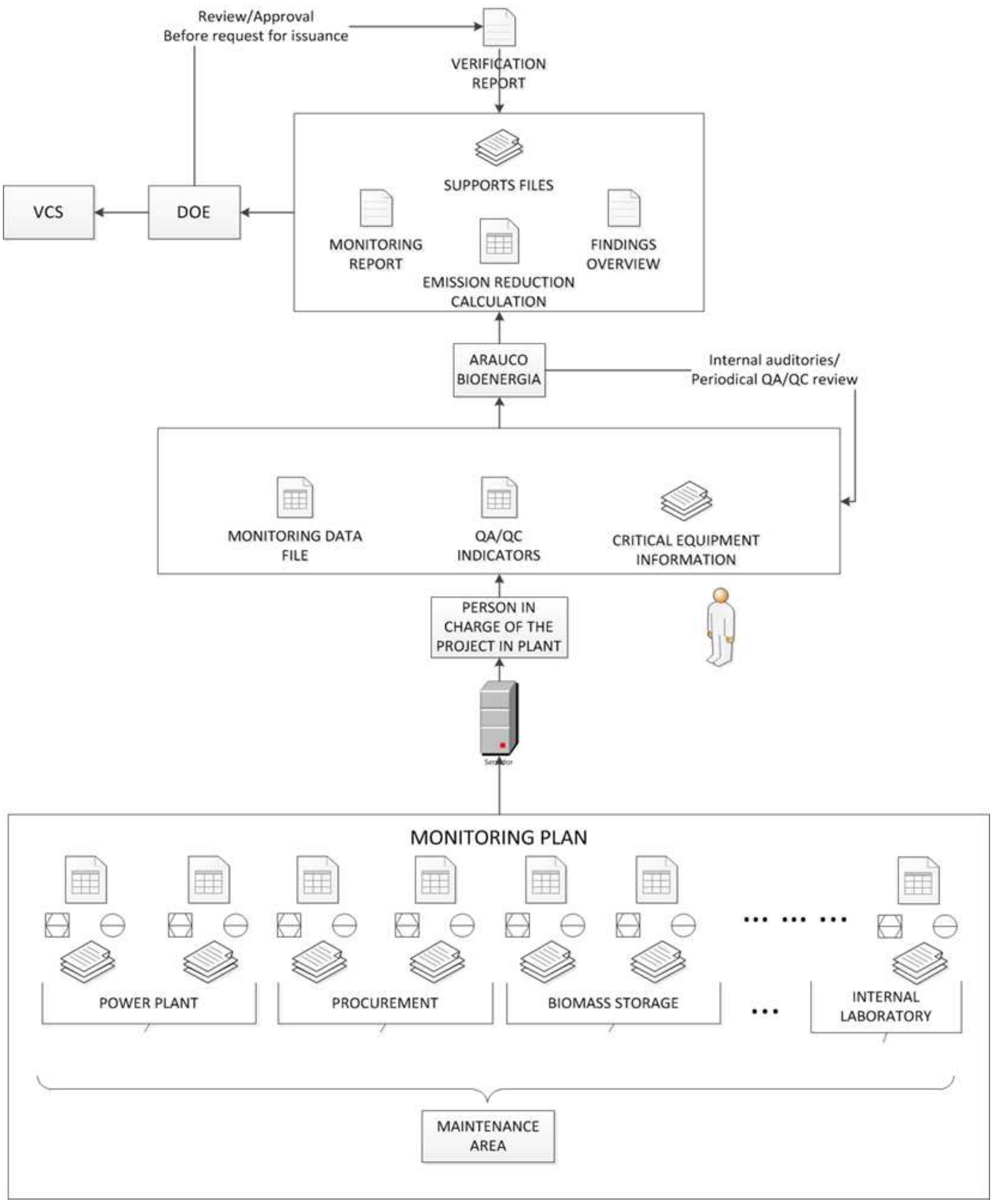
Viñales project is an important and remarkable source of renewable energy in the central interconnected system, sustainable contributing to the Chilean energy policies and the reuse of residual biomass in the region.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

As was exposed in section 1.1, the project participant has implemented procedures per the monitoring methodology chosen, ACM0006 Version 12.1.1.

Arauco counts with on-site personnel (at the project activity site), who oversee gathering and registering all the required information described in the monitoring plan. Such duties are incorporated to the personnel's everyday activities to ensure continuity and high-quality standards. Quantity of biomass used, fossil fuel consumption and net quantity of electricity generated data is monitored continuously and automatically by the Data Control System (DCS). The data is recorded daily and then is aggregated monthly. The information is partially processed and stored on-site, and is sent periodically (monthly) to Arauco Bioenergía S.A. in Santiago for further and final processing (table formats, reports, etc.). With the information at this level, Arauco carries out the external verifications to verify the emission reduction of the Viñales Power Plant project activity periodically (i.e. once every year). The following diagram shows the monitoring information flow implemented by Arauco Bioenergía S.A. for the project activity generation, calculation and reporting.

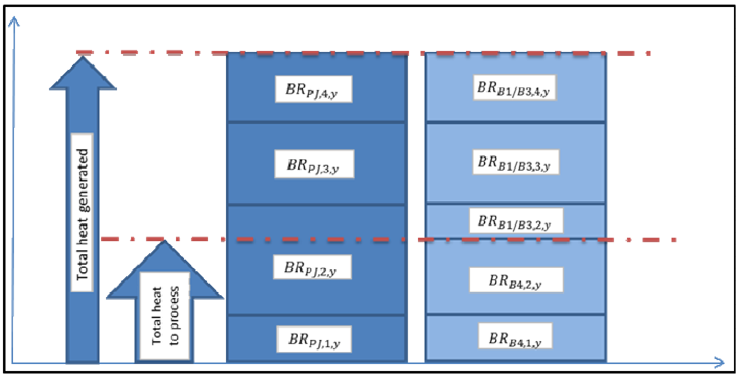

Review/Approval
Before request for issuance
VERIFICATION REPORT
SUPPORTS FILES
VCS
DOE
MONITORING REPORT
EMISSION REDUCTION CALCULATION
FINDINGS OVERVIEW
ARAUCO BIOENERGIA
Internal auditories/
Periodical QA/QC review
MONITORING DATA FILE
QA/QC INDICATORS
CRITICAL EQUIPMENT INFORMATION
PERSON IN CHARGE OF THE PROJECT IN PLANT
MONITORING PLAN
POWER PLANT
PROCUREMENT
BIOMASS STORAGE
INTERNAL LABORATORY
MAINTENANCE AREA

			Power plant		
	N° days	Total hrs.	Availability hrs.	Trips hrs.	Availability per month Power plant (%)
Jan-15	31	744	741	3	99.6%
Feb-15	28	672	657	15	97.7%
Mar-15	31	744	735	9	98.7%
Apr-15	30	720	714	6	99.1%
May-15	31	744	742	2	99.7%
Jun-15	30	720	720	0	100.0%
Jul-15	31	744	742	2	99.8%
Aug-15	31	744	731	13	98.2%
Sep-15	30	720	719	1	99.8%
Oct-15	31	744	744	0	100.0%
Nov-15	30	720	408	312	56.7%
Dec-15	31	744	698	46	93.9%
Jan-16	31	744	649	95	87.2%
Feb-16	29	696	696	0	100.0%
Mar-16	31	744	729	15	97.9%
Apr-16	30	720	715	5	99.3%
May-16	31	744	739	5	99.3%
Jun-16	30	720	715	5	99.2%
Jul-16	31	744	725	19	97.5%
Aug-16	31	744	744	0	100.0%
Sep-16	30	720	709	11	98.5%
Oct-16	31	744	719	25	96.7%
Nov-16	30	720	541	179	75.1%
Dec-16	31	744	699	45	93.9%

From table above can be stated that during the monitoring period the general power plant stoppage was in November 2015 and November 2016, due to regular maintenance program.

Biomass management was implemented according description in current PD, page 57. The use of biomass residues was always prioritized over use of any fossil fuels. The saturated steam biomass boiler has run on the B4 baseline scenario biomass (sawdust and bark from industrial operations) as shows the following diagram:

Biomass consumption in priority order according PD.



First column represent the total quantity of biomass combusted category n to obtain the total heat generated ($BR_{PJ,n,y}$). Second column represent the total quantity of biomass combusted according defined scenarios.

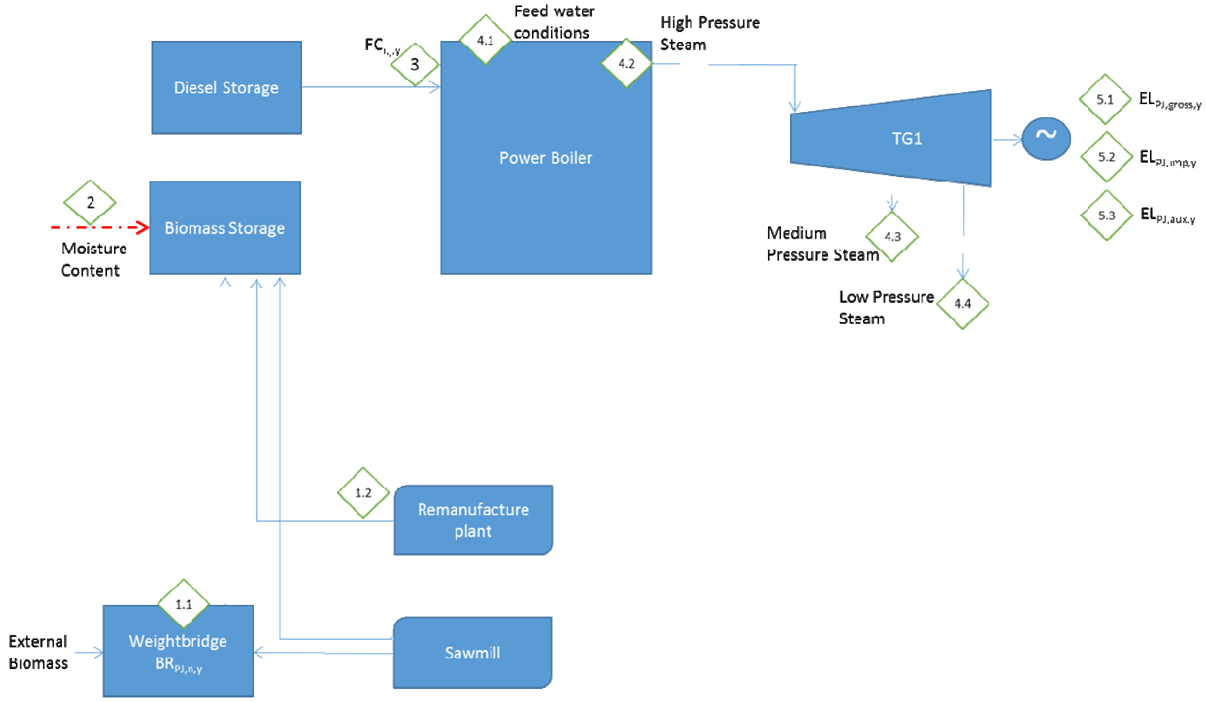
The above diagram indicates the order to combust biomass in power boiler. First biomass to be combusted is used to generate heat to process. Once the heat to process is provided, the rest of the combusted biomass generates energy power: first for satisfied plants demand, then to export the surplus to the grid.

The Power Plant chief estimates and designs a yearly consumption plan for the power boiler. Then, Biomass Chief determines the yearly biomass requirements. As a first step, the Biomass Chief checks biomass residues provisions in Viñales, El Cruce and remanufacture Sawmills[1]. The quantity of biomass residues that cannot be provided by these sawmills is ordered from Forestal Arauco, a subsidiary of Celulosa Arauco in charge of biomass supply to mills. Forestal Arauco proposes a supply plan that is assessed by the Viñales Biomass Chief through an on-site inspection (checking biomass source and absence of chemical contamination). In this inspection, the Biomass Chief measures the distance between suppliers and the power plant. If the inspection yields a positive result, the third-party supplier is approved. Every biomass residue dispatch is checked at the Power Plant entrance from then on.

Project Participant was implemented a Monitoring plan per methodology ACM0006 version 12.1.1 and Project description document (PD) version 03. The following diagram below shows all the relevant monitoring points in Power plant, including the instruments used to measure the variables that are part of the monitoring plan

[1] Viñales and Remanufacture sawmills are part of Viñales project's boundaries. El Cruce Sawmill is part of Celulosa Arauco but for project purpose is considered third party biomass.

The Project Participant presents information about the operation of the project activity occurred during this monitoring period i.e. shutdowns/stoppages due to regular maintenance program and irregular stoppages. The events identified are listed below:



PARAMETER	ITEM	TAG	INSTRUMENT
$BR_{PJ,n,y}$	1.1	611-49-001	Weighbridge gate 1
	1.2	--	Pneumatic transportation system (Calculated biomass residues)
Moisture $content_{BR,n,y}$	2	N/A	Digital weight meter
		N/A	Oven
		N/A	Electronic Moisture Analyzer
$FC_{i,j,y}$	3	663-FT-508	Fossil fuel flow transmitter
		663-FT-522	Fossil fuel flow transmitter
	4.1	663-PT-0106	Feed water conditions Pressure gauge transmitter
		663-TT-0111	Feed water conditions temperature transmitter
	4.2	663-FT-0156	High pressure line Flow transmitter
		663-PT-0155	High pressure line Pressure gauge transmitter
		663-TT-0157	High pressure line Temperature transmitter
		665-FT-9030	High pressure line Flow transmitter
		665-PT-9040-A 665-PT-9040-B	High pressure line Pressure gauge transmitter
		665-PT-9043-A 665-PT-9043-B	High pressure line Pressure transmitter
		665-TT-9043-A 665-TT-9043-B	High pressure line Temperature transmitter
		665-TT-9042-A 665-TT-9042-B	High pressure line Temperature transmitter
	4.3	665-FT-9025 665-FT-9051	Medium pressure line Flow transmitter
		665-PT-9001-A 665-PT-9001-B	Medium pressure line Pressure gauge transmitter
		665-TT-9026	Medium pressure line temperature transmitter
	4.4	665-FT-9019	Low pressure line Flow transmitter
		665-FT-9023	Deareator steam flow transmitter
		665-PT-9002-A 665-PT-9002-B 665-PT-9002-C	Low pressure line Pressure gauge transmitter
		665-TT-9024	Low pressure line temperature transmitter
$EL_{PJ,gross,y}$	5.1	8600-10	Gross energy power generation Viñales _1_10_TG1
$EL_{PJ,imp,y}$	5.2	SE-EI-0006/0007	Import energy power generation Viñales_52B1_SIC_Viñales_66
		8600-2_3	Energy consumption Viñales_2_3_Viñales_Sawmill
$EL_{PJ,aux,y}$	5.3	669-EI-1603/1604	Viñales_1_6_Combustible_residues_handle
		669-EI-1703/1704	Viñales_1_7_CP_Power_Boiler
		669-EI-1803/1804	Viñales_1_8_CP_Power_Boiler
		669-EI-1903/1904	Viñales_1_9_CP_Power_Boiler
		669-EI-1703/1804	Viñales_1_11_Barra_1B_Management_office

Changes in TAG between PD and installed equipment:

Data variable monitored and name		TAG IN current PD	TAG IN POWER PLANT
$HC_{BL,y}$	High pressure line pressure gauge transmitter	663 PI-155	663 PT-0155
	High pressure line temperature transmitter	663 PI-157	663 TT-0157

Equipment that were not defined in PD but are related to parameters measurements in the project:

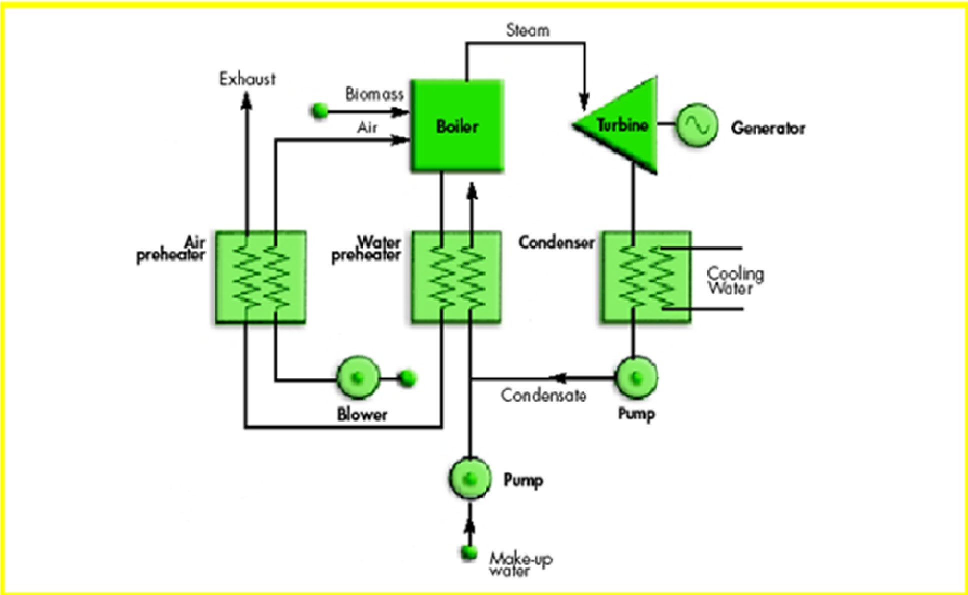
Data variable monitored		TAG	
$HC_{BL,y}$	Pressure transmitter	665-PT-9043-A 665-PT-9043-B	High pressure line
		663-PT-0106	Feed water condition
	Temperature transmitter	665-TT-9043-A 665-TT-9043-B	High pressure line
		665-TT-9024	Low pressure line
		663-TT-0111	Feed water condition
$FC_{i,j,y}$	Fossil fuel flowmeter	663-FT-508	
	Fossil fuel transmitter	663-FT-522	
$EL_{PJ,gross,y}$	Gross energy generated	8600-10	
$EL_{PJ,imp,y}$	Project electricity imports from the grid	8600-2_3	Viñales sawmill

The differences between current PD and the installed instruments did not affect monitoring plan continuity and, therefore, the emission reduction calculation was not affected either. Nevertheless, PP presented a deviation to current PD in section 2.2.2. There were no instruments replaced during the presented monitoring period until the date of this monitoring report.

The predominant technology in all parts of the world today for generating megawatt (MW) levels of electricity from biomass is the steam-Rankine cycle, which consists of direct combustion of biomass in a boiler to generate steam, which is then expanded through a turbine. The steam-Rankine technology is a mature technology, having been introduced into commercial use about 100 years ago. Most steam cycle plants are located at industrial sites, where the waste heat from the steam turbine is recovered and used for meeting industrial-process heat needs. Such combined heat and power (CHP), or cogeneration systems provide greater levels of energy services per unit of biomass consumed than systems that generate electric power only.

Steam turbines are designed as either “backpressure” or “condensing” turbines. CHP applications typically employ backpressure turbines, wherein steam expands to a pressure that is still substantially above ambient pressure. It leaves the turbine still as a vapor and is sent to satisfy industrial heating needs, where it condenses back to water. It is then partially or fully returned to the boiler. Alternatively, if process steam demands can be met using only a portion of the available steam, a condensing extraction steam turbine (CEST) might be used. This design includes the capability for some steam to be extracted at one or more points along the expansion path for meeting process needs. Steam that is not extracted continues to expand to sub-atmospheric pressures, thereby increasing the amount of electricity generated per unit of steam compared to the backpressure turbine. The non-extracted steam is converted back to liquid water in a condenser that utilizes ambient air and/or a cold water source as the coolant.

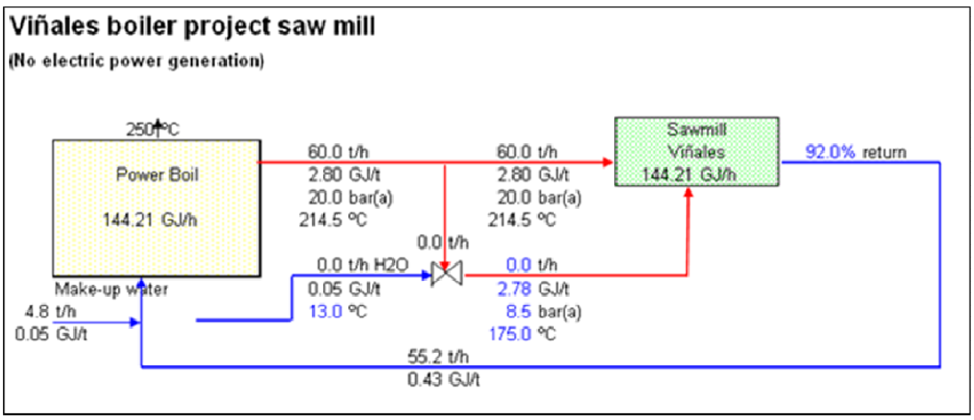
Schematic diagram of a biomass-fired steam-Rankine cycle for cogeneration using a condensing-extracting steam turbine.



Source: Williams & Larson, 1993 apud Kartha & Larson, 2000, p. 101.

The following diagrams show the power generation situation under a BAU (Business-As-Usual) situation, without investment in additional power generation capacity.

The Viñales project without power cogeneration:



2.2 Deviations

2.2.1 Methodology Deviations

There were no methodology deviations applied during this monitoring period.

2.2.2 Project Description Deviations

Crediting period starting date:

The baseline methodology applied to the VCS Viñales project clearly states that moisture content of the biomass residues (directly associated with the calculation of biomass residues on a dry-basis) must be measured on-site and for each batch of biomass of homogeneous quality (page 67 of ACM0006/Version 12.1.1).

Due to logistic and administrative issues, Viñales Power plant took some time to implement a laboratory on-site to monitor the moisture content of the different biomass types, which started to measure from July 2014. Project Participant present a deviation to current PD and proposed a change in the starting date from 01/01/2014 to 01/07/2014. The reasons to delay the star date are:

1) The impossibility to measure directly all monitoring parameters would have compromised seriously the possibility of the project activity to generate CERs since this constitutes a direct non-compliance of the monitoring plan.

2) The impossibility to check the consistency of direct measurement of all monitored parameters as per procedure would have compromised the possibility of the project and generate a direct non-compliance of the standards of the monitoring plan.

Then, project start and change as follows:

	From	To
Star date 1st crediting period	01/01/2014	01/07/2014
Finish date 1st crediting period	31/12/2023	30/06/2024

Is important to emphasize that crediting period start date change does not affect the defined project initial conditions:

- Viñales power plant still is a Greenfield project, only biomass residues are used in the project plant, fossil fuels co-fired in the power boiler does not exceed the 80% of the total fuel, the implementation of the project does not result in an increase of the processing capacity, biomass residues used as fuel came from forestry or industrial operations and no chemical process is involved and biomass residues are not stored for more than one year. In conclusion, the applicability of the methodology ACM0006 Version 12.1.1 has not been modified.
- As was described in current PD Viñales biomass power plant project activity is not considered to be part of the common practice in the relevant and comparable industry

(ies) in Chile and therefore, considered additional from a common practice analysis perspective. Additionality was not impacted by starting date change.

- Viñales project has not modified their project boundaries, then the definition of the baseline scenarios is the same defined in current PD. Appropriateness of the baseline scenario has not been impacted.

Changes in QA/QC procedures for parameters $EL_{PJ,gross,y}$, $EL_{PJ,imp,y}$ and $EL_{PJ,aux,y}$:

The current PD presented the following QA_QC procedures according to the next table:

Parameter	QA_QC procedure Viñales biomass power plant PD (version 03)
$EL_{PJ,gross,y}$	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).
$EL_{PJ,imp,y}$	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).
$EL_{PJ,aux,y}$	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).

Is important to note that the electricity sales receipts are document that support only the electricity export from power plant to the grid, but could not support the gross electricity or the import electricity to plant by itself. To assure and control the quality of the parameters below is necessary consider the following key performance indicators:

Parameter	Applied QA_QC procedure Viñales biomass power plant during present monitoring period
$EL_{PJ,gross,y}$	- Percentage difference between the export surplus energy to the grid with receipts from electricity sales (if available) are comparable to transmission losses. - Indicator between the electricity generation divided by the quantity of combusted biomass in Power boiler (e.g. check whether results in a reasonable efficiency that is comparable to previous years).

	- Measured energy displacement using dedicated equipment must be comparable to calculated energy displacement according methodology.
$EL_{PJ,imp,y}$	- Percentage difference between Total power import and receipts from electricity purchases (if available). - Indicator between the electricity generation divided by the quantity of combusted biomass in Power boiler (e.g. check whether results in a reasonable efficiency that is comparable to previous years).

$EL_{PJ,aux,y}$	- Percentage difference between the export surplus electricity to the grid plus sawmill consumption electricity with receipts from electricity sales (if available) are comparable to transmission losses. - Indicator between the electricity generation divided by the quantity of combusted biomass in Power boiler (e.g. check whether results in a reasonable efficiency that is comparable to previous years). - Measured energy displacement using dedicated equipment must be comparable to calculated energy displacement according methodology.

Project Participant propose the prior indicators as the QA_QC procedures, considering the following describe terms:

Calculated Energy displacement from the grid = Gross quantity electricity generated in power plant + Project electricity imports from the grid - Total auxiliary electricity consumption for power plant operation.

Measured energy displacement= Grid energy export + Sawmill energy consumption.

Changes in QA_QC procedures do not affect the defined monitoring plan in the current PD. There are no changes in the requirements to the applicability of the methodology. Additionality and appropriateness of the baseline scenario have not been affected either because changes didn't impact prior consideration, common practices, barriers and project boundaries.

<u>Changes in critical equipment define in current PD</u>:

As is exposed in section 2.1, there are some differences between the equipment described in current PD and the installed monitoring equipment during the present monitoring period that could be describe as follows:

- 2 transmitter (pressure and temperature) whose TAG's were corrected (typo mistake)
- 3 pressure transmitters, 4 temperature transmitters, 2 fossil fuel transmitters and 2 energy meters that were included in a new PD version. Pressure and temperature transmitter replaced instruments that in current PD where mistakenly defined.

As is mentioned in section 2.1, the following changes must be taken account for this period and the subsequent:

1. *Changes in TAG between PD and installed equipment:*

Data variable monitored and name		TAG IN current PD	TAG IN POWER PLANT
$HC_{BL,y}$	High pressure line pressure gauge transmitter	663 PI-155	663 PT-0155
	High pressure line temperature transmitter	663 PI-157	663 TT-0157

2. *Equipment that were not defined in PD but are related to parameters measurements in the project:*

Data variable monitored		TAG	
$HC_{BL,y}$	Pressure transmitter	665-PT-9043-A 665-PT-9043-B	High pressure line
		663-PT-0106	Feed water condition
	Temperature transmitter	665-TT-9043-A 665-TT-9043-B	High pressure line
		665-TT-9024	Low pressure line
		663-TT-0111	Feed water condition
$FC_{i,j,y}$	Fossil fuel flowmeter	663-FT-508	
	Fossil fuel transmitter	663-FT-522	
$EL_{PJ,gross,y}$	Gross energy generated	8600-10	
$EL_{PJ,imp,y}$	Project electricity imports from the grid	8600-2_3	Viñales sawmill

The differences between current PD and the installed instruments did not affect monitoring plan continuity and, therefore, the emission reduction calculation was not affected either.

As the previous deviation, changes in the equipment do not affect the defined monitoring plan in the current PD. All the parameters defined in the current PD as part of the monitoring plan are equally measured, controlled and registered. No changes were identified in the requirements to the applicability of the methodology. Additionality and appropriateness of the baseline scenario have not been affected either because changes didn't impact prior consideration, common practices, barriers and project boundaries. Additionality or the appropriateness of the baseline scenario, were not affected too. There were no instruments replaced during the presented monitoring period until the date of this monitoring report.

Methane Global Warming Potential (GWP_{CH4}) value update in accordance with the Fourth IPCC Assessment Report:

The GWP derived from the IPCC´s Second Assessment Report sets the CH_4 GWP at 21, which is used by the current PD at the time that project activity was validated. Nevertheless, it is the compromise of the PP to update the GWP_{CH4} value according to any future change. In accordance with the VCS program releases in June 2017, this value was updated derived from the IPCC´s Fourth Assessment Report that sets the methane GWP at 25.

The Project Participant summarizes that the changes described above do not adversely impact the applicability of the baseline methodology, the additionality of the project activity and/or the scale of the project activity. The Project Participant applied the approved consolidated baseline methodology ACM0006 Ver 12.1.1 "Consolidated methodology electricity generation from biomass residues", which is applicable to the project activity as follows:

1) No other biomass types than biomass residues from forestry industry, which has been defined as combustible biomass residues in the registered PD, is the predominant fuel used in the project activity. The changes had not impact here.

2) The implementation of the project shall not result in an increase of the processing capacity of raw input, in this case logs, or in other substantial changes in this process. The changes had no impact here.

3) The additionality of Viñales was based on a barrier analysis and the optimization project did not change or affect any of the barriers faced by the project activity. Therefore, the changes had not impact on the additionality of the project activity.

4) Viñales is a large-scale project activity and the change of the Global Warming potential from 21 to 25 did not change in any way the scale of the emission reduction project activity.

2.3 Grouped Project

Not applicable.

2.4 Safeguards

2.4.1 No Net Harm

The Project Participant, Celulosa Arauco y Constitución, formally embraced the UN Global Compact during a signing ceremony held May 30, 2011 at the UN Global Compact office in Santiago, Chile. The UN Global Compact asks companies to embrace, support and enact, within their spheres of influence, a set of ten core values in the areas of human rights, labour standards, the environment and anti-corruption:

- Support and respect the protection of internationally proclaimed human rights;
- Ensure they are not complicit in human rights abuses;

- Uphold the freedom of association and the effective recognition of the right to collective bargaining;
- Eliminate all forms of forced and compulsory labour;
- Abolish child labour;
- Eliminate discrimination in respect of employment and occupation;
- Support a precautionary approach to environmental challenges;
- Undertake initiatives to promote greater environmental responsibility;
- Encourage the development and diffusion of environmentally friendly technologies; and
- Work against corruption in all its forms, including extortion and bribery.

In the following table is included a briefly description of the 10 cores' actions carried out by the Project Participant during the present monitoring period:

Serial Number	Safeguarding principle	Level of risk	National context	Support action by Project Participant
1	The project respects internationally proclaimed human rights including dignity, cultural property and uniqueness of indigenous people. The project is not complicit in Human Rights abuses.	LOW	Chile has signed the international declaration of Human rights (UDHR) and sustain their compromise with the creation of the Directorate of Human Rights. This Directorate coordinates the international action of Chile regarding Human Rights that involves presenting the country's position in international fora to protect and promote human rights and encourage compliance with international commitments made in this area. According to the policies and priorities set out by the Government, this task includes the promotion and protection of civil, political, economic, social and cultural human rights, as well as the rights of women, children, indigenous peoples, minorities and other vulnerable groups.	In yearly Sustainability Report 2015 and 2016 Arauco declared that the Company endeavors to be an active agent in the economic and social development of the places where it is present. To that end the Company has developed a Good Citizenship Strategy, establishing permanent spaces for dialogue and participation, encouraging decision-making based on respect and care for the environment, shareholders and stakeholders, minimizing the potential negative impacts of its operations, and seeking opportunities to increase its to socioeconomic development.
2	The project does not involve and is not complicit in involuntary resettlement.	LOW	According to environmental impacts declaration (DIA in spanish) presented to complie with the national environmental regulation, page 65 and 66, the project does not generate changes in human groups territory distribution or in the spatial structure of their relations as well as does not generate changes in the demographic composition of the population dimension. During the construction phase 500 people were recruited and came from the nearest communes, and during the operation stage only were required 34 people recruitment.	1.- Not relevant for project activity as no resettlement was required because the Power Plant are installed in non-cultivated and non-habited land. Hence, the low risk level was found applicable. 2.- The project activity has not any major impact on land use patterns. 3.- The land was directly procured by the PP from the landowner and there is no government agency involved in procuring land. No Expropriation has been conducted on any private land involved in project activity. The land is acquired on mutual consent between private landowner and PP and thus there is no conflict or resettlement process involved.
3	The project does not involve and is not complicit in the alteration, damage or removal of any critical cultural heritage	LOW	According to environmental impacts declaration (DIA in spanish) presented to complie with the national environmental regulation, the project is not located in o near to locations protected by chilean law 17.288 or any location who belongs to or represented cultural legacy	The Project does not generate changes in the antrophologic dimension as it does not affect places where religious ceremonies, pilgrimages, processions, celebrations, festivals, tournaments, fairs and markets take place. Furthermore, the project is not located near to any place or site where cultural or folkloric manifestations from village, communities or groups of people take place.
4	The project respects the employees' freedom of association and their right to collective bargaining and is not complicit in restriction of these freedoms and rights	LOW	Arauco yearly sustainability report 2015 and 2016 cited in the GRI Content Index for the "In accordance" Core option and UN Global compact, point "Social Performance: Human Rights" exposed, PP as Celulosa Arauco encourages relations with employees, union groups and their representatives in a climate of mutual respect, in accordance with international guidelines and current labor legislation. Labor relations are based on the values of the Company and a continuous process of communication, collaboration and participation required to maintain them.	The Company works to maintain relations based on transparency, honesty respect and mutual cooperation, where both parties fulfill the commitments they assume in a framework of fairness and trust. In accordance with the law and the spirit of the contracts. Collective agreement Indicators Arauco Chile 2015 / 2016 No. Union groups: 25 / 25 % employees in collective agreements: 58% / 54%
5	The project does not involve and is not complicit in any form of forced or compulsory labor	LOW	As member of International Labour Office (ILO), Chile sustain a Decent Work Programme, a tripartite initiative where social actors and government joint actions to prioritize social dialog and achieve results in subjects of national interest, that constitutes a willingness demonstration to front Chilean challenges in his country vision.	
6	The project does not employ and is not complicit in any form of child labor.	LOW	According to International labour Organization, the hiring of workers under 18 years is not detected. ILO only found in Chilean forestry sector employment for students as interships from industrial and technical high schools in the area where they usually occupied students in the summer time. It is usual that contractors of forest plants employ children of 13 years ago when they do it is in the summer season, with the authorization of the parents, what is allowed in the chilen legislation.	Arauco does not employ children according to Chilean law.

Serial Number	Safeguarding principle	Level of risk	National context	Support action by Project Participant
7	The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis.	LOW	Legal equality is a crucial factor for the Chilean Goverment recognizing that is a State responsability to protect workers' rights to freely choose their jobs as well to ensure regulations compliance of the service provision. For this reason, Chilean Labour Directorate carry out fiscalitation and periodic audits in order to enforce the law and finish discrimination of gender, race, religion, sexual orientation or other basis prohibit by law. The article n°2, Chilean Work Code, specificly in points 2nd, 3rd and 4th, say that "Discrimination acts are contrary to the principles of the labor law. Acts of discrimination are any distinctions, exclusions or preferences based on race, color, sex, age, marital status, syndication, religion, political opinion, nationality, descent, national or social origin, which have as their object of nullifying or impairing opportunity equality or treatment in employment and occupation."	According to yearly Sustainability Report , in 2015 the Company launched a project to define a diversity policy aimed at the fulfillment of diversity and the practice of non-discrimination in the recruitment and selection process, with the inclusion of additional factors related to generating diverse, inclusive work spaces. This effort is reinforcing the experience of the Company already has in relation to hiring persons with disabilities, a program that has been active since 2013.
8	The project provides worker with a safe and healthy work environment and is not complicit in exposing worker to unsafe or unhealthy work environments.	LOW	The prevention of workplace accidents is a top priority for PP, wich is reflected in the definition of safety as a prime value of the Company in a comprehensive Environment and Occupational Health and Safety policy, and in the application of corporate operating standards in OHSAS 18001 systems certification for all of Arauco's Timber business mills in Chile.	During 2015 and 2016 the Company worked on six focal points with respect to safety that covered all of Arauco facilites and two focal points about occupational health: 1.- Involving employees. 2.- Improving risk matrices. 3.- Improving the management of high potental risk incidents. 4.- Improving inspections and observations. 5.- Expanding the potential of the Joint Health and Safety Comittes. 6.- Fulfilling occupational health protocols.
9	The project takes a precautionary approach in regards to environmental challenges and is not complicit in practices contrary to the precautionary principles.	LOW	Arauco's commitment to the environment is an integral part of our business model, ensuring the sustainabe management of its resources and applying standards of management that ensure the continous improvement of our environmental performance.	PP as Celulosa Arauco in the yearly Sustainability report 2015 and 2016 describe the environmental management through the folowing points: 1.- Protecting native forest and creating value propositions for them: Protecting and respecting the biodiversity present in its assets and high conservation value areas (HCVA); and maintaining programs for forest fire prevention and the protection of forest assets. 2.- Soil, water and waste management. 3.- Environmental monitoring, efficiency in the explotation of the raw materials and energy management. 4.- Water use, effluents, emissions and odors. 7.- Fire prevention. 8.- Environmental research.
10	The project does not involve or complicit in significant conversion or degradation of critical natural habitats including those that are (a) legally protected, (b) officially proposed for protection, (c) identified by authoritative sources for their high conservation value or (d) recognized as protected by traditional local communities.	LOW		According to Environmental impacts declaration, the project does not produce significant impacts over the environmental quality in location area. The natural resources are not intervened by the project. The project does not consider the intervention or utilization of the native vegetation, fauna or any hydric resources. Dilusion capacity, dispertion, self cleansing systems, asimilation and regeneration of the natural resources are not affected by the project. The project, that is located in an intervened area, does not affect the biological diversity or their regeneration capacity.
11	The project does not involve and is not complicit in corruption.	LOW	Chile has strong and transparent institutions that promote business and that have effective mechanisms to investigate and punish corrupt practices. The Criminal Code and the Criminal Corporate Liability Law prohibit active and passive bribery of domestic and foreign public officials. Companies operating in Chile are advised to establish an effective compliance system. Facilitation payments and gifts are not explicitly mentioned in Chilean laws, but businesses are unlikey to encounter these in practice.	ARAUCO's code of ethics includes principles and policies that must guide the decisions and actions of each company member. This code's main purpose is to set the general ethical context for work performance in each and every one of ARAUCO's activities, in order to comply with the legislation of countries in which we maintain operations and to ensure the application of the highest principes and standards of corporate social responsibility.

2.4.2 Local Stakeholder Consultation

Community:

The purpose of the Company's Local Development Strategy is to contribute to the development of local communities, developing iniciatives that generate mutual benefit through a model based on dialogue and participation. In Chile, areas of work for contributing to local development have been defined that cover a wide range of programs:

• Education and Training: Arauco firmly believe that education is a key factor in the development of a nation. In Chile, ARAUCO provides management and financial support for schools Arauco, Constitución and Cholguan, three educational institutions known at the national level for their excellent academic results. In addition, the company supports Fundación Belén Educa, an organization providing subsidized education for more than 8,000 students in their seven schools. Arauco also make a significant contribution through Arauco Educational Foundation, which for over 20 years has helped provide quality education to 94,700 students in public schools.

• Infrastructure and Improving the quality of life: At Arauco we are convinced that the home is where the family puts down roots and plans their future. Therefore, the Company has decided to promote access to housing for its employees, the collaborators who works for our service providers, and families in the Company's area of influence. This is achieved through technical support in the process of applying for public subsidies, financial support for hiring expert third

parties to develop projects, locating and technically evaluating land for housing purposes, and cooperation and partnerships with diverse public and private bodies for the generation of quality housing solutions.
Through the program of improving life's quality the Company seeks to bring practical knowledge to the neighbouring communities around Arauco-managed forest areas that will allow them to improve their daily life.

- Participation and dialogue: Ongoing dialogue is required for Company-community relations over the long term. In Chile, an example of how these principles are reflected is the Participation and Community Consultation Guide, which discusses how to carry out participatory processes of recording and controlling the impact of our operations to forests. To maintain fluid communication with the Company's different public interest groups, facilitating the dissemination of information of interest and the timely receipt of queries and concerns, Arauco has actively developed and managed diverse channels, platforms and tools. Hotlines, websites, e-mail addresses and social media accounts on Facebook, YouTube, Flickr and Twitter are all available to the public.
- Corporate Policy on Mapuche Community Relations: Through this policy, Arauco is committed to learning about and respecting the Mapuche culture, establishing a complete program of training, recognition, dialogue and collaboration. The Mapuche culture is recognized as an ancient culture living in the present: relationship between the Mapuche people and land is a culture of nature. The Company has embraced the commitments of promoting mutual knowledge, maintaining channels of participation, identifying and preserving sites of cultural interest, and opening a dialogue with respect to land requirements.

Occupational Health and Safety:

At ARAUCO, the safety of our people always comes first. This commitment includes anticipating any and all actions that may be detrimental to the safety of our workers, in order to minimize the risk of accidents. Leadership means putting safety first in all decisions, thus mitigating risks from the start, incorporating lessons learned, simplifying and improving processes, and always giving recognition to people who show outstanding behavior in terms of safety. A Culture of Prevention means that our workers understand that a safe job is a job well done, and that their compliance with safety procedures and key rules is non-negotiable. Based on this solid foundation, ARAUCO is committed to providing its workers with a safe workplace environment, as well as all the tools, equipment and training necessary to perform their activities in a healthy and safe manner.

Corporate Commitments with Outside Initiatives:

Arauco recognizes the value of working in partnership with other actors, particularly when it comes to complex challenges with multiple points of view. The Company has a permanent relationship with academic institutions, NGO's and trade unions with which it seeks to expand its efforts in various networks and multi-sectoral cooperation, as:

- Santiago Climate Exchange
- Forest Footprint Disclosure (of the Global Canopy Project)
- Center for Business Sustainability (CBS) of Universidad Adolfo Ibañez
- UN Global Compact
- Prohumana
- AccionRSE

- Shared Value Initiative
- Unidos por la Primera Infancia

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	Biomass residues categories and quantities used for the selection of the baseline scenario and assessment of additionality.
Data unit	(tCO_2e/tCH_4)
Description	The biomass quantities provided in the table below were determined ex-ante in accordance with the pulp mill project studies.
Source of data	On-site assessment of biomass residues categories and quantities.
Value applied	See table below:

Biomass residue category k	Biomass residue type	Biomass residue source	Biomass residues fate in the absence of the project activity	Biomass residues use in project scenario	Biomas residue quantit (dry tonnes
1	Sawdust and bark from industrial operations.	On-site production	Heat and power generation on-site (B4)	Heat and power generation on-site (biomass-only boiler)	65,417
2	Sawdust and bark from industrial operations.	On-site production	Dumped and/or burned in the open air (B1: and/or B3:).	Heat and power generation on-site (biomass-only boiler)	83,786
3	Sawdust and bark from industrial operations.	Off-site production	Dumped and/or burned in the open air (B1: and/or B3:).	Heat and power generation on-site (biomass-only boiler)	128,05
4	Biomass from	Off-site production	Dumped and/or	Heat and power	35,500

	forestry operations.		burned in the open air (B1: and/or B3:).	generation on-site (biomass-only boiler)	

Justification of choice of data or description of measurement methods and procedures applied	The project Proponent hired reputed consultants for the development of the new power plant and the estimation ex-ante of the biomass types and quantities.
Purpose of the data	Baseline, project and leakage emissions.
Comments	This parameter is related to the procedure for the selection of the baseline selection and assessment of additionality.

Data / Parameter	P_x
Data unit	cubic meters
Description	Quantity of the main product of the production process produced in year x from plants operated at the project site.
Source of data	On-site measurements.
Value applied	352,686 m^3/yr of sawn timber from the sawmill 88,203 m^3/yr of processed wood products from the remanufacture plant.
Justification of choice of data or description of measurement methods and procedures applied	Average between the productions of 2012 and 2013 is used respectively.
Purpose of the data	Calculation of baseline emissions.
Comments	--

Data / Parameter	$CAP_{HG,h}$
Data unit	(GJ/h)
Description	Baseline capacity of heat generator h (GJ/h)
Source of data	Reference plant design parameters.

Value applied	210 (GJ/h)
Justification of choice of data or description of measurement methods and procedures applied	This parameter reflects the design maximum heat generation capacity (in GJ/h) of the baseline heat generation h. This parameter was determined by Arauco based on its previous experience with saturated heat generators in other sawmills and on the Viñales sawmill heat requirements.
Purpose of the data	Calculation of baseline emissions
Comments	--

Data / Parameter	$LFC_{HG,h}$
Data unit	Ratio
Description	Baseline load factor of heat generator h (ratio).
Source of data	Reference plant design parameters.
Value applied	90%
Justification of choice of data or description of measurement methods and procedures applied	This parameter reflects the maximum load factor (i.e the ratio between the "actual heat generation" of the heat generator and its "design maximum heat generation" along one year of operation) of the baseline heat generator h, taking into account downtime due to maintenance, seasonal operational patterns and any other technical constraints. In this case, this parameter was determined from the baseline study carried out for the Viñales project and other similar/comparable projects in other Arauco sawmill facilities.
Purpose of the data	Calculation of baseline emissions
Comments	--

Data / Parameter	GWP_{CH4}
Data unit	(tCO_2e/tCH_4)
Description	Global Warming Potential of methane valid for the commitment period (tCO_2/tCH_4)
Source of data	IPCC Fourth Assessment Report (2007)
Value applied	25 for the second commitment period. Shall be updated according to any future update.
Justification of choice of	Until the next COP/MOP decision, it is the accepted value for

data or description of measurement methods and procedures applied	emission reduction calculations.
Purpose of the data	Calculation of baseline emissions and project emissions
Comments	--

Data / Parameter	$EF_{burning, CH4,k,y}$
Data unit	(tCH_4/GJ)
Description	CH_4 emission factor for uncontrolled burning of the biomass residue type k during year y.
Source of data	Direct measurement before the start of the project activity.
Value applied	Biomass residues from industrial operations (mainly sawdust and bark from sawmills): 0.0008742 (tCH_4/GJ) or 874.2 (Kg CH_4/TJ). This value includes the adjustment of a conservativeness factor of 0.94. Biomass residues from forestry operations (mainly branches from harvesting, pruning and thinning operations): 0.00010146 (tCH_4/GJ) or 101.46 (Kg CH_4/TJ). This value includes the adjustment of a conservativeness factor of 0.89.
Justification of choice of data or description of measurement methods and procedures applied	The CH_4 measurement was performed for the biomass types that will be used as a result of the implementation of the Viñales project activity. For a detailed description on the methods used, please see Annex 3, page 123, of the current Project Description Document.
Purpose of the data	Calculation of baseline emissions.
Comments	--

Data / Parameter	$EF_{CH4,BR}$
Data unit	(tCH_4/GJ)
Description	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)
Source of data	On-site measurements or default values, as provided in Table 4 and 5 of the ACM0006 (Version 12.1.1).
Value applied	30 kg CH_4/TJ (unadjusted factor)

	41.1 kg CH_4/TJ using conservativeness factor of 1.37 from Table 5 (maximum uncertainty).
Justification of choice of data or description of measurement methods and procedures applied	The measured CH_4 emission factors are adjusted by a conservatism value, thus ensuring the appropriateness and conservativeness of the associated emission reduction calculation. Likewise, the default emission factors provided by the methodology are conservative per se and are further adjusted using conservativeness factors provided by the methodology. This ensures the conservativeness of the emission reduction calculation.
Purpose of the data	Calculation of baseline emissions.
Comments	The project Participant will use the default values in this case. However, the Project Participant might consider measuring this emission factor in the future. In such case, the Project Participant will present the corresponding request for deviation, in accordance with the VCS rules.

Data / Parameter	$\eta_{BL,HG,BR, boiler}$
Data unit	(%)
Description	Heat efficiency of the boiler (heat generator) that would have been installed in the baseline scenario.
Source of data	Baseline plant design parameter defined by Energy Industry consultant. The same value has been recently used by the Project Proponent in other similar emission reduction project activities under the CDM.
Value applied	85%
Justification of choice of data or description of measurement methods and procedures applied	As stated above, the proposed value has been used in other similar emission reduction project activities implemented in Chile and has been suggested by reputable engineering and technology companies such as Metso and Andritz. The value is realistic and furthermore, leads to a more conservative emission reduction calculation than the default value that is proposed in the “Tool to determine the baseline efficiency of thermal or electric energy generation systems”.
Purpose of the data	Calculation of baseline emissions.
Comments	--

Data and parameters not monitored from the tool: "Project and leakage emissions from road transportation of freight" (Version 01.0.0).

Data / Parameter	$EF_{CO2,f}$
Data unit	(g CO_2/t km)
Description	Default CO_2 emission factor for freight transportation activity f.
Source of data	Tool "Project and leakage emissions from road transportation of freight" (Version 01.0.0).
Value applied	Vehicle class: Emission factor (g CO_2/t km) — Light vehicle: 245; Heavy vehicle: 129 In this case, the Project Participant used the emission factor for heavy vehicle according to the type of vehicle used in the transportation of the biomass residues to Viñales power plant.
Justification of choice of data or description of measurement methods and procedures applied	The default value is proposed in the corresponding CDM tool and therefore are deemed conservative and appropriate in this case.
Purpose of the data	Calculation of Project emissions.
Comments	Applicable to Option B. The default CO_2 emission factors take into account emissions generated by loaded outbound trips and empty return trips. The default emission factor used have been derived based on custom design transient speed-time-gradient drive cycle (adapted from the international FIGE cycle), vehicle dimensional data, mathematical analysis of loading scenarios, and dynamic modelling based on engine power profiles, which, in turn, are a function of gross vehicle mass (GVM), load factor, speed/acceleration profiles and road gradient. The following assumptions on key parameters have been made: an average driving speed of 30 km/h, an average gradient of 1% and a load factor attained when biomass is transported is assumed.

Value applied table:

Vehicle class	Emission factor (g CO_2/t km)
Light vehicle	245
Heavy vehicle	129

3.2 Data and Parameters Monitored

Data / Parameter	Biomass residues categories and quantities used in the project activity.
Data unit	- Type - Source

	- Fate in the absence of the project activity - Use in the project scenario - Quantity (BDt)
Description	The biomass quantities were monitored continuously in the project plant, according to proper industry standards.
Source of data	On-site measurement and calculations.
Description of measurement methods and procedures to be applied	Most of the internal biomass residues were measured at the entrance of the biomass power plant, using dedicated weight bridges. The rest of the internal biomass residues that are transported by pneumatic transportation system was estimated by the internal supplier (Viñales Sawmill and Remanufacture Plant) according Annex 1, page 113, current PD. The external biomass residues, from industrial and Forestry operations third parties, was measured using dedicated weight bridges. Dry weight of all biomass residues was subsequently determined using the biomass moisture content of the corresponding biomass type.
Frequency of monitoring/recording	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.
Value monitored	

Biomass residues category k	Biomass residues type	Biomass residue source	Biomass residues fate in the absence of the project activity	Biomass residues use in project scenario	Biomass residues quantity (BDt/yr)
1	Sawdust and bark industrial operations	On-site production	Heat and power generation on-site (B4)	Heat and power generation on-site (biomass only boiler)	2015: 102,472 2016: 103,004
2	Sawdust and bark industrial operations	On-site production	Dumped and/or burned in the open air (B1:/ B3:)	Heat and power generation on-site (biomass only boiler)	
3	Sawdust and bark industrial operations	Off-site from third parties facilities	Dumped and/or burned in the open air (B1:/	Heat and power generation on-site (biomass	2015: 133,299 2016: 161,404

			B3:)	only boiler)	
4	Bark, branches, from harvest, prune or	Off-site from forestry operations	Dumped and/or burned in the open air (B1:/ B3:)	Heat and power generation on-site (biomass only boiler)	2015: 4,760 2016: 0

Monitoring equipment	Type: Weighbridge 1 GSE 460 Accuracy class: Class III (+/- 30 kg) Serial number: 152069 Calibration frequency: Biannual Dates of calibration: 25/10/2014-17/01/2015-20/04/2015-18/07/2015-02/11/2015-23/01/2016-16/04/2016 Validity: 25/02/2017 (As reference).
QA/QC procedures to be applied	Project Participant crosschecked the measurement with an annual energy balance that is based on purchased quantities and stock changes. The result for QA/QC in the current period, January to December 2015 and January to December 2016, were efficiencies of 71.11% and 71.57% respectively in the power boiler. According to provider information, power boiler efficiency could be between 66%-86%, then, yearly energy balance is in an acceptable range. Nevertheless, is important consider that the stoppages due to failures or programmed affects the results of the monthly energy balance.
Purpose of the data	Calculation of baseline emissions and project emissions
Calculation method	For the biomass residues generated on-site that are transported by the pneumatic transportation system, consider equations described in Annex 1, page 113, current PD. $[1] BR\ Brushing\ process = a \cdot b \cdot Dr$ $[2]\ BR\ Logging\ process = c \cdot d \cdot Dr$ $[3] BR\ finger - joints = m \cdot q \cdot Dr$ $[4] BR\ band - sawing = e \cdot f \cdot g \cdot Dr$ $[5] BR\ molding\ process = (h - i) \cdot (1 - j) \cdot Dr + k \cdot l \cdot Dr$ $[6] BR\ squaring\ process = r \cdot s \cdot Dr$ $[7] BR\ Viñales\ sawmill\ plant = I \cdot \left(1 - \frac{S_o}{(S_i \cdot fc)}\right) \cdot Ds$ Where: Dr : Wood density (Kg/m^3) a: Green wod volume consumption of the brushing machine (m^3)

	b: Real (unadjusted) performance factor of the brushing machine (number). c: Logs volume consumption (m^3) d: Performance factor for the production of wood-splinter. This parameter is determined based on empirical measurements (number). m: Sawdust volume generated from processing one wood-blank in the finger-joint process (m^3) q: Amount of wood-blocks produced in the finger-joint process (number). e: Wood thickness that is being sawed (m) f: Linear meters of cuts along the thickness of the wood-blanks (m) g: Cut width (0.0022 m) h: Wood-blank volume consumed by the molding machine (m^3) i: Sawdust volume generated from cutting the wood-blanks to the specified thickness (m^3) j: Performance index from consuming wood-blanks and producing wood-moldings. This factor is calculated from the geometry of the wood molding (number for each type of molding). k: Molding volume production (m^3) l: Process performance (number) r: Input volume moldings to the process (m^3) s: Process performance (number. Empirical, determined for the process) I: Wood volume consumed by the shaving process (m^3) So: Wood section that exists the shaving process (m^2) Si: Wood section that enters the shaving process (m^2) fc: Wood correction factor due to wood drying as a result of the shaving process (number).
Comments	--

Data / Parameter	For biomass residues categories for which scenarios B1: B2: or B3: is deemed a plausible baseline alternative, project participants shall demonstrate that is a realistic and credible alternative scenario.
Data unit	Tonnes
Description	- Quantity of available biomass residues of type n in the region.

	- Quantity of biomass residues of type n that are utilized in the defined geographical region. - Availability of a surplus of biomass residues type n (which cannot be sold or utilized) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region.
Source of data	Official national Survey and statistic.
Description of measurement methods and procedures to be applied	Not applicable in this case.
Frequency of monitoring/recording	At the validation stage for biomass residues categories identified ex-ante, and always that new biomass residues categories are included during the crediting period.
Value monitored	Not applicable in this case.
Monitoring equipment	Not applicable in this case.
QA/QC procedures to be applied	Not applicable in this case.
Purpose of the data	Leakage
Calculation method	Not applicable in this case.
Comments	Biomass residues used during CP1MP2 (Sawdust and Bark from industrial operations, on-site and off-site) were according biomass residues definition in current PD (page 3) and Viñales Validation Report (page 11). There are not new biomass residues categories to declare. Therefore, according to methodology ACM0006 version 12.1.1 is not necessary to present another biomass surplus index study.

Data / Parameter	$BR_{PJ,n,y}$
Data unit	Tonnes
Description	Quantity of biomass residues of category n used in the project activity in year y.
Source of data	On-site measurements.
Description of measurement methods and procedures to be applied	Most of the internal biomass residues were measured at the entrance of the biomass power plant, using dedicated weight bridges. The rest of the internal biomass residues that are transported by pneumatic transportation system was estimated by the internal supplier according Annex 1, page

<table>
<tr><td></td><td>113, current PD.
The external biomass residues were measured using dedicated weight bridges.
Dry weight of all biomass residues was subsequently determined using the biomass moisture content of the corresponding biomass type.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Data monitored continuously and aggregated as appropriate, to calculate emission reductions.</td></tr>
<tr><td>Value monitored</td><td>
<table>
<tr><td></td><td>Biomass residues type</td><td>Biomass residue source</td><td>Biomass residues fate in the absence of the project activity</td><td>Biomass residues use in project scenario</td><td>Biomass residues quantity (dry tonnes/yr)</td></tr>
<tr><td>$BR_{PJ,1,y}$</td><td>Sawdust and bark industrial operations</td><td>On-site</td><td>Heat and power generation on-site (B4)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 36,403
2016: 31,462</td></tr>
<tr><td>$BR_{PJ,2,y}$</td><td>Sawdust and bark industrial operations</td><td>On-site</td><td>Dumped and/or burned in the open air (B1 and or B3)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 66,070
2016: 71,542</td></tr>
<tr><td>$BR_{PJ,3,y}$</td><td>Sawdust and bark industrial operations</td><td>Off-site</td><td>Dumped and/or burned in the open air (B1 and or B3)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 133,229
2016: 161,404</td></tr>
<tr><td>$BR_{PJ,4,y}$</td><td>Biomass from forestry operations</td><td>Of-site</td><td>Dumped and/or burned in the open air (B1 and or B3)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 17,360
2016: 0</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Type: Weighbridge 1 GSE 460
Accuracy class: Class III (+/- 30 kg)
Serial number: 152069
Calibration frequency: Biannual
Dates of calibration: 25/10/2014-17/01/2015-20/04/2015-18/07/2015-02/11/2015-23/01/2016-16/04/2016
Validity: 25/02/2017 (As reference).</td></tr>
</table>

QA/QC procedures to be applied	Project Participant crosschecked the measurement with an annual energy balance that is based on purchased quantities and stock changes. The result for QA/QC in the current period, January to December 2015 and January to December 2016, were efficiencies of 71.11% and 71.57% respectively in the power boiler. According to provider information, power boiler efficiency could be between 66%-86%, then, yearly energy balance is in an acceptable range. Nevertheless, is important consider that the stoppages due to failures or programmed affects the results of the monthly energy balance.
Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	$BR_{PJ,1,y}$ is obtained adding to the measured fraction transported by truck from Viñales sawmill and remanufacture plant, the calculated fraction of internal biomass transported by pneumatic system. Biomass residues by pneumatic transportation system are calculated by the internal suppliers according algorithms described in annex 1 of current PD.
Comments	The biomass residue quantities used should be monitored separately for each type of biomass residue and each source.

Data / Parameter	$BR_{B4,n,y}$
Data unit	(Tonnes in dry basis /BDt)
Description	Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B4:
Source of data	On-site measurement.
Description of measurement methods and procedures to be applied	Internal and external biomass residues were measured at the entrance of the biomass power plant, using dedicated weight bridges. A fraction of the internal biomass residues that are transported by pneumatic transportation system was estimated according Annex 1, page 113, current PD.
Frequency of monitoring/recording	Data monitored continuously and aggregated as appropriate, to calculate emission reductions.
Value monitored	

Biomass residues category	Biomass residues type	Biomass residue source	Biomass residues fate in the absence of the project activity	Biomass residues use in project scenario	Biomass residues quantity (dry tonnes/yr)

<table>
<tr><td></td><td><table><tr><td>$BR_{B4,1,y}$</td><td>Sawdust and bark industrial operations</td><td>On-site</td><td>Heat and power generation on-site (B4)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 36,403
2016: 31,462</td></tr></table></td></tr>
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<tr><td>QA/QC procedures to be applied</td><td>Project Participant crosschecked the measurement with an annual energy balance that is based on purchased quantities and stock changes. The result for QA/QC in the current period, January to December 2015 and January to December 2016, were efficiencies of 71.11% and 71.57% respectively in the power boiler. According to provider information, power boiler efficiency could be between 66%-86%, then, yearly energy balance is in an acceptable range. Nevertheless, is important consider that the stoppages due to failures or programmed affects the results of the monthly energy balance.</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of baseline emissions and project emissions.</td></tr>
<tr><td>Calculation method</td><td>According to methodology ACM0006 Version 12.1.1, step 3, pages 32 to 39.</td></tr>
<tr><td>Comments</td><td>According to Step 1.4 of methodology ACM0006 (Version 12.1.1) all these biomass residue types are used in the power boiler (heat generator) exclusively. As a result, the monitored quantities of biomass residues used in the project was directly allocated to that heat generator in the baseline scenario.</td></tr>
</table>

Data / Parameter	$BR_{B1/B3,n,y}$
Data unit	(Tonnes on dry basis)
Description	Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B1: or B3:
Source of data	On-site measurements.

<table>
<tr><td>Description of measurement methods and procedures to be applied</td><td>Fraction of external biomass residues in baseline scenario B1: or B3: were measured at the entrance of the biomass power plant, using dedicated weight bridges.

Dry weight of all biomass residues was subsequently determined using the biomass moisture content of the corresponding biomass type.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Data monitored continuously and aggregated as appropriate, to calculate emission reductions.</td></tr>
<tr><td>Value monitored</td><td>
<table>
<tr><th></th><th>Biomass residues type</th><th>Biomass residue source</th><th>Biomass residues fate in the absence of the project activity</th><th>Biomass residues use in project scenario</th><th>Biomass residues quantity (dry tonnes/yr)</th></tr>
<tr><td>$BR_{B1/B3,2,y}$</td><td>Sawdust and bark industrial operations</td><td>On-site</td><td>Dumped and/or burned in the open air (B1 and or B3)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 66,070
2016: 71,542</td></tr>
<tr><td>$BR_{B1/B3,3,y}$</td><td>Sawdust and bark industrial operations</td><td>Off-site</td><td>Dumped and/or burned in the open air (B1 and or B3)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 133,229
2016: 161,404</td></tr>
<tr><td>$BR_{B1/B3,4,y}$</td><td>Biomass from forestry operations</td><td>Off-site</td><td>Dumped and/or burned in the open air (B1 and or B3)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>2015: 17,360
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Validity: 25/02/2017 (As reference).</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Project Participant crosschecked the measurement with an annual energy balance that is based on purchased quantities and stock changes. The result for QA/QC in the current period, January to December 2015 and January to</td></tr>
</table>

	December 2016, were efficiencies of 71.11% and 71.57% respectively in the power boiler. According to provider information, power boiler efficiency could be between 66%-86%, then, yearly energy balance is in an acceptable range. Nevertheless, is important consider that the stoppages due to failures or programmed affects the results of the monthly energy balance.
Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	According to methodology ACM0006 Version 12.1.1, step 5, pages 44 to 46.
Comments	--

Data / Parameter	$EF_{FF,y,f}$
Data unit	(tCO_2/GJ)
Description	CO_2 emission factor for fossil fuel type f in year y.
Source of data	Default value. 2006 IPCC Guidelines on National GHG Inventories. Table 1.4 Chapter 1 of Vol.2. In the upper limit of uncertainty at a 95% confidence interval.
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	The Project Participant corroborate appropriateness the value for the current monitoring period.
Value monitored	0.0748 (tCO2/GJ) for Diesel. 0.0788 (tCO2/GJ) for Fuel Oil.
Monitoring equipment	--
QA/QC procedures to be applied	Not applicable.
Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	Not applicable.
Comments	--

Data / Parameter	$EF_{CH4,BR}$
Data unit	(tCH_4/GJ)

Description	CH_4 emission factor for the combustion of biomass residues in the project plant.
Source of data	Default values from the table 4 and 5 of ACM0006 (Version 12.1.1) methodology.
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Not applicable.
Value monitored	30 (kg CH_4/TJ) with an uncertainty conservativeness factor of 1.37 (corresponds to the maximum uncertainty of 300%).
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable.
Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	Not applicable.
Comments	Monitoring of this parameter for project emissions is required, since in this case CH_4 emissions from biomass combustion are included in the project boundary. A conservative factor was applied, as specified in the baseline methodology.

Data / Parameter	$EF_{CO2,LE}$
Data unit	(tCO_2/GJ)
Description	CO_2 emission factor of the most carbon intensive fossil fuel used in the country.
Source of data	Combustible use in Chile published by CNE: "Balance Nacional de Energia 2014: Energía Global." http://energiaabierta.cne.cl/balance-energetico/ and default CO_2 emission factors for combustion in Table 1.4. 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Description of measurement methods and procedures to be applied	--
Frequency of monitoring/recording	Every re-validation process.

Value monitored	Gas Coke and lignite Coke: 0.119 tCO_2e/GJ Not used in this case, since leakage is assumed to be 0 for the present monitoring period.
Monitoring equipment	--
QA/QC procedures to be applied	--
Purpose of the data	Calculation of leakage.
Calculation method	Not applicable.
Comments	--

Data / Parameter	$HC_{BL,y}$
Data unit	(GJ)
Description	Baseline process heat generation in year y.
Source of data	On-site measurements and calculations.
Description of measurement methods and procedures to be applied	This parameter was determined as the difference of the enthalpy of the process heat loads in the project activity minus the enthalpy of the feed-water, the boiler blow-down and any condensate return to the heat generators. The respective enthalpies were determined based on the mass flows, the temperatures and, in case of superheated steam, the pressure. An appropriate thermodynamic equation may be used to calculate the enthalpy as a function of temperature and pressure.
Frequency of monitoring/recording	Calculation based on continuously monitored data an aggregated as appropriate.
Value monitored	2015: 581,617 (GJ) 2016: 499,845 (GJ)
Monitoring equipment	663-PT-0155 Type: Pressure gauge transmitter for Power Boiler Endress & Hauser Cerebar S//PMP75-ACC1WB1UBGAU Accuracy class: +/- 0.075% Serial number: D500C90109C Calibration frequency: 18 months Date of calibration: 17/11/2014-14/11/2015-10/11/2016 Validity: 09/05/2018

	663-FT-0156 Type: Flow transmitter for Power Boiler Endress & Hauser Cerebar S//PMP75-ACC7FB1DAVUDA63M-AB2BBD. Accuracy class: +/- 0.075% Serial number: D501F50109D Calibration frequency: 18 months Date of calibration: 18/11/2014-13/11/2015-10/11/2016 Validity: 09/05/2018 663-TT-0157 Type: Temperature sensor for the Power Boiler Endress & Hauser TH53-8A23E2E2B31AK. Accuracy class: ≤ ±0.05% Serial number: 266161 Calibration frequency: 2 years by PP's protocol. Measurement range: 0 – 600 °C Assembling and calibration date: 13/11/2015-10/11/2016 Validity: 09/11/2018 665-PT-9040-A / 665-PT-9040-B Type: Pressure gauge transmitter High pressure line Rosemount 2051TG4A2B21AB4Q4. Accuracy class: ±0.05% Serial number: 32601 (A) – 32602 (B) Calibration frequency: 18 months. Date of calibration: 19/11/2014-14/11/2015-08/11/2016 Validity: 07/05/2018 665-FT-9030 Type: Flow transmitter high pressure line Rosemount 2051CD2F02A1A55Q4. Accuracy class: ±0.05%. Serial number: 33712 Calibration frequency: 18 months. Date of calibration: 19/11/2014-14/11/2015-08/11/2016 Validity: 17/05/2018 665-TT-9043-A / 665-TT-9043-B Type: Steam Temperature transmitter high pressure line

	Rosemount 644HANAJ6Q4. Accuracy class: ±0.05% Serial number: 0271902 (A) / 0219846 (B) Calibration frequency: 2 years. Date of calibration: 19/11/2014-14/11/2015-08/11/2016 Validity: 07/11/2018 665-PT-9001-A /665-PT-9001-B Type: Pressure gauge transmitter Medium pressure Line. Rosemount 2051TG3F2B21AB4Q4. Accuracy class: ±0.05% Serial number: 32561 (A) / 32562 (B) Calibration frequency: 18 months. Date of calibration: 19/11/2014-14/11/2015-08/11/2016 Validity: 07/05/2018 665-FT-9025 Type: Steam flow transmitter Medium pressure Line. Rosemount 2051CD2F02A1AS5Q4-0305RC32B11B4. Accuracy class: ±0.05% Serial number: 33711 Calibration frequency: 18 months. Date of calibration: 19/11/2014-13/11/2015-12/11/2016 Validity: 11/05/2018 665-FT-9051 Type: Steam flow transmitter Medium pressure Line. Rosemount 2051CD2F02A1AS5Q4-0305RC32B11B4. Accuracy class: ±0.05% Serial number: 107763 Calibration frequency: 18 months. Date of calibration: 19/11/2014-14/11/2015-11/11/2016 Validity: 10/05/2018 665-TT-9026 Type: Steam Temperature transmitter Medium pressure line Rosemount 644HFNAJ6Q4 Accuracy class: ±0.15°C. Serial number: 0271897 Calibration frequency: 2 years Assembling and calibration date: 08/11/2016

	Validity: 07/11/2018 665-PT-9002-A / 665-PT-9002-B / 665-PT-9002-C Type: Pressure gauge transmitter Low pressure line Rosemount 2051TG2A2B21AB4Q4. Accuracy class: ±0.05% Serial number: 32598 (A) / 32599 (B) / 32600 (C) Calibration frequency: 18 months. Date of calibration: 19/11/2014-14/11/2015-09/11/2016 Validity: 08/05/2018 665-FT-9019 Type: Steam flow transmitter Low pressure line. Rosemount 2051CD2F02A1AS5Q4. Accuracy class: ±0.05% Serial number: 33709 0033709 Calibration frequency: 18 months. Date of calibration: 19/11/2014-13/11/2015-12/11/2016 Validity: 11/05/2018 665-FT-9023 Type: Deaerator steam pressure flow transmitter Rosemount 2051CD2F02A1AS5Q4-0305RC32B11B4. Accuracy class: ±0.05% Serial number: 33710 Calibration frequency: 18 months. Date of calibration: 19/11/2014-17/11/2015-11/11/2016 Validity: 10/05/2018 665-TT-9024 Type: Steam Temperature transmitter Low pressure line Rosemount 644HFNAJ6Q4 Accuracy class: ±0.15°C. Serial number: 0271896 Calibration frequency: 2 years Assembling and calibration date: 08/11/2016 Validity: 07/11/2018 663-PT-0106 Type: Pressure gauge transmitter Feed water condition Endress + Hauser PMD75-ARC1WB1UBGAU.

	Accuracy class: ±0.075% Serial number: D500BE0109C Calibration frequency: According to supplier recommendation, PP define 18 months if was necessary. Assembling and calibration date: 24/11/2014-16/11/2015-10/11/2016 Validity: 09/05/2018 663-TT-0111 Type: Steam temperature transmitter Feed water condition Rosemount 644HFNAJ6Q4. Accuracy class: ±0.15°C. Serial number: 265913 Calibration frequency: 2 years. Assembling and calibration date: 13/11/2015-09/11/2016 Validity: 08/11/2018 Calibration on 13/11/2015 equipment was verified in all span. No calibration was needed.
QA/QC procedures to be applied	Heat quantities are directly measured by dedicated steam flow meters and pressure/temperature meters. The associated uncertainty is very low, since these parameters are key to the production processes of the Viñales plant and therefore, receive periodic maintenance as part of the production control system. According to PD, version 07, the consistency of metered net heat generation should be cross-checked with receipts from sales (if available) and the quantity of fuels fired (e.g. check whether the net heat generation divided by the quantity of fuels fired results in a reasonable thermal efficiency that is comparable to comparable to previous years). The thermal efficiency index obtained for CP1MP2 was compared every month since there were no historical efficiency indexes from previous monitoring periods. The monthly comparison resulted in a reasonable value, as can be seen below:

Month	Steam/Biomass index [Ton steam/Ton biomass] 2015	Steam/Biomass index [Ton steam/Ton biomass] 2016
January	2.15	1.94
February	2.22	1.93
March	2.09	1.89

	<table><tr><td>April</td><td>2.70</td><td>2.48</td></tr><tr><td>May</td><td>3.03</td><td>2.14</td></tr><tr><td>June</td><td>2.76</td><td>1.83</td></tr><tr><td>July</td><td>2.41</td><td>2.29</td></tr><tr><td>August</td><td>2.85</td><td>1.84</td></tr><tr><td>September</td><td>2.50</td><td>1.87</td></tr><tr><td>October</td><td>2.31</td><td>2.14</td></tr><tr><td>November</td><td>2.36</td><td>1.67</td></tr><tr><td>December</td><td>2.79</td><td>1.67</td></tr><tr><td>**Average**</td><td>**2.50**</td><td>**1.95**</td></tr></table> QA/QC index tolerance range [2.0-4.2] was defined according to design energy balance for the power boiler ("Design data of the boiler for training 17 to 20.pdf", Kvaerner pulping power division) using quantity of live steam divided by quantity of wet combusted biomass. Then, average value is in the expected range.
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable.
Comments	There is no evidence of calibration during the initial months (2015) of the present monitoring period for the following instruments: -663-TT-0157 (High pressure line) 665-TT-9026 (Medium pressure line) 665-TT-9024 (Low pressure line) 663-TT-0101 (Feed water conditions): Equipment that monitored temperature in steam lines. These measurements check temperature set point and there are no directly involved in emission reduction calculation. Set points Pressure and temperature of steam lines to calculate enthalpies involved in $HC_{BL,y}$ were properly defined and presented during Viñales validation process. Adjustments aren't necessaries -663-PT-0106 (Feed water conditions): Equipment that monitored pressure in feed water line. This measurement checks pressure set point and there is no directly involved in emission reduction calculation. Set points Pressure and temperature of steam lines to calculate enthalpies involved in $HC_{BL,y}$ were properly defined and presented during Viñales validation. Corrections aren't necessaries.

Data / Parameter	$EL_{PJ,gross,y}$
Data 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.
Source of data	On-site measurement.
Description of measurement methods and procedures to be applied	Parameter was measured using proper electric meters, calibrated and maintained according to manufacture specification and proper industry standards.
Frequency of monitoring/recording	Continuously and aggregated as appropriate, to calculate emission reductions.
Value monitored	2015: 277,471 (MWh) 2016: 311,335 (MWh)
Monitoring equipment	8600-10 Type: Energy Meter Gross Power Measurement Schneider Electric ION 8600 Accuracy class: +/- 0.2% Serial number: LT-1012A701-01 Calibration frequency: 7 years Date of last calibration: 24/12/2010 Validity: 23/12/2017
QA/QC procedures to be applied	1. – Monthly rate between receipts from electricity sales (if available) and the calculated displacement of the grid is within a range of ±2%.

	Sale Electricity invoice (A)		Gross quantity electricity generated	Total electricity import from the grid	Total electricity consumption Viñaletes complex	Calculated displacement of the grid (B)	QA/QC rate (A/B) [0.80-1]
2015	n°	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month
Jan	41835	18.123	23.885	18	3.197	20.577	0,88
Feb	42553	15.505	21.728	54	2.857	18.835	0,87
Mar	43234	18.815	24.421	25	3.195	21.251	0,89
Apr	43834	18.759	24.420	23	3.180	21.263	0,88
May	44568	17.345	23.007	38	3.145	19.900	0,87
Jun	45535	18.509	24.284	0	3.074	21.210	0,88
Jul	45842	19.354	25.191	12	3.142	22.052	0,88
Aug	45925	19.558	25.435	47	3.215	22.257	0,88
Sep	47704	15.570	21.012	4	2.958	18.054	0,85
Oct	46451	18.321	24.705	0	3.194	21.512	0,86
Nov	21225	11.135	14.456	959	2.114	13.324	0,84
Dec	25082	19.543	24.941	224	3.135	22.099	0,88

2016	Sale Electricity invoice (A)		Gross quantity electricity generated	Total electricity import from the grid	Total electricity consumption Viñales complex	Calculated displacement of the grid (B)	QA/QC rate (A/B) [0.80-1]
	m³	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month
Jan	32151	17.855	22.850	256	2.982	20.125	0,88
Feb	37567	18.235	24.835	0	3.109	21.727	0,82
Mar	43514	20.613	26.640	40	3.258	23.422	0,82
Apr	42447	20.433	26.247	13	3.177	23.083	0,82
May	54558	23.335	28.505	20	3.400	25.125	0,93
Jun	59744	22.554	28.755	17	3.397	25.375	0,82
Jul	65221	21.510	27.534	44	3.305	24.273	0,82
Aug	70365	22.234	28.448	0	3.418	25.030	0,82
Sep	75568	21.428	27.312	18	3.257	24.072	0,82
Oct		21.321	27.150	25	3.293	23.882	0,82
Nov		12.578	16.010	753	2.093	14.551	0,85
Dec		20.528	26.046	72	3.142	22.984	0,82

2. - Index between electricity generation divided by the quantity of combusted biomass in Power boiler results in a reasonable efficiency comparable to yearly statistic range:

2015	A	B	QA/QC [0.83-1.34]
	Gross electricity generation MWh	Combusted biomass in power boiler BDt	Index MWh/BDt A/B
Jan	23.856	20.719	1.15
Feb	21.728	19.024	1.14
Mar	24.421	19.093	1.23
Apr	24.420	21.723	1.12
May	23.007	19.369	1.19
Jun	24.234	18.460	1.32
Jul	25.191	21.311	1.18
Aug	25.436	20.935	1.21
Sep	21.012	19.522	1.08
Oct	24.706	21.515	1.15
Nov	14.438	16.696	0.87
Dec	24.941	22.094	1.13

2016	A	B	QA/QC [0.83-1.34]
	Gross electricity generation MWh	Combusted biomass in power boiler BDt	Index MWh/BDt A/B
Jan	22.850	18.220	1.25
Feb	24.836	20.571	1.21
Mar	26.640	21.475	1.24
Apr	26.247	18.718	1.40
May	28.505	21.678	1.38
Jun	28.756	25.264	1.14
Jul	27.534	22.429	1.23
Aug	28.448	27.727	1.03
Sep	27.312	25.700	1.06
Oct	27.150	22.977	1.18
Nov	16.010	17.949	0.89
Dec	26.046	21.698	1.20

Is important to note that boiler electricity efficiency change when Power plant is carrying out a programmed stoppage.

3. - Percentage difference between Measured energy displacement using dedicated equipment and calculated energy displacement according methodology must be equal or bigger than zero (i.e. Measured energy shall be mayor than calculated energy

	displacement).

2015	A Measured exported energy to grid MWh	B Measured energy saw mill consumption MWh	C Calculated energy displacement MWh	QA/QC ≥ 0 Difference % ((A-B)-C)/C
Jan	18.159.9	2.319	20.412.7	0.32%
Feb	16.534.0	2.183	18.632.1	0.46%
Mar	18.849.7	2.202	20.988.2	0.30%
Apr	10.003.4	2.203	20.999.7	0.32%
May	17.456.2	2.245	19.630.2	0.36%
Jun	18.646.8	2.378	20.956.2	0.33%
Jul	19.394.3	2.475	21.803.0	0.30%
Aug	19.711.3	2.355	21.999.7	0.30%
Sep	15.602.9	2.283	17.798.6	0.49%
Oct	18.977.4	2.351	21.257.9	0.33%
Nov	11.162.2	1.281	12.351.4	0.75%
Dec	19.588.7	2.133	21.670.6	0.24%

2016	A Measured exported energy to grid MWh	B Measured energy saw mill consumption MWh	C Calculated energy displacement MWh	QA/QC ≥ 0 Difference % ((A+B)-C)/C
Jan	17.905.7	1.849	19.699.3	0.28%
Feb	19.339.3	2.191	21.472.7	0.27%
Mar	20.863.8	2.336	23.152.3	0.20%
Apr	20.487.5	2.397	22.825.9	0.26%
May	23.464.0	2.443	25.864.5	0.17%
Jun	22.731.6	2.440	25.116.6	0.22%
Jul	21.672.7	2.390	23.998.9	0.27%
Aug	22.295.3	2.536	24.775.8	0.22%
Sep	21.487.5	2.387	23.813.9	0.26%
Oct	21.406.0	2.303	23.611.9	0.41%
Nov	12.611.3	1.963	13.810.1	5.53%
Dec	20.576.7	2.247	22.698.1	0.55%

According QA/QC cross check 1 and 2, November 2015 and 2016 presents differences due to programmed yearly Power plant Stoppage. As the process of the power plant is continuous, is not possible to execute the maintenance/calibration, for the majority of the instruments of the power plant, out of the general plant shutdown. One of the main tasks that are performed during the stoppage is the maintenance of the substation located in power plant site. This is a highly risky task that needs to de-energize certain plant's areas to accomplish. The aforementioned areas include the equipment that register the energy imports and exports from and to the grid. Is in this process where the most substantial difference between the Constitucion substation and the power plant equipment are presented, because the substation continuous measuring. Nevertheless, Calculated energy displacement is conservative comparing with measured and invoice energy displacement from the grid, because the measured energy displacement in Constitucion

	substation is bigger than the calculated energy displacement.
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable.
Comments	--

Data / Parameter	$EL_{PJ,imp,y}$
Data unit	(MWh)
Description	Project electricity imports from the grid in year y.
Source of data	On-site measurements.
Description of measurement methods and procedures to be applied	Parameter was measured using proper electric meters, calibrated and maintained according to manufacture specification and proper industry standards.
Frequency of monitoring/recording	Continuously and aggregated as appropriate, to calculate emission reductions.
Value monitored	2015: 502 (MWh) 2016: 363 (MWh)
Monitoring equipment	SE-EI-0006/0007 Type: Energy Meter Import Power Measurement Schneider Electric ION 8600 Accuracy class: +/- 0.2% Serial number: PT-1012A934-01 Calibration frequency: 7 years Date of last calibration: 06/06/2011 Validity: 05/06/2018 8600-2_3 Type: Energy Meter Sawmill consumption Schneider Electric ION 8600 Accuracy class: +/- 0.2% Serial number: MT-1010A242-01 Calibration frequency: 7 years Date of last calibration: 09/10/2010 Validity: 08/10/2017
QA/QC procedures to	- Consistency of metered electricity was checked percentage

be applied

difference between Total power import and receipts from electricity purchases. The difference between measures and invoices are exposed in table below:

2015	A Import electricity to power plant MWh	B Import electricity to Sawmill plant MWh	C n°	 Import electricity invoice MWh	QA/QC ≤ 0 Index % ((A-B)-C)/C
Jan	8	10	569	18.0	0.002
Feb	25	9	694	34.0	0.001
Mar	17	9	810	26.0	0.001
Apr	14	9	920	22.7	0.001
May	22	16	1076	37.8	0.002
Jun	0	0	0	0.0	
Jul	8	5	1324	12.2	0.001
Aug	34	13	1405	46.0	0.001
Sep	3	1	1505	4.5	0.002
Oct	0	0	1678	0.4	0.018
Nov	251	718	1805	967.7	0.002
Dec	120	174	1930	293.1	0.002

2016	A Import electricity to power plant MWh	B Import electricity to Sawmill plant MWh	C n°	 Import electricity Invoice MWh	QA/QC ≤ 0 Index % ((A+E)-C)/C
Jan	56	242	2027	293.0	0.004
Feb	0	0	-	-	
Mar	25	15	2345	40.2	0.001
Apr	10	3	2454	13.2	0.002
May	14	7	2545	20.3	0.002
Jun	12	6	2757	17.4	0.002
Jul	24	20	2889	44.0	0.002
Aug	0	0	3023	0.3	-0.199
Sep	13	4	3121	17.5	0.002
Oct	13	16	3302	23.1	0.002
Nov	147	586	3456	732.1	0.002
Dec	48	31	3615	73.1	0.002

Import electricity invoices report the total import electricity from the grid to Viñales complex (Sawmill and power plant). QA/QC index present a low difference with the QA/QC range. No meaning difference where detected and no correction where applied.

- Index between electricity generation divided by the quantity of combusted biomass in Power boiler results in a reasonable efficiency comparable to yearly statistic range:

2015	A	B	QA/QC [0.83-1.34]
	Gross electricity generation MWh	Combusted biomass in power boiler BDt	Index MWh/BDt A/B
Jan	23.856	20.719	1.15
Feb	21.728	19.024	1.14
Mar	24.421	19.093	1.28
Apr	24.420	21.723	1.12
May	23.007	19.369	1.19
Jun	24.284	18.460	1.32
Jul	25.191	21.311	1.18
Aug	25.436	20.935	1.21
Sep	21.012	19.522	1.08
Oct	24.706	21.515	1.15
Nov	14.468	16.696	0.87
Dec	24.941	22.094	1.13

2016	A	B	QA/QC [0.83-1.34]
	Gross electricity generation MWh	Combusted biomass in power boiler BDt	Index MWh/BDt A/B
Jan	22.850	18.220	1.25
Feb	24.836	20.571	1.21
Mar	26.640	21.475	1.24
Apr	26.247	18.718	1.40
May	29.505	21.678	1.36
Jun	28.756	25.264	1.14
Jul	27.534	22.429	1.23
Aug	28.448	27.727	1.03
Sep	27.312	25.700	1.06
Oct	27.150	22.977	1.18
Nov	16.010	17.949	0.89
Dec	26.046	21.698	1.20

There were no months out of the QA/QC range. Is important to note that boiler electricity efficiency change when Power plant is carrying out a programmed stoppage (November for both years).

Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	Equipment SE-EI-0006/0007 measured total power quantity import to Viñales complex (Viñales sawmill and Power plant). To calculate power import to Power plant is important to consider the available power generation in Viñales complex. The following cases define the

	quantity of imported electricity to Power plant: 1.- Project electricity imports to Power plant are equal to zero when Available power generation is more or equal to Viñales sawmill energy process demand. When Viñales complex use imported power is necessary to calculate the quantity used in power plant: - Project electricity imports are more than zero when Available power generation is less than Viñales sawmill energy process demand, and is possible to determine as follows: Project electricity imports = Available power generation + Total power import - Electricity import to Viñales sawmill process from the grid Available power generation = Gross quantity electricity generated in power plant - export surplus energy to the grid – Internal Transmission losses before Grid injection.
Comments	--

Data / Parameter	ELPJ,aux,y
Data unit	(MWh)
Description	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y.
Source of data	On-site measurements.
Description of measurement methods and procedures to be applied	Parameter was measured using proper electric meters, calibrated and maintained according to manufacture specification and proper industry standards.
Frequency of monitoring/recording	Continuously and aggregated as appropriate, to calculate emission reductions.
Value monitored	2015: 39,472 (MWh) 2016: 40,858 (MWh)
Monitoring equipment	Viñales_1_6_Manejo_Desechos_Comb TAG: 669-EI-1603/1604 (1-6) Brand: Schneider Electric Model: Ion 7550 Serial number: LI-1010A261-02 Accuracy: +/- 0.2% Calibration frequency: 7 years Date of last calibration: 12/10/2010

	Validity: 11/10/2017 Viñales_1_7_CP_Caldera_Poder TAG: 669-EI-1703/1704 (1-7) Brand: Schneider Electric Model: Ion 7550 Serial number: LI-1010A263-02 Accuracy class: +/- 0.2% Calibration frequency: 7 years Date of last calibration: 12/10/2010 Validity: 11/10/2017 Viñales_1_8_CP_Caldera_Poder TAG: 669-EI_1803/1804 (1-8) Brand: Schneider Electric Model: Ion 7550 Serial number: LI-1010A264-02 Accuracy class: +/- 0.2% Calibration frequency: 7 years Date of last calibration: 12/10/2010 Validity: 11/10/2017 Viñales_1_9_CP_Caldera_Poder TAG: 669-EI-1903/1904 (1-9) Brand: Schneider Electric Model: Ion 7550 Serial number: LI-1010A262-02 Accuracy: +/- 0.2% Calibration frequency: 7 years Date of last calibration: 14/10/2010 Validity: 13/10/2017 Viñales_1_11_Barra_1B_Ed_Administración TAG: 669-EI-1703/1804 (1-11) Brand: Schneider Electric Model: Ion 7550 Serial number: LI-1010A265-02 Accuracy: +/- 0.2% Calibration frequency: 7 years Date of last calibration: 12/10/2010

	Validity: 11/10/2017
QA/QC procedures to be applied	1. - Monthly rate between receipts from electricity sales (if available) and the calculated displacement of the grid is within a range of ±2%.

2015	Sale Electricity invoice (A)		Gross quantity electricity generated	Total electricity import from the grid	Total electricity consumption Viñales complex	Calculated displacement of the grid (B)	QA/QC rate (A/B) [0.80-1]
	m³	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month
Jan	41636	16.123	23.858	18	3.137	20.577	0,88
Feb	42880	18.808	21.728	24	2.887	18.608	0,87
Mar	43234	18.615	24.421	25	3.195	21.251	0,88
Apr	43634	18.750	24.420	23	3.160	21.283	0,88
May	44096	17.342	23.007	36	3.142	19.900	0,87
Jun	45536	18.509	24.284	0	3.074	21.210	0,88
Jul	45842	19.354	25.191	12	3.142	22.052	0,88
Aug	45925	19.556	25.436	47	3.215	22.257	0,88
Sep	47704	15.870	21.012	4	2.953	18.054	0,85
Oct	48451	18.921	24.706	0	3.194	21.512	0,88
Nov	21225	11.135	14.468	353	2.114	13.324	0,84
Dec	25082	19.543	24.941	234	3.135	22.093	0,88

2016	Sale Electricity invoice (A)		Gross quantity electricity generated	Total electricity import from the grid	Total electricity consumption Viñales complex	Calculated displacement of the grid (B)	QA/QC rate (A/B) [0.80-1]
2015	m³	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month
Jan	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Feb	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]
Mar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Apr	[illegible]	[illegible]	[illegible]	[illegible]	3.177	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	20	3.400	[illegible]	[illegible]
Jun	[illegible]	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]
Jul	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aug	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]
Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oct		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nov		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dec		[illegible]	[illegible]	78	[illegible]	[illegible]	[illegible]

2. - Index between electricity generation divided by the quantity of combusted biomass in Power boiler results in a reasonable efficiency comparable to yearly statistic range:

2015	A	B	QA/QC [0.83-1.34]
	Gross electricity generation MWh	Combusted biomass in power boiler BDt	Index MWh/BDt A/B
Jan	23.858	20.719	1.15
Feb	21.728	19.024	1.14
Mar	24.421	19.093	1.28
Apr	24.420	21.723	1.12
May	23.007	19.369	1.19
Jun	24.284	18.460	1.32
Jul	25.191	21.311	1.18
Aug	25.436	20.935	1.21
Sep	21.012	19.522	1.08
Oct	24.706	21.515	1.15
Nov	14.468	16.696	0.87
Dec	24.941	22.094	1.13

2016	A Gross electricity generation MWh	B Combusted biomass in power boiler BDt	QA/QC [0.83-1.34] Index MWh BDt A B
Jan	22.850	18.220	1,25
Feb	24.926	20.571	1,21
Mar	26.640	21.475	1,24
Apr	26.247	18.718	1,40
May	29.505	21.678	1,36
Jun	28.756	25.264	1,14
Jul	27.524	22.429	1,23
Aug	28.449	27.727	1,03
Sep	27.212	25.700	1,06
Oct	27.150	22.877	1,19
Nov	16.010	17.948	0,89
Dec	26.046	21.699	1,20

Is important to note that boiler electricity efficiency change when Power plant is carrying out a programmed stoppage.

3. - Percentage difference between Measured energy displacement using dedicated equipment and calculated energy displacement according methodology must be equal or bigger than zero (i.e. Measured energy shall be mayor than calculated energy displacement).

2015	A Measured exported energy to grid MWh	B Measured energy saw mill consumption MWh	C Calculated energy displacement MWh	QA/QC ≥ 0 Difference % ((A+B)-C)/C
Jan	18.159.9	2.319	20.412.7	0.32%
Feb	16.534.0	2.183	18.632.1	0.46%
Mar	18.849.7	2.202	20.988.2	0.30%
Apr	18.803.4	2.263	20.999.7	0.32%
May	17.456.2	2.245	19.630.2	0.36%
Jun	18.646.8	2.378	20.956.2	0.33%
Jul	19.394.3	2.475	21.803.0	0.30%
Aug	19.711.3	2.355	21.999.7	0.30%
Sep	15.602.9	2.283	17.798.6	0.49%
Oct	18.977.4	2.351	21.257.9	0.33%
Nov	11.162.2	1.281	12.351.4	0.75%
Dec	19.588.7	2.133	21.670.6	0.24%

2016	A Measured exported energy to grid MWh	B Measured energy sawmill consumption MWh	C Calculated energy displacement MWh	QA/QC ≥ 0 Difference % ((A+B)-C)/C
Jan	17.905.7	1.849	19.699.3	0.28%
Feb	19.339.3	2.191	21.472.7	0.27%
Mar	20.863.8	2.336	23.152.3	0.20%
Apr	20.487.5	2.397	22.325.9	0.26%
May	23.464.0	2.443	25.364.5	0.17%
Jun	22.731.6	2.440	25.116.6	0.22%
Jul	21.672.7	2.390	23.398.9	0.27%
Aug	22.295.3	2.536	24.775.8	0.22%
Sep	21.487.5	2.387	23.313.9	0.26%
Oct	21.406.0	2.303	23.611.9	0.41%
Nov	12.611.3	1.863	13.310.1	5.53%
Dec	20.576.7	2.247	22.698.1	0.55%

As the process of the power plant is continuous, is not possible to

	execute the maintenance/calibration, for the majority of the instruments of the power plant, out of the general plant shutdown. One of the main tasks that are performed during the stoppage is the maintenance of the substation located in power plant site. This is a highly risky task that needs to de-energize certain plant's areas to accomplish. The aforementioned areas include the equipment that register the energy imports and exports from and to the grid. Is in this process where the most substantial difference between the Constitucion substation and the power plant equipment are presented, because the substation continuous measuring. Nevertheless, Calculated energy displacement is conservative comparing with measured and invoice energy displacement from the grid, because the measured energy displacement in Constitucion substation is bigger than the calculated energy displacement.
Purpose of the data	Calculation of baseline emissions.
Calculation method	According to current PD, page 94, the electricity consumption associated to pneumatic transportation system that carries the biomass from the sawmill and the remanufacturer plants from July to December was calculated as: 348.5 KW *(8,760 hr/yr*0.5) / (1,000 KWh/GWh) = 1.53 GWh/yr. This result is equal to 254 MWh/month that was added to the measured auxiliary electric power consumption for the monitored period.
Comments	--

Data / Parameter	$NCV_{BR,n,y}$
Data unit	(GJ/tonnes of dry matter)
Description	Net calorific value of biomass residue of category n in year y (GJ/tonne on dry-basis)
Source of data	On-site measurements
Description of measurement methods and procedures to be applied	Measurements were carried out by a reputed laboratory, according to international standards. NCV was measured on a dry-basis.
Frequency of monitoring/recording	At least every six months, taking at least three samples for each measurement.
Value monitored	(see table below)

	$NCV_{BR,n,y}$ (GJ/ton-dry matter) 2015	$NCV_{BR,n,y}$ (GJ/ton-dry matter) 2016
$BR_{PJ,1,y}$	18.80	18.69

	<table><tr><td>$BR_{PJ,3,y}$</td><td>19.06</td><td>18.72</td></tr><tr><td>$BR_{PJ,4,y}$</td><td>17.36</td><td>--</td></tr></table>
Monitoring equipment	Not applicable. Net calorific values were measured locally by third party laboratory.
QA/QC procedures to be applied	The consistency of this measurements was compared with values of others projects and relevant data source. This results are according to average value defined by IPCC guideline, 2006: 15.6 TJ/000ton with a range between 7.9 and 31.0 TJ/000ton. TJ/000ton is equivalent to GJ/BDt
Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	Not applicable.
Comments	--

Data / Parameter	Moisture content of the biomass residues
Data unit	%
Description	Moisture content of each biomass residues type k.
Source of data	On-site measurement.
Description of measurement methods and procedures to be applied	The biomass residue moisture content was monitored and registered by periodic samples from each biomass type burned in the power boiler. Humidity content was obtained evaporating the water of the samples and measuring the weight before and after the water has been evaporated. This process was carried out in dedicated equipment.
Frequency of monitoring/recording	Continuously. Daily samples of biomass residues from industrial and forest operations were taken for moisture content measurement.
Value monitored	<table><tr><th></th><th>Average Moisture content CP1 MP2-2015 (%)</th><th>Average Moisture content CP1 MP2-2016 (%)</th></tr><tr><td>$BR_{PJ,1,y}$</td><td>40.2%</td><td>40.3%</td></tr><tr><td>$BR_{PJ,3,y}$</td><td>49.4%</td><td>49.6%</td></tr></table>

	$BR_{PJ,4,y}$ | 19.9% | --
Monitoring equipment	Electronic moisture analyzer Sartorius MA150C Accuracy class: Class I/+/-0.001 gr. Serial number: 27008246 Calibration frequency: Once a year Date of last calibration: 02/10/2014-29/12/2015-26/10/2016 Validity: 25/10/2017 (estimated) Laboratory Oven MEMMERT UFE 600 Accuracy class: +/- 0.5% Serial number: G611.0831 Calibration frequency: 12 months Date of calibration: 28/08/2014-08/10/2015-26/10/2016 Validity: 27/10/2017 Laboratory Digital scale Sartorius TE1502S Accuracy class: Serial number: 27402265 Calibration frequency: 12 months Dates of calibration: 02/10/2014-29/12/2015-26/10/2016 Validity: 25/10/2017
QA/QC procedures to be applied	--
Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	Moisture content is determined using the following equation: Moisture content, biomass type I (%) = [(Sw-Sd)/Sw]*100 Where: Sw: Wet biomass residue type I sample weight. Sd: Bone-dry biomass residue type I weight.
Comments	--

Data / Parameter	P_y
Data unit	m^3/yr.
Description	Quantity of the main product of the production process produced in year y from plants operated at the project site.

Source of data	On-site measurements.
Description of measurement methods and procedures to be applied	--
Frequency of monitoring/recording	Annually, aggregated as appropriate.
Value monitored	Sawn timber: 2015: 334,067 m^3/yr. 2016: 363,764 m^3/yr. Processed wood: 2015: 84,722 m^3/yr. 2016: 91,160 m^3/yr.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	(see table below)
Purpose of the data	--
Calculation method	Not applicable.
Comments	Quantity of the main product of the production process is assessed by Viñales Sawmill and Remanufacture plant.

QA/QC procedures to be applied:

	Value applied in PD m^3/yr	Value obtained in 2015 m^3/yr	Value obtained in 2016 m^3/yr	Maximum potential production 2015-2016 m^3/yr
Sawn timber	352,686	334,067	363,764	422,400
Processed wood	88,203	84,722	91,140	96,000

Data / Parameter	LOC_y
Data unit	Hours.
Description	Length of the operational campaign in year y.
Source of data	On-site measurements.
Description of measurement methods and procedures to be	Records and sum the hours of operation of the project

applied	activity facilities during year y.
Frequency of monitoring/recording	Continuously.
Value monitored	2015: 410 [Hrs] 2016: 373 [Hrs]
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable.
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable.
Comments	--

Data and parameters monitored from the tool: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02)

Data / Parameter	$FC_{i,j,y}$
Data unit	ton/y or m^3/y
Description	Quantity of fuel type I combusted in process j during the year y.
Source of data	On-site measurements.
Description of measurement methods and procedures to be applied	On-site fossil fuel consumption will be calculated in this case.
Frequency of monitoring/recording	Continuously.
Value monitored	- Diesel consumption in the power boiler due to operational reasons: 2015: 90,346 (ton/y) 2016: 73,964 (ton/y) - LPG consumption in the power boiler due to operational reasons: 2015: 145 (l/y) 2016: 118 (l/y) - Diesel consumption due to on-site biomass transportation from the gate to the power boiler conveyor belts and front loaders: 2015: 50.74 (ton/y), 2016: 56.09 (ton/y) - Diesel consumption due to forestry biomass processing: 2015: 19.36 (ton/y), 2016: 0 (ton/y)
Monitoring equipment	663-FT-0508 Type: Fossil fuel flow transmitter. Endress+Hausser 83F40-AABSAAACBAAK Accuracy class: +/- 0.1% Serial number: D606EA16000 Calibration frequency: According to supplier recommendation, PP adopted a calibration frequency of 5 years. Dates of calibration: 02/11/2011-12/11/2015-10/11/2016 Validity: 09/11/2021 663-FT-0522 Type: Fossil fuel flow transmitter. Endress+Hausser 83F25-AABSAAACBAAK Accuracy class: +/- 0.1% Serial number: D606E916000 Calibration frequency: According to supplier recommendation, PP define 5 years.

	Dates of calibration: 02/08/2011-12/11/2015-10/11/2016 Validity: 09/11/2021
QA/QC procedures to be applied	Project Participant crosschecked the measurement with an annual energy balance that is based on purchased quantities and stock changes. The result for QA/QC in the current period, January to December 2015 and January to December 2016, were efficiencies of 71.11% and 71.57% respectively in the power boiler. According to provider information, power boiler efficiency could be between 66%-86%, then, yearly energy balance is in an acceptable range. Nevertheless, is important consider that the stoppages due to failures or programmed affects the results of the monthly energy balance.
Purpose of the data	Calculation of project emissions.
Calculation method	Fossil fuel consumption due to on-site biomass transportation: This could be the transportation of biomass residues from the conveyor belts and the consumption of the front loaders. The project participant obtained a specific diesel consumption for all the vehicles involved biomass transporting. The total amount of diesel consumed due to on-site biomass transportation was the sum of all the vehicles used for on-site biomass transportation.
Comments	--

Data / Parameter	$NCV_{i,y}$
Data unit	GJ/ton
Description	Weighted average net calorific value of fuel type i in year y.
Source of data	2006 IPCC guideline. Table 1.2, chapter 1 of vol.2.
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Any future revision of the IPCC guideline should be taken into account.
Value monitored	$NCV_{Diesel,y}$: 43.3 GJ/ton $NCV_{Fuel\ oil,y}$: 41.7 GJ/ton $NCV_{LPG,y}$: 52.20 GJ/ton

Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions.
Calculation method	Not applicable
Comments	--

Data / Parameter	$EF_{CO2,i}$
Data unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type I in year y.
Source of data	2006 IPCC guideline. Table 1.2, chapter 1 of vol.2.
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Any future revision of the IPCC guideline should be taken into account.
Value monitored	$EF_{CO2,diesel}$: 0.0748 tCO_2/GJ $EF_{CO2,Fuel\ oil}$: 0.0788 tCO_2/GJ $EF_{CO2,LPG}$: 0.0656 tCO_2/GJ
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions.
Calculation method	Not applicable
Comments	--

Data and parameters monitored from the tool: "Project and leakage emissions from road transportation of freight" (Version 01.1)

Data / Parameter	$D_{f,m}$
Data unit	Km
Description	Return trip road distance between the origin and destination of freight transportation activity f in monitoring period m.
Source of data	Records of vehicle operator and/or records by project

	participant.
Description of measurement methods and procedures to be applied	Determined once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources.
Frequency of monitoring/recording	Updated whenever the road distance or the source changes.

Value monitored

Suppliers	Source	Distance (km)
As. El Cruce	Cruce Empedrado	18.90
As. El Cruce	Cruce Empedrado	18.90
As. Mestre	constitución	1.98
As. Mestre	constitución	1.98
As. Mestre	constitución	1.98
As. Mestre	constitución	1.98
As. Viñales	constitución	0.68
As. Viñales	constitución	0.52
As. Viñales	constitución	0.00
Cmpc	constitución	13.70
Cn. Acopio Cent. Ast.	constitución	0.00
Cn. Santa Javiera		81.6
Com. Radiata del Maule	As. Herran Valdes	37.60
Com. Radiata del Maule	As. Herran Valdes	37.60
Com. Radiata del Maule	As. Herran Valdes	37.60
Com. Radiata del Maule	As. Opazo	3.89
Com. Radiata del Maule	As. Opazo	3.89
Com. Radiata del Maule	As. Eduardo Muñoz	10.30
Com. Radiata del Maule	As. Eduardo Muñoz	10.30
Com. Radiata del Maule	As. Eduardo Muñoz	10.30
Damian Fuentes		39.3
Damian Fuentes		39.3
Eduardo Muñoz		10.3
Eduardo Muñoz		10.3
Eduardo Muñoz		10.3
Forestal Arauco	Cn. Camur	10.2
Forestal Arauco	Cn. Camur	10.2
Forestal Arauco	Cn. Camur	10.2
Forestal Arauco	Cn. Cumbres del Maule	9.39
Forestal Arauco	Cn. Descortezado Canbar	0.8
Forestal Arauco	Cn. Espinoza	10.9
Forestal Arauco	Cn. Espinoza	10.9
Forestal Arauco	Cn. Jorge Duran	7.62
Forestal Arauco	Cn. Jorge Duran	7.62
Forestal Arauco	Cn. Mestre	1.98
Forestal Arauco	Cn. Planta Constitución	8.05
Forestal Arauco	Cn. San Ramon Nuñez	5.43
Forestal Arauco	Cn. San Ramon Nuñez	5.43
Forestal Arauco	Cn. Tilleria	7.66
Forestal Arauco	Cn. Tilleria	7.66
Forestal Arauco	Cn. Tilleria	7.66
Oc. Espinoza san Ramon	Oc. Espinoza san Ramon	10.9
Héctor Alarcón	Chanco	58.3
Héctor Alarcón	Chanco	58.3
Héctor Alarcón	Chanco	58.3
Luis Flores E.I.R.L.	constitución	9.38
Luis Flores E.I.R.L.	constitución	9.38
Luis Flores E.I.R.L.	constitución	9.38
Maderas Martin	constitución	2.83
Maderas Martin	constitución	2.83
Maderas Martin	constitución	2.83
Manuel Muñoz	constitución	20.9
Manuel Muñoz	constitución	20.9
Manuel Muñoz	constitución	20.9
Mauricio Muñoz	constitución	6.17
Mauricio Muñoz	constitución	6.17
Pta. Santa Javiera	San Javier	81.6
Pta. Santa Javiera	San Javier	81.6
Remanufactura	constitución	0.82
Remanufactura	constitución	0
Soc. Maderera E. Ltda.	Empedrado	36.9

Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions.
Calculation method	Not applicable
Comments	--

Data / Parameter	$FR_{f,m}$
Data unit	[ton]
Description	Total mass of freight transported in freight transportation activity f in monitoring period m.
Source of data	Records by project participant.
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Continuously.
Value monitored	2015: 271,759 wet ton 2016: 324,255 wet ton
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of project emissions.
Calculation method	Not applicable
Comments	--

Data and parameters monitored from the tool: "Tool to calculate the emission factor for an electricity system (Version 03.0)

Data / Parameter	$FC_{i,m,y}$, $FC_{i,k,y}$
Data unit	Mass or volume unit
Description	Amount of fuel type i consumed by power plant/unit m, k or n in year y
Source of data	CDEC-SIC public information.

Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Annually for the first crediting period.
Value monitored	See the grid emission factor calculation spread sheet.
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable
Comments	--

Data / Parameter	$NCV_{i,y}$
Data unit	GJ/mass or volume
Description	Net calorific value (energy content) of fossil fuel type i in year y.
Source of data	CNE (National Energy commission) yearly energy balance.
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Annually for the first crediting period.
Value monitored	$NCV_{Pet\ coke,2014}$: 27.8 (GJ/ton) $NCV_{Diesel,2014}$: 43.3 (GJ/ton) $NCV_{IFO\ 180,2014}$: 41.8 (GJ/ton) $NCV_{Natural\ Gas,2014}$: 35.2 (TJ/MMm3) $NCV_{Coal,2014}$: 27.8 (GJ/ton) $NCV_{Butane,2014}$: 45.6 (GJ/ton) $NCV_{Propane,2014}$: 45.6 (GJ/ton)
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable

Comments	In the National energy balance information was not specify if the Calorific values are net or gross. To be conservative, PP applied the guideline of IPCC 2006 (Volume 2, Chapter 1, page 1-16, section 1.4.1.2): "The difference between NCV and GCV is the latent heat of vaporization of the water produced during combustion of the fuel. As a consequence for coal and oil, the NCV is about 5 percent less than the GCV For most forms of natural and manufactured gas, the NCV is about 10 percent less."

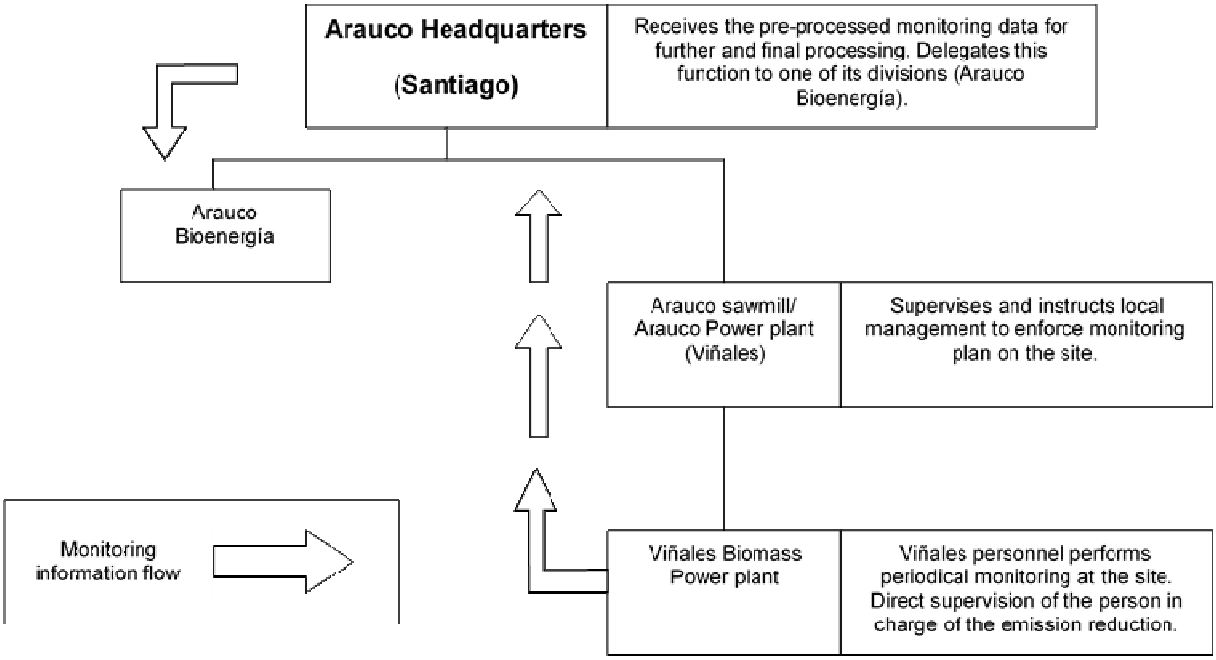
Data / Parameter	$EF_{CO2,i,y}$, $EF_{CO2,m,i,y}$
Data unit	[tCO_2/GJ]
Description	CO_2 emission factor of fossil fuel type i used in power unit m in year y.
Source of data	2006 IPCC guideline. Table 1.2, chapter 1 of vol.2.
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Annually for the first crediting period.
Value monitored	$EF_{CO2,Diesel,2014}$: 0.0726 (tCO_2/GJ) $EF_{CO2,IFO\ 180,2014}$: 0.0755 (tCO_2/GJ) $EF_{CO2,Natural\ Gas,2014}$: 0.0543 ($tCO_2$/GJ) $EF_{CO2,Coal,2014}$: 0.0928 (tCO_2/GJ) $EF_{CO2,Petcoke,2014}$: 0.0829 (tCO_2/GJ) $EF_{CO2,Butane,2014}$: 0.0616 (tCO_2/GJ) $EF_{CO2,Propane,2014}$: 0.0616 (tCO_2/GJ) $EF_{CO2,Natural\ Gas\ Liquid,2014}$: 0.0543 ($tCO_2$/GJ)
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable
Comments	--

Data / Parameter	$EG_{m,y}$, $EG_{k,y}$
Data unit	[MWh]
Description	Net electricity generated by power plant/unit m, k in year y.
Source of data	CDEC-SIC public information
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Annually for the first crediting period.
Value monitored	See the Appendix at the end of this Monitoring Report
Monitoring equipment	Not applicable.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable
Comments	--

3.3 Monitoring Plan

The monitoring plan designed for Project Viñales Power plant VCS, describes the periodic data procurement by the current design document and point 3.2 of this monitoring report. The objective of a monitoring plan is guarantee the quality and assurance control of the parameters, allowing the yearly calculation of the emission reductions associated to project Viñales.

Project participant had defined the steps to follow a correctly critical parameter monitoring plan in “Monitoreo variables críticas proyecto VCS Viñales.pdf”. Parameters are collected and supported in file “Viñales monit CP1MP2 Ver1 170426.xlsx” for the current monitoring period. Required parameters to assure and control the quality of the monitoring plan were reported monthly to Arauco’s headquarters in file RPG Viñales CP1 170411.xlsx as is indicated in the following diagram:



As is described in point 2.1, Arauco counts with on-site personnel in charge of gathering and registering all the required information described in the monitoring plan. Such duties are incorporated to the personnel's everyday activities to ensure continuity and high-quality standards. Using a Data Control System (DCS) electricity generated data is monitored continuously and automatically supported in their corresponding files daily or monthly frequency according monitoring plan definition. The information is partially processed and stored on-site, and is sent monthly to Arauco Bioenergía S.A. in Santiago for further and final processing. An internal verification is carried out every month to review the key performance indicators (KPI) and an annually internal verification to check the implementation level of the monitoring report.

A briefly description of the applied monitoring plan is described in the following table:

	Data / Parameter	Description	Responsible	Procurement source area	Monitoring frequency	Generating/Measuring method	Recording method
1	BF	Quantity of biomass residue of category n used in the project activity in year y	Power plant Engineer in charge	Biomass Procurement Area	Continuously	1.- Appropriate equipment installed 2.- Calculation method according PD	Monthly recording and aggregated. File: Recepción biomasa B_Carbono_mmmm_YYYY.xls
2	BF	Quantity of biomass residue of category n used in the project activity in year y for which the baseline scenario is B4:					
3	BF	Quantity of biomass residue of category n used in the project activity in year y for which the baseline scenario is B1: or B3:					
4	BF	Quantity of biomass residue of category n used in the project activity in year y for which the baseline scenario is B5:, B6:, B7: or B8:					Not applicable in current monitoring period
5	EF	CO_2 emission factor for fossil fuel type f in year y	Arauco Bioenergia	External and public source.	At least annually	Consulting public IPCC values	Anually recording. File: Viñales monit CP1MP1 yymmdd.xlsx
6	EF	CH_4 emission factor for the combustion of biomass residues in the project plant.					
7	EF_{CO2}	CO_2 emission factor of the most carbon intensive fossil fuel used in the country.				-	Since leakage is 0, parameter is not used.
8	$HC_{BL,y}$	Baseline process heat generation in year y.	Power plant Engineer in charge	Operation Area/DCS	Continuously and aggregated monthly	1.- Appropriate equipment installed 2.- Calculation method according PD	Monthly recording. File: Operaciones YYYY.xls
9	EL_{P}	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.	Power plant Engineer in charge	idem	Continuously	1.- Appropriate equipment installed	Monthly recording and aggregated. File: Operaciones YYYY
10	EL_{P}	Project electricity imports from the grid in year y.					
11	EL_{P}	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y.					
12	NCV_{BR}	Net calorific value of biomass residue of category n in year y.	Power plant Engineer in charge	External laboratory	Every six months, taking at least three samples for each measurement.	Samples and laboratory process applied by third party.	Measured according defined frequency. File: NCVYYYY.xls

	Data / Parameter	Description	Responsible	Procurement source area	Monitoring frequency	Generating/Measuring method	Recording method
13	Moisture content of the biomass residues	% water content in mass basis in wet biomass residues.	Power plant Engineer in charge	Internal Laboratory	Daily average by type of biomass. Mean value calculated at least annually	Samples and laboratory process applied by internal laboratory. Equipment involved described in point 3.2.	Daily recording and obtain a monthly average. File: Base de datos Contenido de Humedad PBV_mmmm_YY.xls
14	P_y	Quantity of the main product of the production process produced in year y from plants operated at the project site.	Power plant Engineer in charge	Production control/SAP	Annually	Products are registered using SAP system.	Monthly recorded. File: Producción Aserradero YYYY - Pter mmYY.xls
15	LCC_y	Lenght of the operational campaign in year y.	Power plant Engineer in charge	DCS System/Operation Area	Monthly and annually aggregated.	Information registered in Power Plant.	Daily registered and annually aggregated. File: Consumos mes de mmmm YYYY.xls
16	$FC_{i,j,y}$	Quantity of fuel type i combusted in process j during the year y.	Power plant Engineer in charge	Instrumentation Area/DCS	Continuously and monthly aggregated.		Daily recorded and monthly aggregated. File: Recepción biomasa B_Carbono_mmmm_YYYY - Operaciones YYYY.xls
17	$NCV_{i,y}$	Weighted average net calorific value of fuel type i in year y.	Power plant Engineer in charge	External and public source.	At least annually	Consulting public IPCC values	Anually recording. File: Viñales monit CP1MP1 yymmdd.xlsx
18	$EF_{CO2,i,y}$	Weighted average CO_2 emission factor of fuel type i in year y.					
19	$D_{f,m}$	Return trip road distance between the origin and destination of freight transportation activity f in monitoring period m.	Power plant Engineer in charge	Biomass Procurement Area	Continuously and annually aggregated.	Provider Geographical references according information in Biomass residues invoices from suppliers.	Monthly recorded an anually aggregated. File: Recepción biomasa B_Carbono_mmmm_YYYY.xls
20	$FR_{f,m}$	Total mass of freight transported in freight transportation activity f in monitoring period m.					
21	$FC_{i,m,y}$, $FC_{i,k,y}$	Amount of fossil fuel type i consumed by power plant/unit m and k in year y.	Arauco Bioenergia	External and public source.	Annually	Consulting third parties data base. Directly obtained by the CDEC-SIC Dispatch Center or	Anually recording and processing. File: Emission Factor SIC 2014 ACM0002 Ver12 ver1 Viñales.xlsx
22	$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y.					
23	$EG_{m,y}$, $EG_{k,y}$	Net electricity generated by power plant/unit m,k in year y.					
24	$EF_{CO2,m,i,y}$ $EF_{CO2,k,i,y}$	CO_2 emission factor of fossil fuel type y used in power unit m in year y.	Arauco Bioenergia	External and public source.	Anualy	Default values indicated in IPCC 2006 Guideline (Volume 2, Chapter 1, page 1-16).	Anually recording and processing. File: Emission Factor SIC 2014 ACM0002 Ver12 ver1 Viñales.xlsx

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

Please note the following:

1. - Differences in baseline and project emission calculations included in tables below are due to the fact that all calculations are done directly in excel spreadsheets with full decimals (no rounding), this implies a decimal precision that is not carried onto word formatted tables because decimals are shown truncated and rounded down. Exact values can be viewed directly in emission reduction calculation spreadsheet.

2. - In emission reduction calculation spreadsheet (Version 2), sheet "Summary" the final result of Baseline and Project activity emissions are truncated and rounded in a conservative way.

3. - Since the emission reduction calculation for the project activity was done monthly, in some cases year-averages were employed the calculations presented below.

4.1 Baseline Emissions

According to ACM0006 (Version 12.1.1), baseline emissions are calculated using equation 2 as follows:

$$BE_y = EL_{BL,GR,y} \cdot EF_{EG,GR,y} + \sum_f FF_{BL,HG,y,f} \cdot EF_{FF,y,f} + EL_{BL,FF/GR,y} \cdot min(EF_{EG,GR,y}, EF_{EG,FF,y}) + BE_{BR,y}$$

Where:

BE_y	Baseline emissions in year y (tCO_2).
$EL_{BL,GR,y}$	Baseline minimum electricity generation in the grid in year y (MWh).
$EF_{EG,GR,y}$	Grid emission factor in year y (tCO_2/MWh).
$FF_{BL,HG,y,f}$	Baseline fossil fuel demand for process heat in year y (GJ/yr).
$EF_{FF,y,f}$	CO_2 emission factor for fossil fuel type f in year y (tCO_2/GJ).
$EL_{BL,FF/GR,y}$	Baseline uncertain electricity generation in the grid or on-site in year y (MWh/yr).
$EF_{EG,FF,y}$	CO_2 emission factor for electricity generation with fossil fuels at the project site in the baseline in year y (tCO_2/MWh).
$BE_{BR,y}$	Baseline emissions due to disposal of biomass residues in year y (tCO_2e).
y	Year of the crediting period.
f	Fossil fuel type.

ACM0006 (Version 12.1.1) describe the algorithm used to determine the data above as following:

Determine biomass availability, generation and capacity constraints, efficiencies and power emission factors

1.1 Determine total baseline process heat generation

As is described in PD, page 52, the amount of process heat that would be generated in baseline during year y ($HC_{BL,y}$) was determined as the difference of the enthalpy of the process heat (steam) supplied to process heat loads in the project activity minus the enthalpy of the feed water, the boiler blow-down and any condensate return to heat generator.

The enthalpies were determined using an on-line tool[2] as a function of turbine condition design for temperature and pressure and monitored continuously to ensure that pressure and temperature stay in an acceptable range around these conditions.

1.2. Determine total baseline electricity generation

Using equation 3 (page 25) of ACM0006 (Version 12.1.1) the baseline electricity generation in the grid can be calculated as follows:

$$EL_{BL,y} = EL_{PJ,gross,y} + EL_{PJ,imp,y} - EL_{PJ,aux,y}$$

Data:

		2015	2016
(1) Gross quantity of electricity generated.	$EL_{PJ,gross,y}$	277,471 (MWh)	311,335 (MWh)
(2) Project electricity imports from the grid.	$EL_{PJ,imp,y}$	502 (MWh)	363 (MWh)
(3) Total auxiliary electricity consumption required for the operation of the power plant.	$EL_{PJ,aux,y}$	36,422 (MWh)	37,808 (MWh)
(4) Auxiliary electricity consumption due to pneumatic transportation system.		1,525 (MWh)	1,525 (MWh)

1.3 Determine the baseline capacity of electricity generation

As is defined in PD, page 53, the project activity baseline does not consider on-site power generation. All the power electricity would be generated in grid-connected power plants.

$$CAP_{EG,total,y} = 0$$

1.4. Determine the baseline availability of biomass residues

As is described in PD, page 53, the biomass type that was used for heat generation in Viñales sawmill during this monitoring period was sawdust and bark from industrial operations. Quantity of heat to process was measured by dedicated equipment described in pages 32 to 34 in the present document.

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

[2] http://www.peacesoftware.de/einigewerte/wasser_dampf_e.html (reference consulting date: February, 2016)

As described PD, page 54, and Validation report, page 17, only option 1: “Default values should be chosen” is applicable to the project. Nevertheless, as is indicated in validation report an efficiency of 100%, proposed by “Tool to determine the baseline of thermal or electric energy generation system” it would not result in the most conservative scenario. The lower the baseline heat generator efficiency, the lower would be the amount of biomass associated with power generation. Consequently, the lower recommended efficiency by Andritz and Metso for the project’s heat generator is 85%.1.6 Determine the emission factor of on-site electricity generation with fossil fuels

As describes current PD, page 54, there is no fossil fuel based power generation identified as part of the baseline scenario. Then:

$$EF_{EG,FF,y} = EF_{EG,GR,y}$$

1.7 Determination of the emission factor of the grid electricity generation

The parameter $EF_{EG,GR,y}$ should be determined as the combined margin CO_2 emission factor for the grid to which the project activity is connected in year y, calculated according to the “Tool to calculate the emission factor for an electricity system (Version 03.0.0)”.

- The relevant electricity system is the Central Interconnected System of Chile (SIC), the largest of the fourth transmission systems in Chile, accounting for about 75% of the power generation capacity of the country and supplying. SIC has no interconnection with any other transmission system in Chile or in the region.

- According current PD, step 2 is not applicable in this case

- According current PD, page 55, option b was chosen to calculate the Operating Margin (OM). In this case the OM emission factor is calculated using the simple/adjusted method. The Project Participant used ex-post data to calculate this parameter, that is, the coefficient was calculated in year in which the project generation occurs, in this case corresponds to years 2015 and 2016.

  The Project Participant used data from 2015 and 2016 to determine the lambda factor that expresses the percentage of the time when low-cost/must-run sources were on the margin:

$$\lambda_y = \lambda_{2015/2016} = 0.0000$$

  The rest of the parameters used to calculate the $EF_{EG,GR,y}$ for 2015 and 2016 were obtained from the CDEC-SIC dispatch centre (official and public information).

- The calculation of the $EF_{grid,OM\text{-}adj,y}$ is as follows:

  - CO_2 emission of non-low cost/must-run power sources:

$$\sum_{i,j} F_{i,j,2015} \,.\, COEF_{i,j} = 17{,}752{,}776\,(tCO_2/y)$$

$$\sum_{i,j} F_{i,j,2016} \, . \, COEF_{i,j} = 22{,}729{,}277 \; (tCO_2/y)$$

- The total power generation in the SIC by non-low-cost/must-run power sources:

$$\sum_{j} GEN_{j,2015} = 23{,}405{,}443 (Mwh/y)$$

$$\sum_{j} GEN_{j,2016} = 27{,}579{,}894 (Mwh/y)$$

- The CO_2 emissions of low-cost/must run power sources. Note that since in Chile low-cost/must run power sources include mostly hydro energy, the total emissions for this part of the equation are low:

$$\sum_{i,k} F_{i,k,2015} . COEF_{i,k} - 440{,}012 \; (tCO_2/y)$$

$$\sum_{i,k} F_{i,k,2016} . COEF_{i,k} = 509{,}760 \; (tCO_2/y)$$

- Total power generation in the SIC by low-cost/must-run resources:

$$\sum_{j} GEN_{j,2015} = 29{,}581{,}771 \; (Mwh/y)$$

$$\sum_{j} GEN_{j,2016} = 26{,}325{,}270 \; (Mwh/y)$$

Replacing the above values in the equation used to calculate the $EF_{electricity,y}$ for year 2015 and 2016, the operating margin results:

$$EF_{OM,2015} - (1 - 0.0000) . \frac{17{,}752{,}776}{23{,}405{,}443} (tCO_2/Mwh) + 0.0000 . \frac{440{,}012}{29{,}581{,}771} (tCO_2/Mwh)$$

$$EF_{OM,2015} = EF_{OM,simple\ adjusted,2015} = 0.758 (tCO_2/Mwh)$$

$$EF_{OM,2016} = (1 - 0.0000).\frac{22,759,277}{27,579,894}(tCO_2/Mwh) + 0.0000.\frac{509,760}{26,325,270}(tCO_2/Mwh)$$

$$EF_{OM,2016} = EF_{OM,simple\ adjusted,2016} = 0.824(tCO_2/Mwh)$$

- According to 2015 and 2016 SIC data, the group of plants that accounts for the largest generation in each year are the ones responsible for the 20% of the total generation in both years. These plants are considered to calculate the Build Margin for 2015 and 2016:

$$EF_{BM,2015} = 0.667(tCO_2/Mwh)$$

$$EF_{BM,2016} = 0.520(tCO_2/Mwh)$$

As in the previous case, the Build Margin calculation also considered official CDEC-SIC data and/or other official data publicly available.

- Having obtained the Operating Margin $EF_{grid,OM,y}$ and the Build Margin $EF_{grid,BM,y}$, and considering the default value of (0.5) for the weights W_{OM} and (0.5) for the W_{BM}, it is possible to calculate $EF_{grid,CM,y}$. The results obtained were the following:

Data:

		2015	**2016**
(1) Operating Margin (OM).	$EF_{grid,OM,y}$	0.758 (tCO_2/MWh)	0.824 (tCO_2/MWh)
(2) Build Margin (BM).	$EF_{grid,BM,y}$	0.667 (tCO_2/MWh)	0.520 (tCO_2/MWh)
(3) Weighting of Operating Margin.	W_{OM}	50%	50%
(4) Weighting of Build Margin.	W_{BM}	50%	50%

Calculations:

			2015	**2016**
(5) Combined Margin calculation (CM).	$EF_{grid,CM,y}$	(1)*(3)+(2)*(4)	0.713 (tCO_2/MWh)	0.672 (tCO_2/MWh)

Determine the minimum baseline electricity generation in the grid

Current PD, page 57, describes calculation of this parameter using equation 13 of ACM0006 (Version 12.1.1) methodology:

$$EL_{BL,GR,y} = max[0, EL_{BL,y} - CAP_{EG,total,y}]$$

Determine the baseline biomass-based heat and power generation

Determination of the baseline biomass-based heat generation and the baseline biomass-based cogeneration of process heat and electricity and heat extraction

The following diagram present biomass priority order during CP1MP2.

Biomass consumption in priority order during CP1MP2.

First column represent the total quantity of biomass combusted category n to obtain the total heat generated ($BR_{PJ,n,y}$). Second column represent the total quantity of biomass combusted according defined scenarios.

As is described in the current PD, page 58, (equation 14 in ACM0006 Ver12.1.1) was used to calculate the amount of heat generated with biomass residues.

$$HG_{BL,BR,y} = \sum_{h}\sum_{n}\left(BR_{B4,n,h,y} \cdot NCV_{BR,n,y} \cdot \eta_{BL,HG,BR,h}\right)$$

Data:

		2015	2016
(1) Biomass mix from internal industrial operations.	$BR_{PJ,1,y}$	102,472 (BDt/yr)	103,004 (BDt/y)
(2) Net calorific value (NCV) of biomass mix from internal industrial operations.	$NCV_{BR,1,y}$	18.80 (GJ/BDt)	18,69 (GJ/BDt)
(3) Biomass mix from external industrial operations	$BR_{PJ,3,y}$	133,229 (BDt/yr)	161,404 (BDt/yr)
(4) Net calorific value (NCV) of biomass mix from external industrial operations.	$NCV_{BR,3,y}$	19,06 (GJ/BDt)	18,72 (GJ/BDt)
(5) Biomass mix from forestry operations	$BR_{PJ,4,y}$	4,760 (BDt/y)	0 (BDt/y)
(6) Net calorific value (NCV) of biomass mix from forestry operations	$NCV_{BR,4,y}$	17.36 (GJ/BDt)	--
(7) Baseline biomass-based heat generation efficiency of heat generator	$\eta_{BL,HG,BR}$	85%	85%
(A) Total measured heat generated	[(1)*(2)+(3)*(4)+(5)*(6)]*(7)	**3,866,232 (GJ/y)**	**4,204,146 (GJ/y)**

		2015	2016
(B) Total heat to process		**581,617 (BDt/y)**	**499,845 (BDt/y)**
(8) Mix of biomass from internal industrial operations $BR_{PJ,1,y}$, heat generation.	(1)*(2)*(5)	581,617 (GJ/BDt)	499,845 (GY/BDt)
(9) Biomass mix from external industrial operations	(B)-(6)	0 (GJ/BDt)	0 (GJ/BDt)
(10) Biomass mix from forestry	(B)-(6)-(7)	0 (GJ/BDt)	0 (GJ/BDt)

operations			
(11) Mix of biomass from internal industrial operations, heat generation	$BR_{B4,1,y}$	36,403 (BDt/yr)	31,462 (BDt/yr)
(12) Biomass mix from external industrial operations, electricity generation	(A)-(B)	3,284,615 (GJ/y)	3,704,301 (GJ/y)
(13) Mix of biomass from internal industrial operations, electricity generation, attributable to project activity		66,070 (BDt/y)	71,542 (BDt/y)
(14) Mix of biomass from external industrial operations, electricity generation, attributable to project activity		133,229 (BDt/y)	161,404 (BDt/y)
(15) Biomass from forestry operations, electricity generation, attributable to project activity		17,360 (BDt/y)	--

Determination of the baseline demand for fossil fuels to meet the balance of process heat and corresponding electricity generation

Determination of the baseline fossil fuel based cogeneration of process heat and electricity and remaining process heat demand and baseline heat generation to meet the fossil-based cogeneration of heat and power and the heat to meet the balance of process heat

Both are not applicable, since there would be no fossil-fuel-based heat generators identified in baseline scenario (page 58 and 59, current PD). 100% of the heat demand by the saturated biomass boiler in baseline scenario.

Determination of the baseline emissions due to uncontrolled burning or decay of biomass residues

According ACM0006 Version 12.1.1, baseline emissions are determined separately for biomass residues categories for which scenarios B1 and B3 (aerobic decay or uncontrolled burning) apply, and for biomass residues categories for which scenario B2 (anaerobic decay) apply. According to current PD (page 59), the biomass residues that are used for heat and power generation due to the implementation of the project activity would be dumped or left to decay under mainly aerobic conditions (B1) or burnt in an uncontrolled manner without utilizing then for energy purposes (B3), PP proceed to equation (36) of methodology ACM0006 version 12.1.1, multiplying the quantity of biomass residues with the net calorific value and an appropriate emission factor, as follows:

$$BE_{BR,B1/B3,y} = GWP_{CH4} \cdot \sum_{n} BR_{B1/_{B3},n,y} \cdot NCV_{BR,n,y} \cdot EF_{BR,n,y}$$

		2015	2016
(16) CH_4 Global Warming Potential	GWP_{CH4}	25	25
(17) Adjusted CH_4 factor for uncontrolled burning, biomass from industrial operations.	$EF_{BR,3,y}$	874.2 (Kg CH_4/TJ)	874.2 (Kg CH_4/TJ)
(18) Total emissions	([(13)*[(17)*(16)*(2)]/1000]+[(14)*[(17)*(16)*	**77,689**	**89,529**

$BE_{BR,B1/B3,y}$	(3)/1000]+(12)*[(17)*(16)*(4)/1000])/1000	**(tCO_2e)**	**(tCO_2e)**

Calculate baseline emissions

According to equation 2 (page 22) of the ACM0006 version 12.1.1:

$$BE_y = EL_{BL,GR,y} \cdot EF_{EG,GR,y} + \sum_f FF_{BL,HG,y,f} \cdot EF_{FF,y,f} + EL_{BL,FF/GR,y} \cdot \min(EF_{EG,GR,y}, EF_{EG,FF,y}) + BE_{BR,y}$$

Since the baseline scenario is that the current practice continues, i.e. the biomass related to the project activity would be disposed and not utilized for electricity generation. The emission reductions then, result from the avoidance of biomass open-air burning and the electric power generated with fossil fuels. According to this, the baseline emissions for year y were calculated according to the following resumed formula (page 59, current PD).

		2015	2016
(1) Baseline minimum electricity generation in the grid in year y.	$EL_{BL,GR,y}$	238,500 (MWh)	270,840 (MWh)
(2) Grid emission factor in year y.	$EF_{EG,GR,y}$	0.713 (tCO_2/MWh)	0.672 (tCO_2/MWh)
(3) Baseline fossil fuel demand for process heat in year y.	$FF_{BL,HG,y,f}$	0 (GJ)	0 (GJ)
(4) CO_2 emission factor for fossil fuel type f in year y.	$EF_{FF,y,f}$	0.0748 (tCO_2/GJ)	0.0748 (tCO_2/GJ)
(5) Baseline uncertain electricity generation in the grid or on-site in year y.	$EL_{BL,FF/GR,y}$	0 (MWh)	0 (MWh)
(6) CO_2 emission factor for electricity generation with fossil fuels at the project site in the baseline in year y.	$EF_{EG,FF,y}$	0.713 (tCO_2/MWh)	0.672 (tCO_2/MWh)
(7) Baseline emissions due to disposal of biomass residues in year y	$BE_{BR,y}$	77,689 (tCO_2e)	89,529 (tCO_2e)

(8) Baseline emissions in year y	**(1)*(2)+(7)**	**247,642 (tCO_2e)**	**271,504 (tCO_2e)**

(*) Calculations are done directly in excel spreadsheets with full decimals (no rounding), this implies a decimal precision that is not carried onto word formatted tables because decimals are shown truncated and rounded down for Baseline emissions calculation. Exact values can be viewed directly in emission reduction calculation spreadsheet.

4.2 Project Emissions

The anthropogenic emissions by sources of GHGs of the project activity in year y (PEy) can be determined using equation 37 of the ACM0006 Version 12.1.1 as follows:

$$PE_y = PE_{FF,y} + PE_{GR1,y} + PE_{GR2,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y} + PE_{BG2,y} + PE_{BC,y}$$

Where:

PE_y Total project activity emissions (tCO_2eq/yr).
$PE_{FF,y}$ Project emissions due to fossil fuel consumption at the project site (tCO_2eq/yr).
$PE_{GR1,y}$ Project emissions due to electricity imports from the grid to the project site (tCO_2/yr).
$PE_{GR2,y}$ Emissions due to a reduction in electricity generation at the project site as compared to the

baseline scenario in year y (tCO_2/yr)
$PE_{TR,y}$ Project emissions due to transport of the biomass residues to the project plant (tCO_2/yr).
$PE_{BR,y}$ Project emissions from the combustion of biomass residues (tCO_2/yr).
$PE_{ww,y}$ Emissions from the production of biogas in year y (tCO_2e/yr)
$PE_{BG2,y}$ Emissions from the production of biogas in year y (tCO_2/yr)
$PE_{BC,y}$ Project emissions associated with the cultivation of land to produce biomass in year y (tCO_2e/yr)

According current PD (page 61) considering the particular circumstances of the present project activity, the following simplification apply in this case:

$PE_{GR2,y}= 0$ In this case, there would be no electricity generation in the baseline scenario.
$PE_{ww,y}= 0$ There are no anaerobic treatment of waste water generated from the treatment of biomass residues (if any).
$PE_{BG2,y}= 0$ The project activity does not imply the production of biogas
$PE_{BC,y}= 0$ The project activity does not contemplate the cultivation of land to produce biomass.

Then, equation 37 simplifies and reduces to the following:

$$PE_y = PE_{FF,y} + PE_{GR1,y} + PE_{TR,y} + PE_{BR,y}$$

1.- Determination of $PE_{FF,y}$

The project activity implies additional fossil fuel consumption due to:

- Operational reasons associated to additional biomass consumption (e.g. biomass too wet in winter, etc.).
- On-site additional biomass transportation.

According the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FF,y} = \sum_i FC_{i,j,y} \cdot COEF_{i,y}$$

Where:
$FC_{i,j,y}$ Quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr).
$COEF_{i,y}$ CO_2 emission factor for the fossil fuel of type i used in the power boiler (tCO_2/kg).

A) Fossil Fuel consumption in the power boiler

Data:

		2015	2016
(1) Diesel used in the power boiler due to operational reasons.	$FC_{diesel,poject\ plant,y}$	75.89 (t/y)	62.13 (t/y)
(2) Diesel net calorific value.	$NCV_{FF,diesel,y}$	43.30 (GJ/t)	43.30 (GJ/t)
(3) Diesel CO_2 emission factor.	$EF_{FF,y,diesel}$	0.0748 (tCO_2/GJ)	0.0748 (tCO_2/GJ)

		2015	2016
(4) LPG used in the power boiler due to operational reasons.	$FC_{LPG,poject\ plant,y}$	0.08 (t/y)	0.07 (t/y)
(5) LPG net calorific value.	$NCV_{FF,LPG,y}$	52.20 (GJ/t)	52.20 (GJ/t)
(6) LPG CO_2 emission factor.	$EF_{FF,y,LPG}$	0.0656 (tCO_2/GJ)	0.0656 (tCO_2/GJ)

Calculations:

		2015	2016
(7) Emissions due to fossil fuel consumption in the power boiler.	(1)*(2)*(3)+(4)*(5)*(6)	246 (tCO_2/y)	201 (tCO_2/y)

Fossil fuel consumption due to on-site transportation of biomass residues

Data:

		2015	2016
(1) Fossil fuel used for on-site biomass transportation due to the project activity.	$FC_{diesel,poject\ site,y}$	50.74 (t/y)	56.10 (t/y)
(2) Fossil fuel net calorific value.	$NCV_{FF,diesel,y}$	43.30 (GJ/t)	43.30 (GJ/t)
(3) Fossil fuel CO_2 emission factor.	$EF_{FF,y,diesel}$	0.0748 (tCO_2/GJ)	0.0748 (tCO_2/GJ)

Calculations:

		2015	2016
(1) Fossil fuel used for processing biomass from forestry operations.	$FC_{diesel,biomass\ processing,y}$	19.36 (t/y)	0 (t/y)
(2) Fossil fuel net calorific value.	$NCV_{FF,diesel,y}$	43.30 (GJ/t)	43.30
(3) Fossil fuel CO_2 emission factor.	$EF_{FF,y,diesel}$	0.0748 (tCO_2/GJ)	0.0748 (tCO_2/GJ)

Calculations:

		2015	2016
(4) Emissions due to fossil fuel consumption for processing forestry biomass residues.	(1)*(2)*(3)	63 (tCO_2/y)	0 (tCO_2/y)

Then, the Carbon dioxide emissions from on-site consumption of fossil fuel was:

		2015	2016
Emissions due to fossil fuel consumption in the power boiler.	$FC_{diesel,poject\ site,y}$	246 (tCO_2/y)	201 (tCO_2/y)
Emissions due to fossil fuel consumption for on-site transportation	$FC_{diesel,poject\ site,y}$	164 (tCO_2/y)	182 (tCO_2/y)
Emissions due to fossil fuel consumption for processing forestry biomass residues.	$FC_{diesel,biomass\ processing,y}$	63 (tCO_2/y)	0 (tCO_2/y)
Total emissions.	$PE_{FF,y}$	**473 (tCO_2/y)**	**383 (tCO_2/y)**

2.- Determination of $PE_{GR1,y}$

If electricity is imported from the grid to the project site during year y, corresponding emissions should be accounted for as project emissions, as follows:

$$PE_{GR1,y} = EF_{EG,GR,y} \cdot EL_{PJ,imp,y}$$

Data:

		2015	2016
(1) Project electricity imports from the grid.	$EL_{PJ,imp,y}$	502 (MWh)	363 (MWh)
(2) Grid emission factor.	$EF_{EG,GR,y}$	0.713 (tCO_2/MWh)	0.672 (tCO_2/MWh)

Calculations:

			2015	2016
Total emissions.	**(1)*(2)**	**$PE_{GR1,y}$**	**358 (tCO_2/y)**	**244 (tCO_2/y)**

3.- Determination of $PE_{TR,y}$

Emission were determined using latest version of the tool "Project and leackage emissions from road transportation of freight".

Data:

		2015	2016
(1) Total mass of freight transported in freight transportation activity f.	$FR_{f,m}$	271,759 (ton/y)	324,255 (ton/y)
(2) Weight average calculation.	$\Sigma[D_{f,m}*FR_{f,m}]$	8,816,929	10,936,033
(3) Default CO_2 emission factor for freight transportation activity f.	EF_{CO2}	129	129

Calculations:

			2015	2016
Total emissions.	$[(2)*(3)]/10^6$	$PE_{TR,y}$	1,137 (tCO_2/y)	1,411 (tCO_2/y)

4.3 Leakage

As project activity includes emissions due to uncontrolled burning or decay of biomass residues in baseline calculation, then PP shall include emissions from the combustion of biomass residues that are calculated as follows (equation 40, ACM0006 version 12.1.1, page 49):

4.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)*	Project emissions or removals (tCO_2e)**	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2015 (01/01/2015-31/12/2015)	247,642	5,854	0	241,788
2016 (01/01/2016-31/12/2016)	271,504	6,515	0	264,988
Total	519,145	12,370	0	506,775

As a conservative manner:

*Baseline emissions calculation in table above may present some minor imprecision with tables in section 4.3 due to some decimal conservative rounding-down.

**Project emissions calculations in table above may present some minor imprecision with tables in section 4.3 due to some decimal conservative rounding-up.

Remarks on difference from estimated emissions reduction in current PD

The emission reductions for the present monitoring period were 506,775 VCU's. This amount is 7% lower than the double of the emission reductions estimated in registered PD (258,093 VCU's for both years 2015 and 2016. 516,186 VCU's estimated from January, 2015 to December, 2016). This last difference could be explained by the following reasons:

1.-Combined margin used in the monitoring period emissions reduction calculation:

		PD Values	MR ver3	
		2014	Jan-Dec 2015	Jan-Dec 2016
Combined Margin for the CDM activity	(tCO_2/GWh)	667.84	712.59	671.89
			3.6%	-2.3%

In current monitoring period, the Combined margin (CM_{2015} and CM_{2016}) differs from the one used in the PD's estimation by 3.6% and -2.3%. While CM in PD was calculated with public data reported during 2011, CM used in last MR was calculated using 2015 and 2016 public data, according to monitoring plan requirements.

2.-Biomass and fossil fuels data:

		PD Values	MR ver3	
		2014	Jan-Dec 2015	Jan-Dec 2016
Internal biomass from industrial operations				
Net calorific value	(TJ / 000 ton)	18.50	18.80	18.69
Average moisture content of biomass	(% wet basis)	50.0%	40.2%	40.3%
Third party biomass from industrial operations				
Net calorific value	(TJ / 000 ton)	18.50	19.06	18.72
Average moisture content of biomass	(% wet basis)	50.0%	49.4%	49.6%
Third party biomass from forestry operations				
Net calorific value	(TJ / 000 ton)	18.50	17.36	
Average moisture content of biomass	(% wet basis)	50.0%	19.9%	
CH_4 conversion factor (CH_4/C)	(number)	1.3	1.3	1.3
CH_4 Global Warming Potential	(number)	21.0	25.0	25.0
Methane emission factor for controlled biomass burning				
CH_4 emission factor (1)	(Kg/TJ)	30.00	30.00	30.00
Conservativeness factor (3)	(number)	1.37	1.37	1.37
Adjusted CH_4 emission factor	(Kg/TJ)	41.10	41.10	41.10
Controlled burning factor, biomass from internal industrial operations	**(tCO_2eq/ 000 ton)**	**15.97**	**19.31**	**19.20**
Controlled burning factor, biomass from extrenal industrial operations	**(tCO_2eq/ 000 ton)**	**15.97**	**19.59**	**19.23**
Controlled burning factor, biomass from forestry operations	**(tCO_2eq/ 000 ton)**	**15.97**	**17.84**	
Methane emission factors for uncontrolled biomass burning				
Third party biomass from industrial operations				
CH_4 factor for biomass uncontrolled burning (2)	(Kg/TJ)	930.0	930.0	930.0
Conservativeness factor (4)	(%)	0.94	0.94	0.94
Adjusted CH_4 default factor	(Kg/TJ)	874.2	874.2	874.2
Uncontrolled burning factor, biomass from internal industrial operations	**(tCO_2eq/ 000 ton)**	**339.6**	**410.8**	**408.5**
Uncontrolled burning factor, biomass from external industrial operations	**(tCO_2eq/ 000 ton)**	**339.6**	**416.6**	**409.0**
Third party biomass from forestry operations				
CH_4 factor for biomass uncontrolled burning (2)	(Kg/TJ)	114.0	114.0	114.0
Conservativeness factor (4)	(%)	0.89	0.89	0.89
Adjusted CH_4 default factor	(Kg/TJ)	101.5	101.5	101.5
Uncontrolled burning factor, biomass from forestry operations	**(tCO_2eq/ 000 ton)**	**39.4**	**44.0**	**0.0**

Fossil fuel data

Diesel		PD Values 2014	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Net calorific value	(GJ / ton)	43.30	43.30	43.30
Emission factor	(tCO_2 / GJ)	0.07480	0.07480	0.07480
Fuel density	(Kg/lt)	0.97	0.84	0.84
CO2 Conversion factor	**(tCO_2eq/ 000 ton)**	**3,239**	**3,239**	**3,239**

Fuel oil		2014	Jul-Dec 2014	Jul-Dec 2014
Net calorific value	(GJ / ton)	41.70		
Emission factor	(tCO_2 / GJ)	0.07880		
Fuel density	(Kg/lt)	0.93		
CO2 Conversion factor	**(tCO_2eq/ 000 ton)**	**3,286**		

LPG		2014	Jul-Dec 2014	Jul-Dec 2014
Net calorific value	(GJ / ton)		52.20	52.20
Emission factor	(tCO_2 / GJ)		0.06563	0.06563
Fuel density	(Kg/lt)		0.51	0.51
CO2 Conversion factor	**(tCO_2eq/ 000 ton)**		**3,426**	**3,426**

Meaning difference of the fossil fuel data during monitoring period 2015 and 2016 are:

- GWP value was updated according IPCC´s Fourth Assessment Report that sets CH_4 global warming potential at 25.
- Moisture content values of the different types of biomass differs from the values estimated during validation process.
- Controlled burning emission factor for forestry operations biomass was not required during 2016, because this year didn't use this type of biomass.
- Fossil fuel used to star the ignition in the power boiler was LPG, not Fuel oil, which was the option during validation process. Values for net calorific value and fuel density were taken from national information supplied by fossil fuels providers.

3.-Baseline operational parameters:

Biomass consumption data		PD Values	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Power boiler efficiency (*)	(%)	85.0%	85.0%	85.0%
Total biomass consumption in the cogeneration plant	**(BDt/yr)**	**312,755**	**240,461**	**264,408**
Own biomass from industrial operations	(BDt/yr)	149,203	102,472	103,004
Third party biomass from industrial operations	(BDt/yr)	128,052	133,229	161,404
Biomass from forestry operations	(BDt/yr)	35,500	4,760	0
Biomass attributable to the baseline scenario (heat generation)	(BDt/yr)	65,417	36,403	31,462
			-44%	-52%
Biomass attributable to the CDM project activity (electricity generation)	(BDt/yr)	247,338	199,317	232,946
Own biomass from industrial operations	(BDt/yr)	83,786	66,070	71,542
Third party biomass from industrial operations	(BDt/yr)	128,052	133,229	161,404
Biomass from forestry operations	(BDt/yr)	35,500	17	0
Total biomass consumption in the cogeneration plant	**(BDt/yr)**	**312,755**	**235,720**	**264,408**

During 2015 and part of 2016, Viñales power plant restricted the electricity generation due to constraint in the transmission line, then, Viñales Power plant needed less quantity of combustible biomass to satisfy the energy requirements. In this way, Viñales power plant did not need to use biomass residues from forestry operations. This type of biomass is the last option to use in the power boiler due to its cost (gathering, transportation and conditioning). The energy generated in the power boiler for heat and electricity was obtained from internal and external biomass from industrial operations.

Fossil fuel consumption data		PD Values 2014	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Off-site fossil fuel consumption:				
Off-site biomass transportation				
Average distance between supplying mills and Power Plant	(km)	120	120	120
Specific CO2 emission factor of freight (heavy trucks default factor)	(gCO_2/t km)	129	129	129
On-site fossil fuel consumption:				
Fossil fuel consumption in the project plant:				
Total diesel due to operational reasons	(ton/yr)	50	75.89	62.13
Total LPG due to operational reasons	(ton/yr)		0.08	0.07
Total diesel used to increase power output	(ton/yr)	0	0	0
Fossil fuel consumption for aux. equipment and systems related to gen of H&P				
Diesel consumption for on-site biomass transportation	(lt/yr)	85,198	60,409	66,783

The difference between the estimated quantity of on-site fossil-fuel consumption and the consumption during the monitoring period is not significant in the final result.

As was mentioned before the electricity generation during the monitoring period was restricted due to constraint in the transmission line. That condition result in a difference of 15% and 9% below the estimated baseline emissions due to the electricity displacement from the grid.

Grid emission savings

		PD Values	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Baseline electricity generation	(MWh/y)	291.180	238.500	270.840
Baseline emissions due to minimum grid electricity displacement	(tCO_2/yr)	200.285	169.953	181.974
Baseline emissions due to fossil fuel demand for process heat generation in year y	(tCO_2/yr)	0	0	0
Baseline emissions due to uncertain electricity generation in the grid in year y	(tCO_2/yr)	0	0	0
Total emissions	**(tCO_2/yr)**	**200,285**	**169,953**	**181,974**
			-15%	-9%

Emissions from biomass uncontrolled burning

			MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Own biomass from industrial operations	(BDt/yr)	83.786	66.070	71.542
Third party biomass from industrial operations	(BDt/yr)	128.052	133.229	161.404
Biomass from forestry operations	(BDt/yr)	35.500	17	0
Total emissions	**(tCO_2eq/yr)**	**73,345**	**77,689**	**89,529**
			6%	22%

4.-<u>Project operational parameters</u>:

Emissions from fossil fuel consumption at the project site

		PD Values	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Diesel consumption	(ton/yr)	133	126.63	118.23
LPG consumption	(ton/yr)		0.08	0.07
Total emissions	**(tCO_2/yr)**	**430**	**473**	**383**
			10%	-11%

Emissions due to grid electricity imports to the project site

			MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Grid electricity import to the Viñales site	(GWh/yr)	1.5	0.5	0.4
Total emissions	**(tCO_2/yr)**	**1,032**	**358**	**244**
			-65%	-76%

Note: This estimate is consistent with 4% of downtime of the biomass power plant.

During the monitoring period, a lower grid electricity import was measured and registered due to more efficient maintenance stoppages during November 2015 and 2016. Usually, maintenance stoppage is not longer than 10 days.

Emissions from biomass transportation to the Power Plant

		PD Values 2014	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Third party biomass from industrial operations	(BDt/yr)	128,052		
Biomass from forestry operations	(BDt/yr)	35,500		
Total biomass transported to the power plant	(BDt/yr)	163,552	271,759	324,255
Biomass attributable to the project activity	(BDt/yr)	247,338	199,317	232,946
Biomass transported to the plant and attributed to the project activity	(BDt/yr)	163,552		
Average return trip distance from origin to destination	(km)	240	32	34
Biomass supply from 3rd parties (wet)	(t/yr)	327,104		
Total emissions	**(tCO_2/yr)**	**10,127**	**1,137**	**1,411**
			-89%	-86%

For calculation of the emissions due to biomass transportation to the power plant in the monitoring period, was used Tool 12 "Methodological tool: Project and leakage emissions from transportation of freight" against an estimation using an average suppliers distance and an average quantity of the wet biomass supply from 3rd parties. Comparing the result between them, is important to note that estimation in PD considered an average distance of 240 km from suppliers to plant. The measured weight average distance during the monitoring period was 31.6 and 33.7 km respectively and implicate less emissions than the estimated.

Emissions from the combustion of biomass residues

		PD Values 2014	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Own biomass from industrial operations	(BDt/yr)	83,786	66,070	71,542
Third party biomass from industrial operations	(BDt/yr)	128,052	133,229	161,404
Biomass from forestry operations	(BDt/yr)	35,500	17	0
Total emissions	**(tCO_2eq/yr)**	**3,949**	**3,886**	**4,478**

The emissions from the combustion of biomass residues is less than the estimated emissions in PD, due to the minor quantity of biomass residues burned in the power boiler. As was explained before, that condition result from the constraint in the transmission line and the consequential reduction in the electricity generation.

5.-Net emissions of the project activity:

BASELINE EMISSIONS

		PD Values	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Grid emission savings	(tCO_2/yr)	200,285	169,953	181,974
CH_4 emissions savings	(tCO_2eq/yr)	73,345	77,689	89,529
TOTAL BASELINE EMISSIONS	**(tCO_2eq/yr)**	**273,631**	**247,642**	**271,504**
			-9%	-1%

PROJECT EMISSIONS

		PD Values	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Emissions from fossil fuel consumption at the project site	(tCO_2/yr)	430	473	383
Emission due to grid electricity imports to the project site	(tCO_2/yr)	1,032	358	244
Emissions from biomass transportation to the Power Plant	(tCO_2/yr)	10,127	1,137	1,411
Emissions from the combustion of biomass residues	(tCO_2eq/yr)	3,949	3,886	4,478
TOTAL PROJECT EMISSIONS	**(tCO_2eq/yr)**	**15,538**	**5,854**	**6,515**
			-62%	-58%

NET EMISSIONS OF THE PROJECT ACTIVITY

		PD Values	MR ver3 Jan-Dec 2015	MR ver3 Jan-Dec 2016
Total baseline emissions	(tCO_2eq/yr)	273,631	247,642	271,504
Total project emissions	(tCO_2eq/yr)	15,538	5,854	6,515
NET EMISSION SAVINGS	**(tCO_2eq/yr)**	**258,093**	**241,788**	**264,988**
			-6%	3%

The difference between the estimated quantity emission reduction in PD and the calculated emission reduction presented in this monitoring report result in 6% under and 3% above the yearly expected emissions reduction. The meaningful reasons are:

- Baseline emissions: Lower baseline electricity generation during the current monitoring period due to constraint in the transmission line during 2015 and part of 2016.
- Project emissions: Difference between the estimated supplying distance in PD and the measured average distance during the present monitoring period result in decreasing emission related to biomass transportation.
- Baseline and project emissions: The GWP derived from the IPCC´s Second Assessment Report sets the GWP of CH_4 at 21, which is used by this project activity was updated during the current monitoring period in accordance with the VCS program releases in June 2017, which sets the GWP derived from the IPCC´s Fourth Assessment Report that sets the CH_4 GWP at 25.

APPENDIX A: MONITORING PLAN, CRITICAL EQUIPMENT

	Name	Parameter	TAG - PTV	Manufacturer	Model	Serial number	Span	Accuracy	Calibration Frequency	Monitoring period calibration	Validity
1	Power Boiler pressure gauge transmitter High pressure line	$HC_{BL,y}$	663-PT-0155	ENDRESS + HAUSER	Cerabar S // PMP75-ACC1WB1UBGAU	D500C90109 C	0 - 120 Bar	±0.075%	18 months	17.11.2014 14.11.2015 10.11.2016	09.05.2018
2	Power boiler Flow transmitter High pressure line	$HC_{BL,y}$	663-FT-0156	ENDRESS + HAUSER	Cerabar S // PMP75-ACC7FB1DAVUDA63M-AB2BBD	D501F50109D	0 – 200 inch H_2O	±0.075%	18 months	18.11.2014 13.11.2015 10.11.2016	09.05.2018
3	Temperature transmitter High pressure line	$HC_{BL,y}$	663-TT-0157	ENDRESS + HAUSER	TH53-8A23E2E2B31AK	266161	0-600°C	±0.75%	2 years	13.11.2015 10.11.2016	09.11.2018
4	Pressure gauge transmitter High pressure line	$HC_{BL,y}$	665-PT-9040-A/B	ROSEMOUNT	2051TG4A2B21AB 4Q4	32601(A)-32602(B)	0 – 140 bar (G)	±0.05% of span	18 months	19.11.2014 14.11.2015 08.11.2016	07.05.2018
5	Flow transmitter high pressure line	$HC_{BL,y}$	665-FT-9030	ROSEMOUNT	2051CD2F02A1A55Q4	33712	(0 a 200) inH2O	±0.05% of span	18 months	19.11.2014 14.11.2015 08.11.2016	07.05.2018
6	Temperature transmitter High pressure line	$HC_{BL,y}$	665-TT-9043-A-B	ROSEMOUNT	644HANAJ6Q4	0271902(A)-0219846(B)	0-650 ºC	±0.03% of span	2 years	19.11.2014 14.11.2015 08.11.2016	07.11.2018
7	Pressure gauge transmitter Medium pressure line	$HC_{BL,y}$	665-PT-9001-A-B	ROSEMOUNT	2051TG3F2B21AB4Q4	32561(A)- 32562(B)	(0 a 18) Bar	±0.05% of span	18 months	19.11.2014 14.11.2015 08.11.2016	07.05.2018
8	Flow transmitter Medium pressure line	$HC_{BL,y}$	665-FT-9025	ROSEMOUNT	2051CD2F02A1AS5Q4 - 0305RC32B11B4	33711	0-45,564 inch H_2O	±0.05% of span	18 months	19.11.2014 13.11.2015 12.11.2016	11.05.2018
9	Flow transmitter Medium pressure line	$HC_{BL,y}$	665-FT-9051	ROSEMOUNT	2051CD2F02A1AS5Q4 - 0305RC32B11B4	107763	0 – 40 ton/h	±0.05% of span	18 months	19.11.2014 14.11.2015 11.11.2016	18.05.2016
10	Temperature transmitter Medium pressure line	$HC_{BL,y}$	665-TT-9026	ROSEMOUNT	644HFNAJ6Q4	0271897	0-450 ºC	±0.03% of span	2 years	08.11.2016	07.11.2018
11	Pressure gauge transmitter Low pressure line	$HC_{BL,y}$	665-PIC-9002-A-B-C	ROSEMOUNT	2051TG2A2B21AB4Q4	32598(A)-32599(B)- 32600(C)	0 – 10 bar (G)	±0.05% of span	18 months	19.11.2014 14.11.2015 09.11.2016	08.05.2018
12	Steam flow transmitter Low pressure line	$HC_{BL,y}$	665-FT-9019	ROSEMOUNT	2051CD2F02A1AS5Q4	33709 0033709	0 – 30 ton/h	±0.05% of span	18 months	19.11.2014 13.11.2015 12.11.2016	11.05.2018
13	Deaerator steam flow transmitter Low pressure line	$HC_{BL,y}$	665-FT-9023	ROSEMOUNT	2051CD2F02A1AS5Q4 - 0305RC32B11B4	33710	0 – 19,982 inch H_2O	±0.05% of span	18 months	19.11.2014 17.11.2015 11.11.2016	10.05.2018
14	Temperature transmitter Medium pressure line	$HC_{BL,y}$	665-TT-9024	ROSEMOUNT	644HFNAJ6Q4	0271896	0-450 ºC	±0.03% of span	2 years	08.11.2016	07.11.2018
15	Feed water conditions pressure transmitter	$HC_{BL,y}$	663-PT-0106	ENDRESS + HAUSER	PMD75-ARC1WB1UBGAU	D500BE0109C	0 – 120 bar (G)	±0.075%	18 months	24.11.2014 16.11.2015 10.11.2016	09.05.2018
16	Feed water conditions temperature transmitter	$HC_{BL,y}$	663-TT-0111	ROSEMOUNT	644HFNAJ6Q4	265913	0-200 ºC	±0.03% of span	2 years	13.11.2015 09.11.2016	08.11.2018
17	Energy meter Gross power generation	$EL_{PJ,gross,y}$	8600-10	SCHNEIDER ELECTRIC	ION 8600	LT-1012A701-01	kWh-kVARH Entregada	± 0.2%	7 years	24.12.2010	23.12.2017
18	Energy meter Import power generation	$EL_{PJ,imp,y}$	SE-EI-0006/0007 (52-B1)	SCHNEIDER ELECTRIC	ION 8600	PT-1012A934-01	kWH-kVARH Recibida	± 0.2%	7 years	06.06.2011	05.06.2018
19	Energy meter Import power generation	$EL_{PJ,imp,y}$	8600-2_3	SCHNEIDER ELECTRIC	ION 8600	MT-1010A242-01	kWH-kVARH Recibida	± 0.2%	7 years	09.10.2010	08.10.2017
20	Energy meter (1-6)	$EL_{PJ,aux,y}$	669-EI-1603/1604 (1-6)	SCHNEIDER ELECTRIC	ION 7550	LI-1010A261-02	kWh-kVARH Entregada	± 0.2%	7 years	12.10.2010	11.10.2017
21	Energy meter (1-7)	$EL_{PJ,aux,y}$	669-EI-1703/1704 (1-7)	SCHNEIDER ELECTRIC	ION 7550	LI-1010A263-02	kWh-kVARH Entregada	± 0.2%	7 years	12.10.2010	11.10.2017
22	Energy meter (1-8)	$EL_{PJ,aux,y}$	669-EI-1803/1804 (1-8)	SCHNEIDER ELECTRIC	ION 7550	LI-1010A264-02	kWh-kVARH Entregada	± 0.2%	7 years	12.10.2010	11.10.2017
23	Energy meter (1-9)	$EL_{PJ,aux,y}$	669-EI-1903/1904 (1-9)	SCHNEIDER ELECTRIC	ION 7550	LI-1010A262-02	kWh-kVARH Entregada	± 0.2%	7 years	14.10.2010	13.10.2017
24	Energy meter (1-11)	$EL_{PJ,aux,y}$	669-EI-1703/1804 (1-11)	SCHNEIDER ELECTRIC	ION 7550	LI-1010A265-02	kWh-kVARH Entregada	± 0.2%	7 years	12.10.2010	11.10.2017
25	Weighbridge gate 1	$BR_{PJ,n,y}$	611-49-001	PESAMATIC (GSE)	Sistema de Pesaje dinámico (460)	v4.0.0 (162069)	0-30.000 Kgs.	Class III	6 months*	25.10.2014 17.01.2015 20.04.2015 18.07.2015 02.11.2015 23.01.2016 16.04.2016	17.02.2017
26	Digital weight meter	Moisture content	-	Sartorius	TE1502S	27402265	0 - 1500 gr		12 months	02.10.2014 29.12.2015 26.10.2016	25.10.2017
27	Oven	Moisture content	-	MEMMERT	UFE 600	G611.0831	30 - 250°C	±0.5 °C	12 months	28.08.2014 08.10.2015 26.10.2016	25.10.2017
28	Electronic moisture analyser	Moisture content	-	Sartorius	MA 150C	27008246	40 - 180°C 0-150 gr	±0.05%	12 months	02.10.2014 29.12.2015 26.10.2016	01.10.2015
29	Fossil fuel Flow transmitter	$FC_{i,j,y}$	663-FT-0508	ENDRESS + HAUSER	83F40-AABSAAACBAAK	D606EA16000	0-70 Ton/Hr	±0.1%	5 years	02.11.2011 12.11.2015 10.11.2016	09.11.2021
30	Fossil fuel Flow transmitter	$FC_{i,j,y}$	663-FT-0522	ENDRESS + HAUSER	33F25-AABSAAACBAAK	D606E916000	0-70 Ton/Hr	±0.5%	5 years	02.08.2011 12.11.2015 10.11.2016	09.11.2021