MONITORING REPORT

VIÑALES BIOMASS POWER PLANT

Document Prepared By Arauco Bioenergia S.A.

Project Title	Viñales biomass power plant
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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[1]) 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

Total net emission reductions claimed in the 1st monitoring period (from July 1st 2014 to December 31th 2014) are 66,099 tCO_2e.

The Project Participant, has implemented monitoring procedures according to 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

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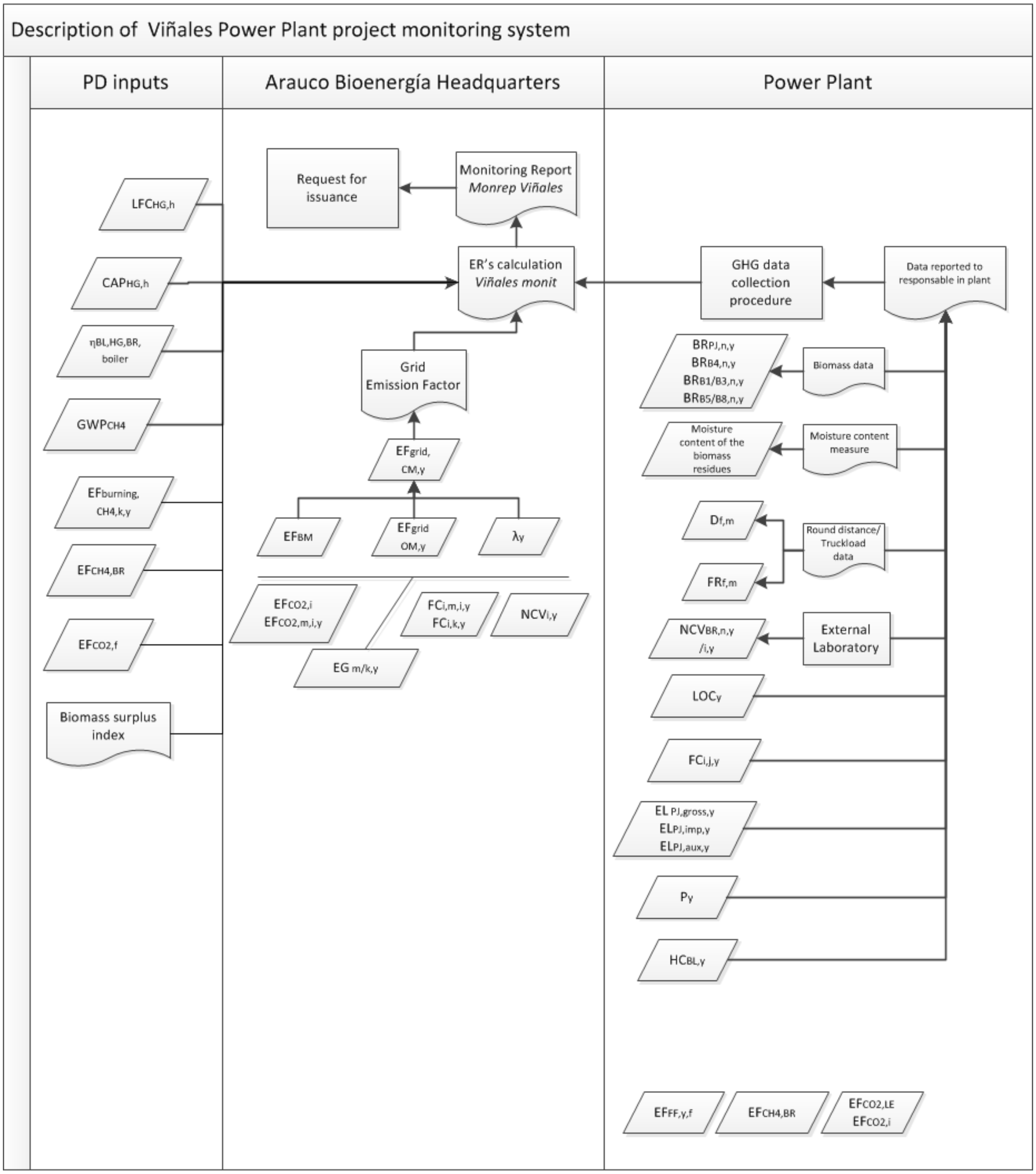
[1] Arauco is a leading forestry and pulp-producing company in the world.

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.

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.
Contact person	Mr. Christian A. Patrickson.
Title	Development Manager of Arauco Bioenergia S.A.
Address	El Golf Ave. 150, 7th floor, Las Condes, Santiago, Chile.
Telephone	56-2-2462 3795
Email	cpatrickson@arauco.cl

1.4 Other Entities Involved in the Project

During 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	
Role in the project	
Contact person	
Title	
Address	
Telephone	
Email	

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 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).

1.7 Project Location

The project activity es 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 CO_2 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. This mechanism, however, is a non-GHG related environmental mechanism, so there are no double-counting issues involved with the VCS program in this case.

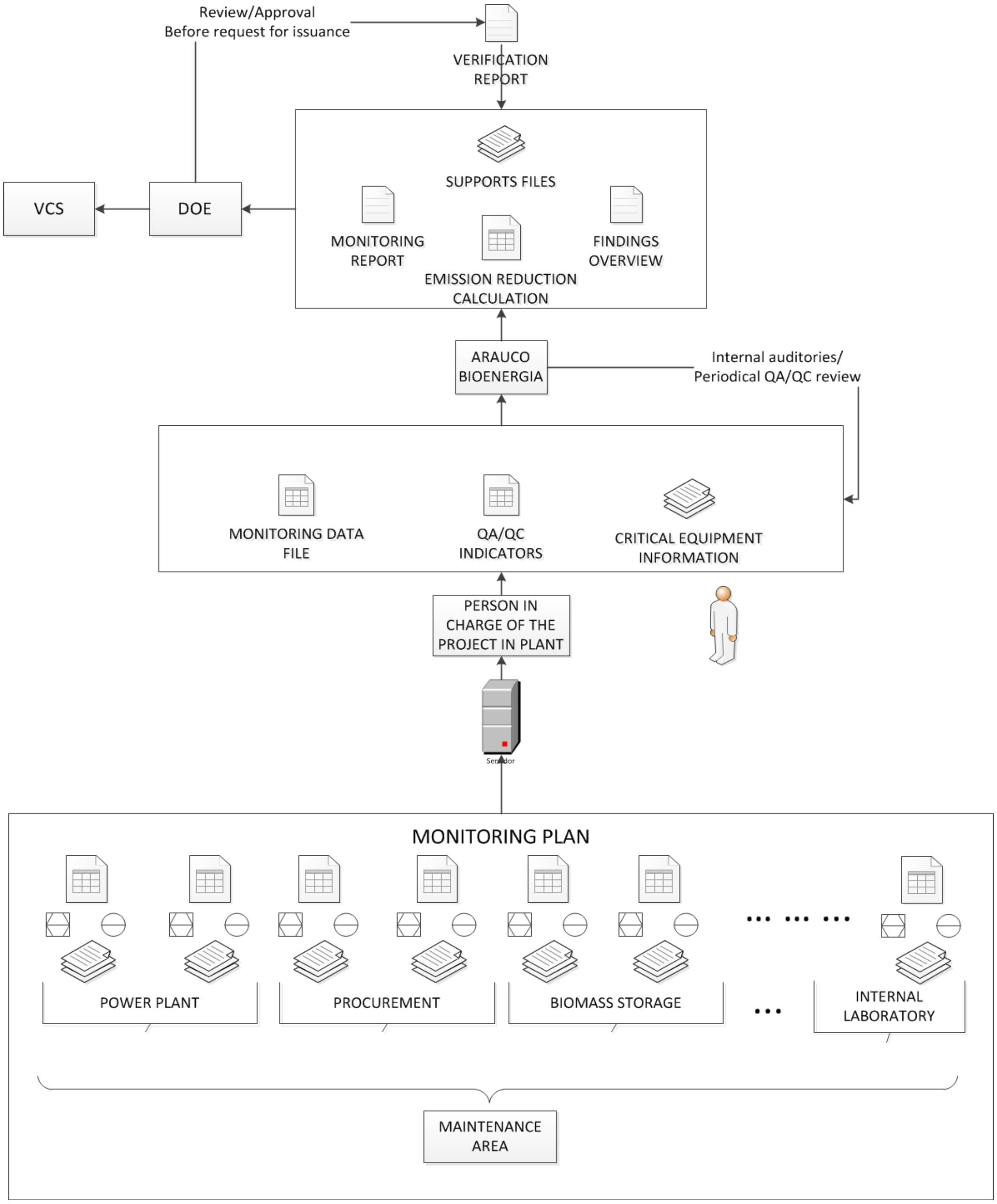
2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

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

Arauco counts with on-site personnel (at the project activity site), who are 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. 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.

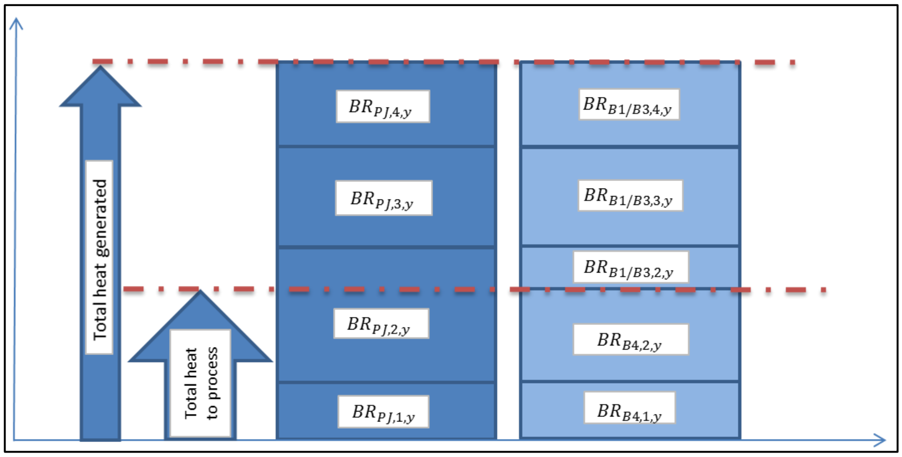

Review/Approval
Before request for issuance
VERIFICATION REPORT
SUPPORTS FILES
MONITORING REPORT
EMISSION REDUCTION CALCULATION
FINDINGS OVERVIEW
VCS
DOE
ARAUCO BIOENERGIA
Internal auditories/ Periodical QA/QC review
MONITORING DATA FILE
QA/QC INDICATORS
CRITICAL EQUIPMENT INFORMATION
PERSON IN CHARGE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

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 also irregular stoppages. The events identified are listed below:

			Power plant		
	N° days	Total hrs.	Availability hrs.	Trips hrs.	Availability per month Power plant (%)
jul-14	31	744	744.0	0	100.00%
aug-14	31	744	742.5	1.53	99.79%
sep-14	30	720	718.9	1.15	99.84%
oct-14	31	744	741.8	2.18	99.71%
nov-14	30	720	360.0	360.00	50.00%
dec-14	31	744	452.4	291.62	60.80%

From table above can be stated that during the monitoring period the general power plant stoppage was in November-December 2014, due to regular maintenance. Is important to note that there were no stoppages or maintenance activities during July, 2014.

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) according to 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. According to this, the 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[2]. 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 according to 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.

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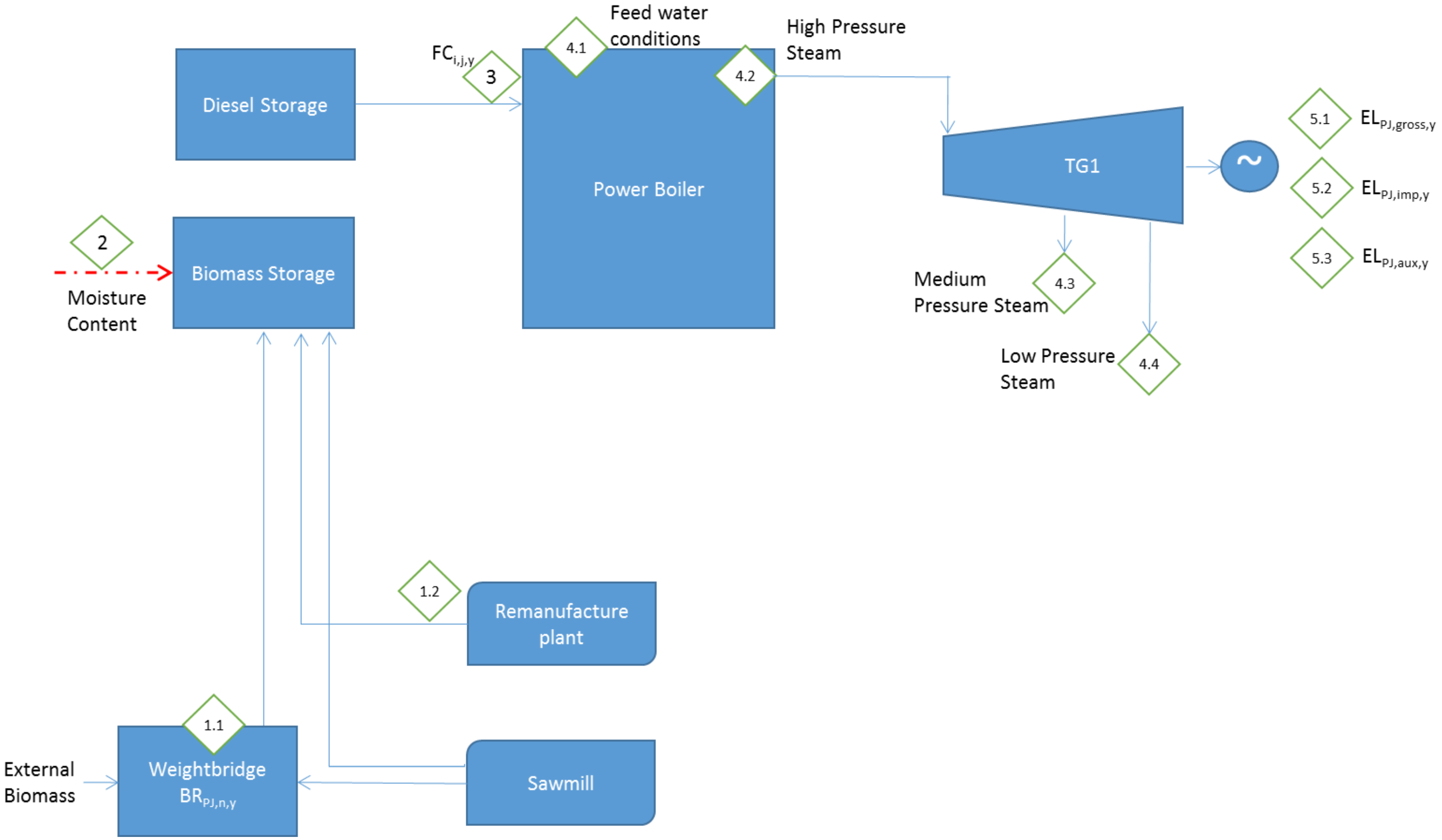
[2] Viñales and Remanufacture sawmills are part of Viñales project’s boundaries. El Cruce Sawmill is part of Celulosa Arauco but for project purpose is considered third party biomass.


Diesel Storage
FC$_{i,j,y}$
3
4.1
Feed water conditions
Power Boiler
4.2
High Pressure Steam
TG1
~
5.1
EL$_{PJ,gross,y}$
5.2
EL$_{PJ,imp,y}$
5.3
EL$_{PJ,aux,y}$
Medium Pressure Steam
4.3
Low Pressure Steam
4.4
2
Moisture Content
Biomass Storage
1.2
Remanufacture plant
1.1
External Biomass
Weightbridge BR$_{PJ,n,y}$
Sawmill

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

Suppliers, models, serial numbers and other relevant information is included in Appendix B of this monitoring report document. Is important to note that some of the equipment describe in current PD, were changed during power plant stage construction. The following equipment present differences between the description in current PD and the current equipment installed in Power plant:

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

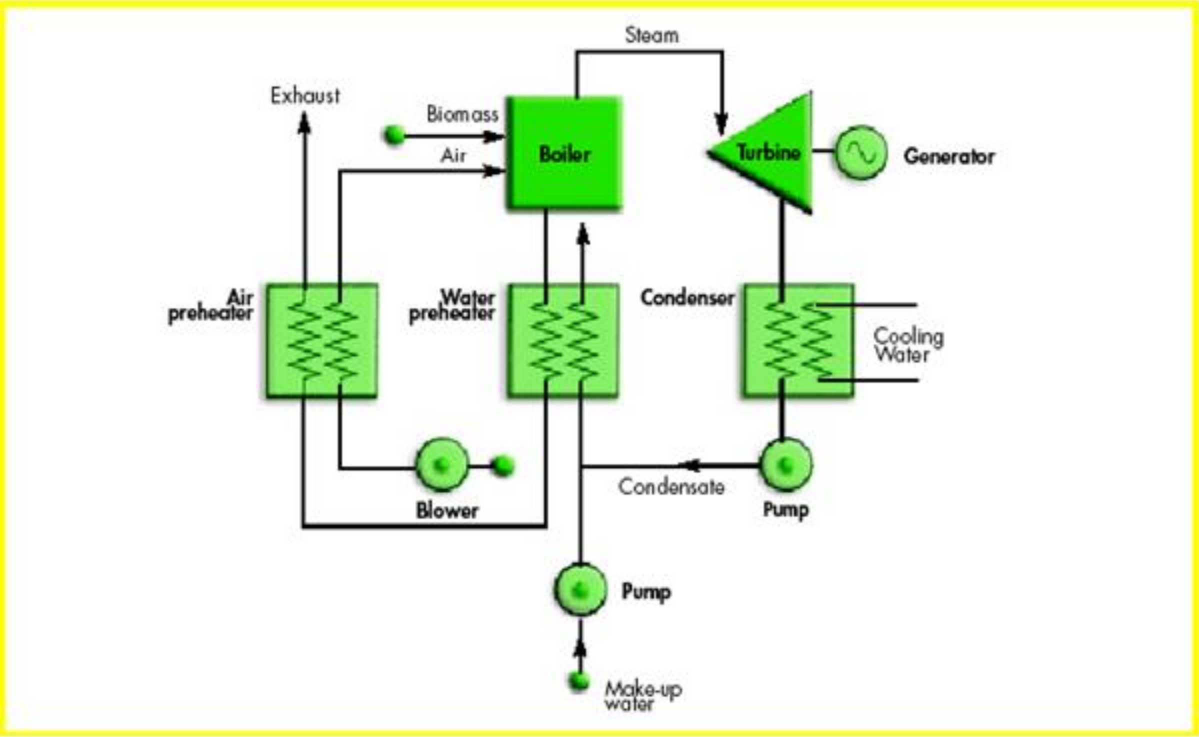
Equipment that were not defined in PD but are related to parameters measurements in the project:

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 corrections to current PD in new PD version 03. 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.

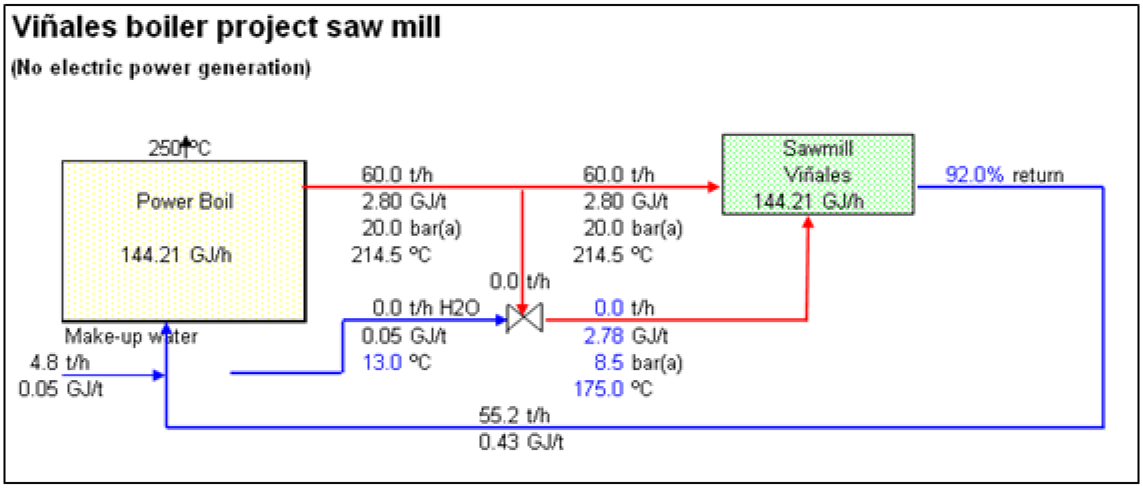
Steam turbines are designed as either “backpressure” or “condensing” turbines. CHP applications typically employ backpressure turbines, wherein steam expands to a pressure that is still substantially above ambient pressure. It leaves the turbine still as a vapor and is sent to satisfy industrial heating 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

As is exposed in section 2.1, there are some differences between the installed monitoring equipment and the equipment described in PD 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 transmitter, 2 fossil fuel transmitter 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.

Detail of this corrections are exposed in section 2.1 as was above mentioned.

2.3 Grouped Project

Not applicable.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

<table>
<tr><td>Data / Parameter</td><td>Biomass residues categories and quantities used for the selection of the baseline scenario and assessment of additionality.</td></tr>
<tr><td>Data unit</td><td>(tCO_2e/tCH_4)</td></tr>
<tr><td>Description</td><td>The biomass quantities provided in the table below were determined ex-ante in accordance with the pulp mill project studies.</td></tr>
<tr><td>Source of data</td><td>On-site assessment of biomass residues categories and quantities.</td></tr>
<tr><td>Value applied:</td><td>See table below:
<table>
<tr><th>Biomass residue category k</th><th>Biomass residue 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>1</td><td>Sawdust and bark from industrial operations.</td><td>On-site production</td><td>Heat and power generation on-site (B4)</td><td>Heat and power generation on-site (biomass-only boiler)</td><td>65,417</td></tr>
<tr><td>2</td><td>Sawdust and bark from industrial operations.</td><td>On-site production</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>83,786</td></tr>
<tr><td>3</td><td>Sawdust and bark from industrial operations.</td><td>Off-site production</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>128,052</td></tr>
<tr><td>4</td><td>Biomass from forestry operations.</td><td>Off-site production</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>35,500</td></tr>
</table>
</td></tr>
</table>

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	
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. These production levels correspond to the average between the productions of 2012 and 2013 respectively. Production levels might vary from year to year, depending on the market conditions.
Justification of choice of data or description of measurement methods and procedures applied	--
Purpose of the data	--
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	--
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 parameters 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	--
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 COP/MOP decisions.

Justification of choice of data or description of measurement methods and procedures applied	--
Purpose of the data	Calculation of baseline emissions and project emissions
Comments	According PD (version 02, page 68) applicable methane global warming potential was 21 tCO_2/tCH_4 during the first commitment period. Even though this is a fixed parameter, updated value according COP/MOP decision is 25 rather than the informed value. Please note that this was addressed in EB 69 Annex 3 which indicated the following: "All emission reductions and removals achieved by CDM project activities and PoAs in the second commitment period of the Kyoto Protocol shall be calculated using the global warming potentials (GWPs) adopted by the Conference of the Parties serving as the meeting of the Parties at its seventh session, in accordance with decision 4/CMP.7. This requirement shall apply from 1 January 2013, notwithstanding any GWPs stated to be applicable in the relevant procedures, standards, guidance, approved baseline and monitoring methodologies, methodological tools and other rules being used in relation to that project activity or PoA."

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	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.

procedures applied	
Purpose of the data	Calculation of baseline emissions.
Comments	Differences between IPCC default values and the measured values are due to the compactness level of the biomass residues burned. In case of the biomass from industrial operations, the biomass is densely packed allowing for very little oxygen in the combustion process. This leads to high methane emission factors. In the case of the biomass from forestry operations, the biomass (mainly branches) allow for plenty of oxygen during the combustion, which leads to much lower methane emission factors. The measured values are consistent with values obtained in other parts of the word under similar conditions.

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)

<table>
<tr><td>Data / Parameter</td><td>$EF_{CO2,f}$</td></tr>
<tr><td>Data unit</td><td>(g CO_2/t km)</td></tr>
<tr><td>Description</td><td>Default CO_2 emission factor for freight transportation activity f.</td></tr>
<tr><td>Source of data</td><td></td></tr>
<tr><td>Value applied:</td><td><table><tr><td>Vehicle class</td><td>Emission factor (g CO_2/t km)</td></tr><tr><td>Light vehicle</td><td>245</td></tr><tr><td>Heavy vehicle</td><td>129</td></tr></table>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.</td></tr>
<tr><td>Justification of choice of data or description of</td><td>The default value are proposed in the corresponding CDM tool and therefore are deemed conservative and appropriate in this case.</td></tr>
</table>

measurement methods and procedures applied	
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.

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.

<table>
<tr><td>Frequency of monitoring/recording</td><td>Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.</td></tr>
<tr><td>Value monitored:</td><td>
<table>
<tr><th>Biomass residues category k</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 (BDt/yr)</th></tr>
<tr><td>1</td><td>Sawdust and bark industrial operations</td><td>On-site production</td><td>Heat and power generation on-site (B4)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>52,740</td></tr>
<tr><td>2</td><td>Sawdust and bark industrial operations</td><td>On-site production</td><td>Dumped and/or burned in the open air (B1:/ B3:)</td><td>Heat and power generation on-site (biomass only boiler)</td><td></td></tr>
<tr><td>3</td><td>Sawdust and bark industrial operations</td><td>Off-site from third parties facilities</td><td>Dumped and/or burned in the open air (B1:/ B3:)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>66,681</td></tr>
<tr><td>4</td><td>Bark, branches, from harvest, prune or</td><td>Off-site from forestry operations</td><td>Dumped and/or burned in the open air (B1:/ B3:)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>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: 24/04/2014-21/07/2014-25/10/2014
Validity: 24/04/2015 (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 (July to December) was an efficiency of 69.42% in the power boiler. According to provider information, power boiler efficiency could be</td></tr>
</table>

	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) S_o: Wood section that exists the shaving process (m^2) S_i: 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 CP1MP1 (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 113, current PD. The external biomass residues 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 emission reductions.
Value monitored:	

	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)
$BR_{PJ,1,y}$	Sawdust and bark industrial operations	On-site	Heat and power generation on-site (B4)	Heat and power generation on-site (biomass only boiler)	52,740
$BR_{PJ,2,y}$	Sawdust and bark industrial operations	On-site	Dumped and/or burned in the open air (B1 and or B3)	Heat and power generation on-site (biomass only boiler)	0
$BR_{PJ,3,y}$	Sawdust and bark industrial operations	Off-site	Dumped and/or burned in the open air (B1 and or B3)	Heat and power generation on-site (biomass only boiler)	66,681

$BR_{PJ,4,y}$	Biomass from forestry operations	Of-site	Dumped and/or burned in the open air (B1 and or B3)	Heat and power generation on-site (biomass only boiler)	0

Monitoring equipment	Type: Weighbridge 1 GSE 460 Accuracy class: Class III (+/- 30 kg) Serial number: 152069 Calibration frequency: Biannual Dates of calibration: 24/04/2014-21/07/2014-25/10/2014 Validity: 24/04/2015 (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. Due to current Monitoring period duration is only six months, PP presented an energy balance for total monitoring period. The result for QA/QC in the current period (July to December) was an efficiency of 69.42% 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. PP calculated a monthly power boiler efficiency for internal control. The differences with QA/QC range in monthly efficiencies are due to maintenance outages. Nevertheless, monthly efficiencies variation do not affected the monitoring period power boiler efficiency that is in the expected values.
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	Internal and external biomass residues were measured at the entrance of the biomass power plant, using dedicated weight bridges.

<table>
<tr><td>and procedures to be applied</td><td>A fraction of the internal biomass residues that are transported by pneumatic transportation system was estimated according Annex 1, page 113, current PD.
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>Biomass residues category</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>$BR_{B4,1,y}$</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>52,740</td></tr>
<tr><td>$BR_{B4,3,y}$</td><td>Sawdust and bark industrial operations</td><td>Off-site</td><td>Heat and power generation on-site (B4)</td><td>Heat and power generation on-site (biomass only boiler)</td><td>55,945</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: 24/04/2014-21/07/2014-25/10/2014
Validity: 24/04/2015 (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. Due to current Monitoring period duration is only six months, PP presented an energy balance for total monitoring period. The result for QA/QC in the current period (July to December) was an efficiency of 69.42% 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. PP calculated a monthly power boiler efficiency for internal control. The differences with QA/QC range in monthly efficiencies are due to maintenance outages. Nevertheless, monthly efficiencies variation do not affected the</td></tr>
</table>

	monitoring period power boiler efficiency that is in the expected values.
Purpose of the data	Calculation of baseline emissions and project emissions.
Calculation method	According to methodology ACM0006 Version 12.1.1, step 3, pages 32 to 39.
Comments	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.

<table>
<tr><td>Data / Parameter</td><td>$BR_{B1/B3,n,y}$</td></tr>
<tr><td>Data unit</td><td>(Tonnes on dry basis)</td></tr>
<tr><td>Description</td><td>Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B1: or B3:</td></tr>
<tr><td>Source of data</td><td>On-site measurements.</td></tr>
<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><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>$BR_{B1/B3,2,y}$</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>0</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</td><td>Heat and power generation on-site</td><td>10,736</td></tr>
</table>
</td></tr>
</table>

			air (B1 and or B3)	(biomass only boiler)	
$BR_{B1/B3,4,y}$	Biomass from forestry operations	Off-site	Dumped and/or burned in the open air (B1 and or B3)	Heat and power generation on-site (biomass only boiler)	0

Monitoring equipment	Type: Weighbridge 1 GSE 460 Accuracy class: Class III (+/- 30 kg) Serial number: 152069 Calibration frequency: Biannual Dates of calibration: 24/04/2014-21/07/2014-25/10/2014 Validity: 24/04/2015 (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. Due to current Monitoring period duration is only six months, PP presented an energy balance for total monitoring period. The result for QA/QC in the current period (July to December) was an efficiency of 69.42% 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. PP calculated a monthly power boiler efficiency for internal control. The differences with QA/QC range in monthly efficiencies are due to maintenance outages. Nevertheless, monthly efficiencies variation do not affected the monitoring period power boiler efficiency that is in the expected values.
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	Not applicable.

and procedures to be applied	
Frequency of monitoring/recording	The Project Participant corroborate appropriateness the value for the current monitoring period.
Value monitored:	0.0748 (tCO_2/GJ) for Diesel. 0.0788 (tCO_2/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 equations 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:	1,743,132 (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: 21/10/2013-17/11/2014 Validity: 16/05/2016 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: 24/10/2013-18/11/2014 Validity: 17/05/2016 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: 24/08/2011 Validity: 23/08/2013 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: 24/10/2013-19/11/2014 Validity: 18/05/2016 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: 21/10/2013-19/11/2014 Validity: 18/05/2016 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: 03/01/2013 Validity: 02/01/2015 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: 24/10/2013 Validity: 23/04/2015 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: 22/10/2013-19/11/2014 Validity: 18/05/2016 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: 21/10/2013-19/11/2014 Validity: 18/05/2016 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: 09/09/2011 Validity: 08/09/2013 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: 24/10/2013-19/11/2014 Validity: 18/05/2016 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: 22/10/2013-19/11/2014 Validity: 18/05/2016 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: 21/10/2013-19/11/2014 Validity: 18/05/2016 665-TT-9024 Type: Steam Temperature transmitter Low pressure line Rosemount 644HFNAJ6Q4 Accuracy class: ±0.15°C. Serial number: 0271896 Calibration frequency: 2 years

<table>
<tr><td></td><td>Assembling and calibration date: 09/09/2011
Validity: 08/09/2013

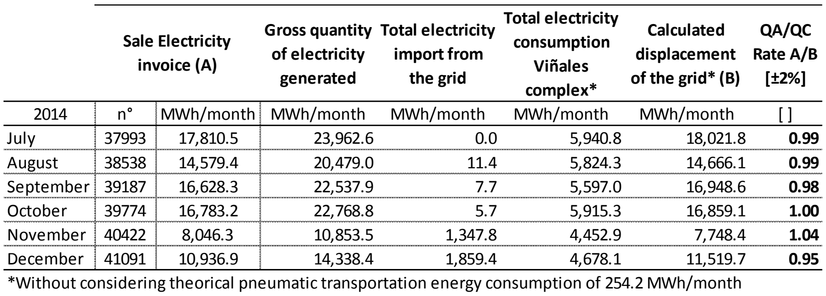
663-PT-0106
Type: Pressure gauge transmitter Feed water condition Endress + Hauser PMD75-ARC1WB1UBGAU.
Accuracy class: ±0.075%
Serial number: D500BE0109C
Calibration frequency: According to supplier recommendation, PP define 18 months if was necessary.
Assembling and calibration date: 03/09/2011-24/11/2014
Validity: 23/05/2016

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: 30/08/2011
Validity: 29/08/2013*
*Last calibration was 13/11/2015 and equipment verified in all span. No calibration was needed.</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>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 CP1MP1 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:
<table>
<tr><th>Month</th><th>Steam/Biomass Index
[Ton steam/Ton biomass]</th></tr>
</table>
</td></tr>
</table>

July, 2014	2.51
August, 2014	2.64
September, 2014	2.80
October, 2014	2.38
November, 2014	2.07
December, 2014	2.67
Average	**2.51**

	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 are no evidence of calibration during the 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	Parameter was measured using proper electric meters, calibrated and maintained according to manufacture specification and proper industry standards.

<table>
<tr><td>and procedures to be applied</td><td></td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuously and aggregated as appropriate, to calculate emission reductions.</td></tr>
<tr><td>Value monitored:</td><td>114,940 (MWh)</td></tr>
<tr><td>Monitoring equipment</td><td>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</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>
<p>1. – Monthly rate between receipts from electricity sales (if available) and the calculated displacement of the grid is within a range of ±2%.</p>

<table>
<tr><th></th><th colspan="2">Sale Electricity invoice (A)</th><th>Gross quantity of electricity generated</th><th>Total electricity import from the grid</th><th>Total electricity consumption Viñales complex*</th><th>Calculated displacement of the grid* (B)</th><th>QA/QC Rate A/B [±2%]</th></tr>
<tr><td>2014</td><td>n°</td><td>MWh/month</td><td>MWh/month</td><td>MWh/month</td><td>MWh/month</td><td>MWh/month</td><td>[ ]</td></tr>
<tr><td>July</td><td>37993</td><td>17,810.5</td><td>23,962.6</td><td>0.0</td><td>5,940.8</td><td>18,021.8</td><td>0.99</td></tr>
<tr><td>August</td><td>38538</td><td>14,579.4</td><td>20,479.0</td><td>11.4</td><td>5,824.3</td><td>14,666.1</td><td>0.99</td></tr>
<tr><td>September</td><td>39187</td><td>16,628.3</td><td>22,537.9</td><td>7.7</td><td>5,597.0</td><td>16,948.6</td><td>0.98</td></tr>
<tr><td>October</td><td>39774</td><td>16,783.2</td><td>22,768.8</td><td>5.7</td><td>5,915.3</td><td>16,859.1</td><td>1.00</td></tr>
<tr><td>November</td><td>40422</td><td>8,046.3</td><td>10,853.5</td><td>1,347.8</td><td>4,452.9</td><td>7,748.4</td><td>1.04</td></tr>
<tr><td>December</td><td>41091</td><td>10,936.9</td><td>14,338.4</td><td>1,859.4</td><td>4,678.1</td><td>11,519.7</td><td>0.95</td></tr>
</table>
<p>*Without considering theorical pneumatic transportation energy consumption of 254.2 MWh/month</p>
<p>November and December Index is out of QA/QC acceptable range.</p>
<p>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:</p>
<table>
<tr><th></th><th>A</th><th>B</th><th>QA/QC [0.83-1.34]</th></tr>
<tr><td></td><td>Gross electricity generation MWh</td><td>Combusted biomass in power boiler BDt</td><td>Index MWh/BDt A/B</td></tr>
<tr><td>Jul/14</td><td>23,962.6</td><td>22,944.6</td><td>1.04</td></tr>
<tr><td>Ago/14</td><td>20,479.0</td><td>19,510.4</td><td>1.05</td></tr>
<tr><td>Sep/14</td><td>22,537.9</td><td>17,707.3</td><td>1.27</td></tr>
<tr><td>Oct/14</td><td>22,768.8</td><td>23,451.1</td><td>0.97</td></tr>
<tr><td>Nov/14</td><td>10,853.5</td><td>17,296.7</td><td><i>0.63</i></td></tr>
<tr><td>Dec/14</td><td>14,338.4</td><td>18,511.3</td><td><i>0.77</i></td></tr>
</table>
<p>November and December were out of the QA/QC range. Is important to note that boiler electricity efficiency change when Power plant is carrying out a programmed stoppage.</p>
</td></tr>
</table>

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).

	A	**B**	**C**	**QA/QC ≥ 0**
	Measured exported energy to grid MWh	Measured energy sawmill consumption MWh	Calculated energy displacement MWh	Difference % ((A+B)-C)/C
Jul/14	17,848.6	2,557.0	20,324.5	0.40%
Ago/14	14,606.0	2,440.4	16,846.3	1.19%
Sep/14	16,663.1	2,323.3	19,013.0	**-0.14%**
Oct/14	16,814.9	2,531.5	19,135.8	1.10%
Nov/14	8,059.2	1,179.3	7,854.0	17.63%
Dec/14	10,957.3	1,294.2	11,548.4	6.09%

September Index is out of QA/QC acceptable range.

According QA/QC cross check 1 and 2, November and December 2014 presents a significant difference 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 includes 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. It's important to note that the general shutdown in 2014 was singularly extensive due to a major intervention in the turbogenerator. 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.

Deviation in cross check 3, September, 2014, registered a calculated energy displacement that is not conservative compared with measured energy displacement. PP corrected and used measured quantity grid energy displacement for the final reported value.

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:	1,390 (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 be applied	- Consistency of metered electricity was checked percentage difference between Total power import and receipts from electricity purchases. The difference between measures and invoices are exposed in table below:

	A	B	C		QA/QC ≤ 0
	Import electricity to power plant MWh	Import electricity to Sawmill plant MWh	n^{ro}	Import electricity invoice MWh	Index % ((A+B)-C)/C
Jul/14	0.0	0.0			-

<table>
<tr>
<td></td>
<td>
<table>
<tr><td>Ago/14</td><td>5.4</td><td>6.0</td><td>13334</td><td>11.4</td><td>-0.09</td></tr>
<tr><td>Sep/14</td><td>2.9</td><td>4.8</td><td>00090</td><td>7.7</td><td>-0.14</td></tr>
<tr><td>Oct/14</td><td>5.1</td><td>0.6</td><td>00198</td><td>5.7</td><td>-0.15</td></tr>
<tr><td>Nov/14</td><td>528.3</td><td>819.5</td><td>00295</td><td>1,346.7</td><td>-0.08</td></tr>
<tr><td>Dec/14</td><td>848.0</td><td>1,011.4</td><td>00439</td><td>1,858.9</td><td>-0.03</td></tr>
</table>
<p>Import electricity invoices report the total import electricity from the grid to Viñales complex (Sawmill and power plant). QA/QC index is according quality assurance criteria.</p>
<p>- Index between electricity generation divided by the quantity of combusted biomass in Power boiler results in a reasonable efficiency comparable to yearly statistic range:</p>
<table>
<tr><th></th><th>A</th><th>B</th><th>QA/QC [0.83-1.34]</th></tr>
<tr><td></td><td>Gross electricity generation MWh</td><td>Combusted biomass in power boiler BDt</td><td>Index MWh/BDt A/B</td></tr>
<tr><td>Jul/14</td><td>23,962.6</td><td>22,944.6</td><td>1.04</td></tr>
<tr><td>Ago/14</td><td>20,479.0</td><td>19,510.4</td><td>1.05</td></tr>
<tr><td>Sep/14</td><td>22,537.9</td><td>17,707.3</td><td>1.27</td></tr>
<tr><td>Oct/14</td><td>22,768.8</td><td>23,451.1</td><td>0.97</td></tr>
<tr><td>Nov/14</td><td>10,853.5</td><td>17,296.7</td><td>0.63</td></tr>
<tr><td>Dec/14</td><td>14,338.4</td><td>18,511.3</td><td>0.77</td></tr>
</table>
<p>November and December were out of the QA/QC range. Is important to note that boiler electricity efficiency change when Power plant is carrying out a programmed stoppage. Nevertheless, average Monitoring period QA/QC (0.96) is in quality assurance criteria.</p>
</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>
<p>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:</p>
<p>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:</p>
<p>- 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:</p>
</td>
</tr>
</table>

	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	$EL_{PJ,aux,y}$
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:	21,608 (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%.

	Sale Electricity invoice (A)		**Gross quantity of electricity generated**	**Total electricity import from the grid**	**Total electricity consumption Viñales complex***	**Calculated displacement of the grid* (B)**	**QA/QC Rate A/B [±2%]**
2014	n°	MWh/month	MWh/month	MWh/month	MWh/month	MWh/month	[ ]
July	37993	17,810.5	23,962.6	0.0	5,940.8	18,021.8	**0.99**
August	38538	14,579.4	20,479.0	11.4	5,824.3	14,666.1	**0.99**
September	39187	16,628.3	22,537.9	7.7	5,597.0	16,948.6	**0.98**
October	39774	16,783.2	22,768.8	5.7	5,915.3	16,859.1	**1.00**
November	40422	8,046.3	10,853.5	1,347.8	4,452.9	7,748.4	**1.04**
December	41091	10,936.9	14,338.4	1,859.4	4,678.1	11,519.7	**0.95**

*Without considering theorical pneumatic transportation energy consumption of 254.2 MWh/month

November and December Index is out of QA/QC acceptable range.

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:

	A	B	QA/QC [0.83-1.34]
	Gross electricity generation MWh	Combusted biomass in power boiler BDt	Index MWh/BDt A/B
Jul/14	23,962.6	22,944.6	1.04
Ago/14	20,479.0	19,510.4	1.05
Sep/14	22,537.9	17,707.3	1.27
Oct/14	22,768.8	23,451.1	0.97
Nov/14	10,853.5	17,296.7	**0.63**
Dec/14	14,338.4	18,511.3	**0.77**

November and December were out of the QA/QC range. 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).

	A	B	C	QA/QC ≥ 0
	Measured exported energy to grid MWh	Measured energy sawmill consumption MWh	Calculated energy displacement MWh	Difference % ((A+B)-C)/C
Jul/14	17,848.6	2,557.0	20,324.5	0.40%
Ago/14	14,606.0	2,440.4	16,846.3	1.19%
Sep/14	16,663.1	2,323.3	19,013.0	**-0.14%**
Oct/14	16,814.9	2,531.5	19,135.8	1.10%
Nov/14	8,059.2	1,179.3	7,854.0	17.63%
Dec/14	10,957.3	1,294.2	11,548.4	6.09%

September Index is out of QA/QC acceptable range.

According QA/QC cross check 1 and 2, November and December 2014 presents a significant difference 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 includes 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. It's important to note that the general shutdown in 2014 was singularly extensive due to a major intervention in the turbogenerator. 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. Deviation in cross check 3, September, 2014, registered a calculated energy displacement that is not conservative compared with measured energy displacement. PP corrected and used measured quantity grid energy displacement for the final reported value.
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.

<table>
<tr><td>Value monitored:</td><td><table><tr><td></td><td>$NCV_{BR,n,y}$ (GJ/ton-dry matter)</td></tr><tr><td>$BR_{PJ,1,y}$</td><td>18.89</td></tr><tr><td>$BR_{PJ,3,y}$</td><td>18.85</td></tr><tr><td>$BR_{PJ,4,y}$</td><td>--</td></tr></table></td></tr>
<tr><td>Monitoring equipment</td><td>Not applicable. Net calorific values were measured locally by third party laboratory.</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The consistency of this measurements were compared with values of others projects and relevant data source. Results of these cross-checks were deemed reasonable, as can be seen from table below:<table><tr><td></td><td colspan="2">Trupan
CDM Ref:0259</td><td>Viñales
VCS 1186</td></tr><tr><td></td><td>1st semester</td><td>2nd semester</td><td>2nd semester</td></tr><tr><td>$NCV_{Industrial}$ operations on-site, 1 and 2,2014</td><td>4,158 Kg/Kcal
17.38 GJ/BDt</td><td>4,179 Kg/Kcal
17.47 GJ/BDt</td><td>4,519 Kg/Kcal
18.89 GJ/BDt</td></tr><tr><td>$NCV_{Industrial}$ operations off-site,3,2014</td><td>4,503 Kg/Kcal
18.82 GJ/BDt</td><td>4,208 Kg/Kcal
17.59 GJ/BDt</td><td>4,509 Kg/Kcal
18.85 GJ/BDt</td></tr></table>* NCV [GJ/BDt] = NCV [Kg/Kcal]*0.00418.
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</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>Not applicable.</td></tr>
<tr><td>Comments</td><td>--</td></tr>
</table>

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.

<table>
<tr><td>Frequency of monitoring/recording</td><td>Continuously. Daily samples of biomass residues from industrial and forest operations were taken for moisture content measurement.</td></tr>
<tr><td>Value monitored:</td><td><table>
<tr><th></th><th>Moisture content CP1 MP1

(%)</th></tr>
<tr><td>$BR_{PJ,1,y}$</td><td>40.9%</td></tr>
<tr><td>$BR_{PJ,3,y}$</td><td>56.0%</td></tr>
<tr><td>$BR_{PJ,4,y}$</td><td>--</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>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
Validity: 01/10/2015 (estimated)

Laboratory Oven MEMMERT UFE 600
Accuracy class: +/- 0.5%
Serial number: G611.0831
Calibration frequency: 12 months
Date of calibration: 28/08/2014
Validity: 27/08/2015

Laboratory Digital scale Sartorius TE1502S
Accuracy class:
Serial number: 27402265
Calibration frequency: 12 months
Dates of calibration: 02/10/2014
Validity: 01/10/2015</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>--</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>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.</td></tr>
</table>

	Sd: Bone-dry biomass residue type I weight.
Comments	--

<table>
<tr><td>Data / Parameter</td><td>P_y</td></tr>
<tr><td>Data unit</td><td>m^3/yr.</td></tr>
<tr><td>Description</td><td>Quantity of the main product of the production process produced in year y from plants operated at the project site.</td></tr>
<tr><td>Source of data</td><td>On-site measurements.</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>--</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Annually, aggregated as appropriate.</td></tr>
<tr><td>Value monitored:</td><td>Sawn timber: 382,092 m^3/yr.
Processed wood: 92,971 m^3/yr.</td></tr>
<tr><td>Monitoring equipment</td><td>Not applicable.</td></tr>
<tr><td>QA/QC procedures to be applied</td><td><table>
<tr><td></td><td>Value applied in PD m^3/yr</td><td>Value obtained in 2014 m^3/yr</td><td>Maximum potential production 2014 m^3/yr</td></tr>
<tr><td>Sawn timber</td><td>352,686</td><td>382,092</td><td>422,400</td></tr>
<tr><td>Processed wood</td><td>88,203</td><td>92,971</td><td>96,000</td></tr>
</table>
The maximum potential production was not exceeded during the presented monitoring period, according to table above.</td></tr>
<tr><td>Purpose of the data</td><td>--</td></tr>
<tr><td>Calculation method</td><td>Not applicable.</td></tr>
<tr><td>Comments</td><td>Quantity of the main product of the production process is assessed by Viñales Sawmill and Remanufacture plant.</td></tr>
</table>

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 applied	Records and sum the hours of operation of the project activity facilities during year y.
Frequency of monitoring/recording	Continuously.
Value monitored:	656 [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: 36.437 (ton/y) - LPG consumption in the power boiler due to operational reasons: 0.038 (ton/y) - Diesel consumption due to on-site biomass transportation from the gate to the power boiler conveyor belts and front loaders: 29.52 (ton/y) - Diesel consumption due to forestry biomass processing: 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: 08/08/2011 Validity: 07/18/2016 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 Validity: 01/08/2016
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. Due to current Monitoring period duration is only six months, PP presented an energy balance for total monitoring period. The result for QA/QC in the current period (July to December) was an efficiency of 69.42% 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. PP calculated a monthly power boiler efficiency for internal control. The differences with QA/QC range in monthly efficiencies are due to maintenance outages. Nevertheless, monthly efficiencies variation do not affected the monitoring period power boiler efficiency that is in the expected values.
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. Hernan Valdes	37.60
Com. Radiata del Maule	As. Hernan Valdes	37.60
Com. Radiata del Maule	As. Hernan 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:	110,229 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:	$NCV_{\text{Pet coke},2014}$: 27.8 (GJ/ton) $NCV_{\text{Diesel},2014}$: 43.3 (GJ/ton) $NCV_{\text{IFO 180},2014}$: 41.8 (GJ/ton) $NCV_{\text{Natural Gas},2014}$: 35.2 (TJ/MMm3) $NCV_{\text{Coal},2014}$: 27.8 (GJ/ton) $NCV_{\text{Butane},2014}$: 45.6 (GJ/ton) $NCV_{\text{Propane},2014}$: 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	--

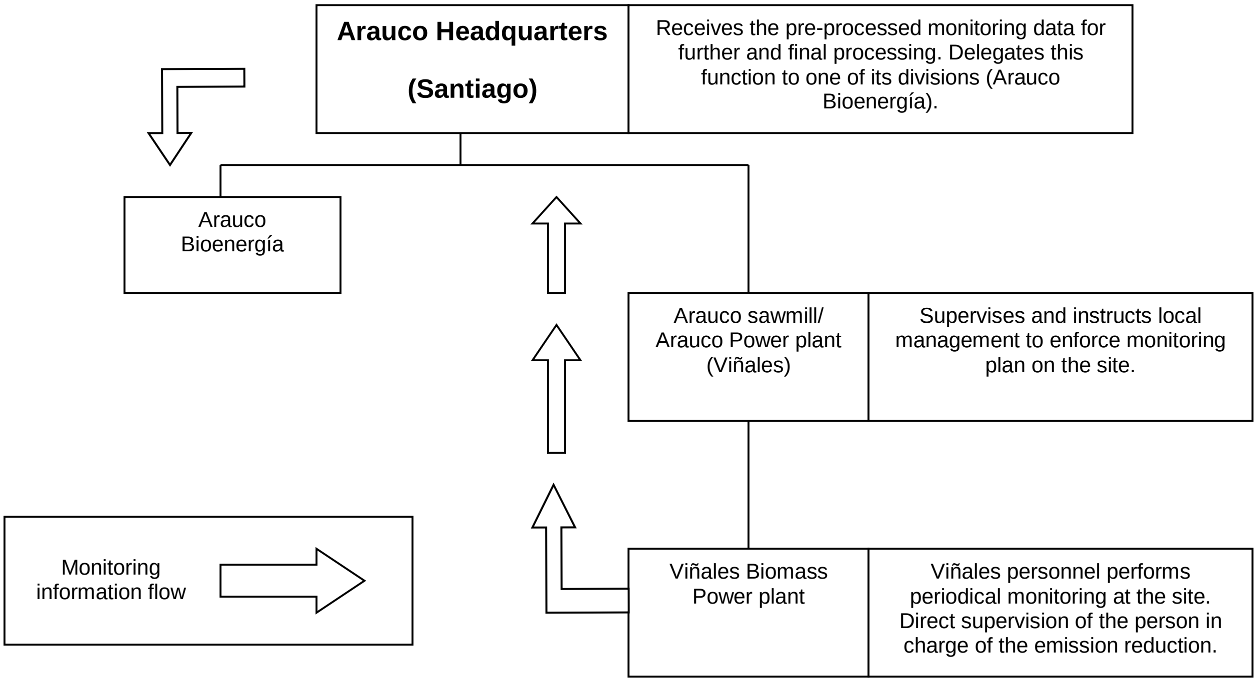
Data / Parameter	$EG_{m,y}$, $EG_{k,y}$
Data unit	[MWh]
Description	Net electricity generated by power plant/unit m, k in year y.
Source of data	CDEC-SIC public information
Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Annually for the 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 parameters monitoring plan in “Monitoreo variables críticas proyecto VCS Viñales.pdf”. Parameters are collected and supported in file “Viñales monitoring plan 2014.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 2014.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	$BF_{PJ,n,y}$	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	$BF_{B4,n,y}$	Quantity of biomass residue of category n used in the project activity in year y for which the baseline scenario is B4:					
3	$BF_{B1/B3,n,y}$	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	$BF_{B5/B8,n,y}$	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	$EF_{FF,y,f}$	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	$EF_{CH4,BR}$	CH_4 emission factor for the combustion of biomass residues in the project plant.					
7	$EF_{CO2,LE}$	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	$EL_{PJ,gross,y}$	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	$EL_{PJ,imp,y}$	Project electricity imports from the grid in year y.					
11	$EL_{PJ,aux,y}$	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y.					
12	$NCV_{BR,n,y}$	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: NCV YYYY.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	LOC_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	$EF_{CO2,i}$	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	$EF_{CO2,i,y}$, $EF_{CO2,m,i,y}$	CO_2 emission factor of fossil fuel type y used in power unit m in year y.	Arauco Bioenergia	External and public source.	Anually	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:

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

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[3] 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:

		2014
(1) Gross quantity of electricity generated.	$EL_{PJ,gross,y}$	114,940 (MWh)
(2) Project electricity imports from the grid.	$EL_{PJ,imp,y}$	1,390 (MWh)
(3) Total auxiliary electricity consumption required for the operation of the power plant.	$EL_{PJ,aux,y}$	20,083 (MWh)
(4) Auxiliary electricity consumption due to pneumatic transportation system.		1,525 (MWh)

Applying QA/QC procedure, PP compared the monthly calculated energy displacement from de grid against monthly measured invoices. A positive difference was found for September 2014. PP corrected energy displacement using data invoice for this month. Final baseline electricity generation capacity en year 2014 was corrected in the following table:

Calculations:

			2014
(5) Monitored Baseline electricity generation capacity in year y.	$EL_{BL,y}$	(1)+(2)-[(3)+(4)]	94,722 (MWh)
(5) Corrected Baseline electricity generation capacity in year y*	$EL_{BL,y}$		94,661 (MWh)

* Corrected value was used to final calculation of the baseline emissions reduction

1.3 Determine the baseline capacity of electricity generation

As is defined in PD, page 53, the project activity baseline does not considered 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.

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

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

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 year 2014.

  The Project Participant used data from 2014 to determine the lambda factor that expresses the percentage of the time when low-cost/must-run sources were on the margin:

  $$\lambda_y = \lambda_{2014} = 0.0000$$

  The rest of the parameters used to calculate the $EF_{EG,GR,y}$ for 2014 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 for 2014:

$$\sum_{i,j} F_{i,j,2014} \, . \, COEF_{i,j} = 16{,}629{,}928 \; (tCO_2/y)$$

- The total power generation in the SIC by non-low-cost/must-run power sources in 2014:

$$\sum_{j} GEN_{J,2014} = 22{,}702{,}572 (Mwh/y)$$

- The CO_2 emissions of low-cost/must run power sources in 2014. 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:

$$\sum_{i,k} F_{i,k,2014}.COEF_{i,k} = 462{,}943\ (tCO_2/y)$$

- Total power generation in the SIC by low-cost/must-run resources for 2014:

$$\sum_{j} GEN_{J,2014} = 28{,}059{,}495\ (Mwh/y)$$

Replacing the above values in the equation used to calculate the $EF_{electricity,y}$ for year 2014, the operating margin results:

$$EF_{OM,2014} = (1 - 0.0000).\frac{16{,}629{,}928}{22{,}702{,}572}(tCO_2/Mwh) + 0.0000.\frac{462{,}943}{28{,}059{,}495}(tCO_2/Mwh)$$

$$EF_{OM,2014} = EF_{OM,simple\ adjusted,2014} = 0.732(tCO_2/Mwh)$$

- According to 2014 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 2014. These plants are considered to calculate the Build Margin for 2014:

$$EF_{BM,2014} = 0.657(tCO_2/Mwh)$$

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 $EF_{grid,CM,y}$ for 2014. The results obtained were the following:

Data:

		2014
(1) Operating Margin (OM).	$EF_{grid,OM,y}$	0.732 (tCO_2/MWh)

(2) Build Margin (BM).	$EF_{grid,BM,y}$	0.657 (tCO_2/MWh)
(3) Weighting of Operating Margin.	W_{OM}	50%
(4) Weighting of Build Margin.	W_{BM}	50%

Calculations:

			2014
(5) Combined Margin calculation (CM).	$EF_{grid,CM,y}$	(1)*(3)+(2)*(4)	0.695 (tCO_2/MWh)

Determine the minimum baseline electricity generation in the grid

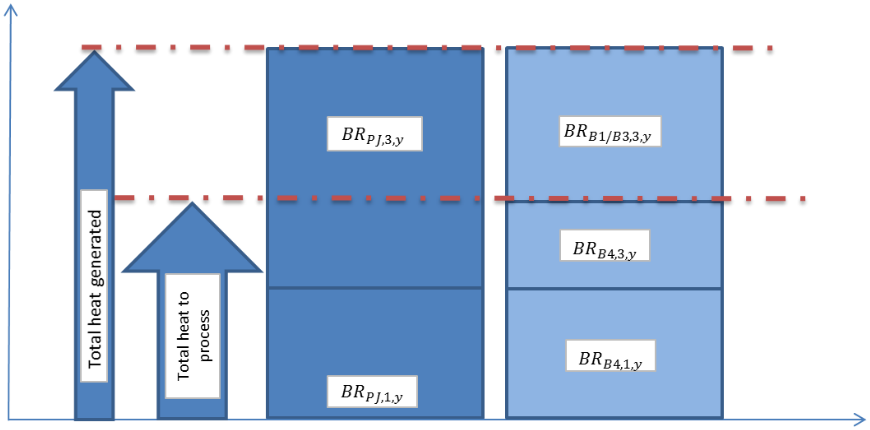
Current PD, page 57, describes calculation of this parameter using equation 13 of ACM0006 (Version 12.1.1) methodology:

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

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 CP1MP1.



Biomass consumption in priority order during CP1MP1.

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.

Due to a low performance of the turbine during the current period, quantity of combusted biomass to supply heat to process use all biomass type 1 and part of biomass type 3. Remnant of $BR_{PJ,3,y}$ that is not use to generate heat to process is use to power generation.

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.

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

Data:

		2014
(1) Biomass mix from internal industrial operations.	$BR_{PJ,1,y}$	52,740 (BDt/yr)

(2) Net calorific value (NCV) of biomass mix from internal industrial operations.	$NCV_{BR,1,y}$	18.89 (GJ/BDt)
(3) Biomass mix from external industrial operations	$BR_{PJ,3,y}$	66,681 (BDt/yr)
(4) Net calorific value (NCV) of biomass mix from external industrial operations.	$NCV_{BR,3,y}$	18.85 (GJ/BDt)
(5) Baseline biomass-based heat generation efficiency of heat generator	$\eta_{BL,HG,BR}$	85%
(A) Total measured heat generated	[(1)*(2)+(3)*(4)]*(5)	**1,915,140 (GJ/yr)**

		2014
(B) Total heat to process		**1,743,132 (BDt/yr)**
(6) Mix of biomass from internal industrial operations $BR_{PJ,1,y}$, heat generation.	(1)*(2)*(5)	846,797 (GJ/BDt)
(7) Biomass mix from external industrial operations	(B)-(6)	896,335 (GJ/BDt)
(8) Mix of biomass from internal industrial operations, heat generation	$BR_{B4,1,y}$	52,740 (BDt/yr)
(9) Mix of biomass from external industrial operations $BR_{B4,3,y}$, heat generation	(7)/[(4)*(5)]	55,945 (BDt/yr)
(10) Biomass mix from external industrial operations, electricity generation	(A)-(B)	172,007 (GJ/yr)
(11) Mix of biomass from external industrial operations, electricity generation, attributable to project activity	(10)/[(4)*(5)]	10,736 (BDt/yr)

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:

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

		2014
(12) CH_4 Global Warming Potential	GWP_{CH4}	25
(13) Adjusted CH_4 factor for uncontrolled burning, biomass from industrial operations.	$EF_{BR,3,y}$	821.7 ((Kg CH_4/TJ))
(14) Total emissions $BE_{BR,B1/B3,y}$	[(12)*(11)*(4)*(14)]/1000	**4,157 (tCO_2e)**

Calculate baseline emissions

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

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

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).

		2014
(1) Baseline minimum electricity generation in the grid in year y.	$EL_{BL,GR,y}$	94,661 (MWh)
(2) Grid emission factor in year y.	$EF_{EG,GR,y}$	0.695 (tCO_2/MWh)
(3) Baseline fossil fuel demand for process heat in year y.	$FF_{BL,HG,y,f}$	0 (GJ)
(4) CO_2 emission factor for fossil fuel type f in year y.	$EF_{FF,y,f}$	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)
(6) CO_2 emission factor for electricity generation with fossil fuels at the project site in the baseline in year y.	$EF_{EG,FF,y}$	0.695 (tCO_2/MWh)
(7) Baseline emissions due to disposal of biomass residues in year y	$BE_{BR,y}$	4,157 (tCO_2e)

(8) Baseline emissions in year y	**(1)*(2)+(7)**	**69,916 (tCO_2e)**

4.2 Project Emissions

The anthropogenic emissions by sources of GHGs of the project activity in year y (PE_y) 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:

		2014
(1) Diesel used in the power boiler due to operational reasons.	$FC_{diesel,poject\ plant,y}$	36.44 (t/y)
(2) Diesel net calorific value.	$NCV_{FF,diesel,y}$	42.89 (GJ/t)
(3) Diesel CO_2 emission factor.	$EF_{FF,y,diesel}$	0.0748 (tCO_2/GJ)

		2014
(4) LPG used in the power boiler due to operational reasons.	$FC_{LPG,poject\ plant,y}$	0.04 (t/y)
(5) LPG net calorific value.	$NCV_{FF,LPG,y}$	46.33 (GJ/t)
(6) LPG CO_2 emission factor.	$EF_{FF,y,LPG}$	0.0656 (tCO_2/GJ)

Calculations:

		2014
(7) Emissions due to fossil fuel consumption in the power boiler.	(1)*(2)*(3)+(4)*(5)*(6)	117 (tCO_2/y)

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

Data:

		2014
(1) Fossil fuel used for on-site biomass transportation due to the project activity.	$FC_{diesel,poject\ site,y}$	36.72 (t/y)
(2) Fossil fuel net calorific value.	$NCV_{FF,diesel,y}$	42.89 (GJ/t)
(3) Fossil fuel CO_2 emission factor.	$EF_{FF,y,diesel}$	0.0748 (tCO_2/GJ)

Calculations:

		2014
(4) Emissions due to fossil fuel consumption for on-site transportation.	(1)*(2)*(3)	118 (tCO_2/y)

C) Fossil fuel consumption for processing biomass residues from forest operations

Data:

		2014
(1) Fossil fuel used for processing biomass from forestry operations.	$FC_{diesel,biomass\ processing,y}$	0 (t/y)
(2) Fossil fuel net calorific value.	$NCV_{FF,diesel,y}$	43.30 (GJ/t)
(3) Fossil fuel CO_2 emission factor.	$EF_{FF,y,diesel}$	0.0748 (tCO_2/GJ)

Calculations:

		2014
(4) Emissions due to fossil fuel consumption for processing forestry biomass residues.	(1)*(2)*(3)	0 (tCO_2/y)

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

		2014
Emissions due to fossil fuel consumption in the power boiler.	$FC_{diesel,poject\ site,y}$	117 (tCO_2/y)
Emissions due to fossil fuel consumption for on-site transportation	$FC_{diesel,poject\ site,y}$	118 (tCO_2/y)
Emissions due to fossil fuel consumption for processing forestry biomass residues.	$FC_{diesel,biomass\ processing,y}$	0 (tCO_2/y)

Total emissions.	**$PE_{FF,y}$**	**235 (tCO_2/y)**

2.- <u>Determination of $PE_{GR1,y}$</u>

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:

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

<u>Data:</u>

		2014
(1) Project electricity imports from the grid.	$EL_{PJ,imp,y}$	1,390 (MWh)
(2) Grid emission factor.	$EF_{EG,GR,y}$	0.695 (tCO_2/MWh)

<u>Calculations:</u>

			2014
Total emissions.	**(1)*(2)**	**$PE_{GR1,y}$**	**965 (tCO_2/y)**

3.- <u>Determination of $PE_{TR,y}$</u>

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

<u>Data:</u>

		2012
(1) Total mass of freight transported in freight transportation activity f.	$FR_{f,m}$	110,229 (BDt/y)
(2) Weight average calculation.	$\Sigma[D_{f,m}*FR_{f,m}]$	2,333,652
(3) Default CO_2 emission factor for freight transportation activity f.	EF_{CO2}	129

<u>Calculations:</u>

			2012
Total emissions.	$[(2)*(3)]/10^6$	$PE_{TR,y}$	301 (tCO_2/y)

4.- <u>Determination of $PE_{BR,y}$</u>

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):

$$PE_{BR,y} = GWP_{CH4} \cdot EF_{CH4,BR} \cdot \sum_{n} BR_{PJ,n,y} \cdot NCV_{BR,n,y}$$

<u>Data:</u>

		2014
(1) CH_4 Global Warming Potential.	GWP_{CH4}	25

(2) Adjusted CH_4 emission factor for controlled burning, biomass residues.	$EF_{CH4,BR}$	0.000030 ($kgCH_4$/TJ)
(3) Conservativeness factor.		1.37
(4) Biomass residues (sawdust and bark) from internal industrial operations.	$BR_{PJ,1,y}$	52,740 (BDt/y)
(5) Biomass residues (mix of sawdust and bark) from external industrial operations.	$BR_{PJ,3,y}$	66,681 (BDt/y)
(6) Biomass residues (mix of sawdust and bark) from forestry operations.	$BR_{PJ,4,y}$	0 (BDt/y)
(7) Net calorific value (NCV) of biomass residues from on-site industrial ops.	$NCV_{BR,1,y}$	18.89 (GJ/t)
(8) Net calorific value (NCV) of biomass residues (mix of sawdust and bark) from off-site industrial ops.	$NCV_{BR,3,y}$	18.85 (GJ/t)
(9) Net calorific value of biomass residues (mix of sawdust and bark) from on-site industrial op.*	$NCV_{BR,4,y}$	0.00 (GJ/t)

Calculations:

			2014
Total emissions.	(1)*[(2)*(3)]*[(4)*(7)+(5)*(8)+(6)*(9)]	$PE_{BR,y}$	2,315 (tCO_2/y)

Total project emissions

Project emission sources.		**2014**
Emissions due to fossil fuel consumption at the project site.	$PE_{FF,y}$	235 (tCO_2e)
Emissions due to grid electricity imports to the project site.	$PE_{GR1,y}$	965 (tCO_2e)
Emissions due to transport of the biomass residues to the project plant.	$PE_{TR,y}$	301 (tCO_2e)
Emissions from the combustion of biomass residues.	$PE_{BR,y}$	2,315 (tCO_2e)
Total project activity emissions (*).	$\mathbf{PE_y}$	**3,817 (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 up. Exact values can be viewed directly in emission reduction calculation spreadsheet.

4.3 Leakage

According to the detailed Excel spreadsheet presented during the validation process Viñales Power Plant Project, the supply/demand indexes for each biomass types consumed by the project activity are clearly higher than 1.25 as is established by the criteria of the ACM0006 (Version12.1.1). Viñales Validation Report (page 16 and 17) indicates that the project activity counts with enough biomass locally, and therefore, is not causing other biomass plants in the area to switch to fossil fuels.

As described section 3.3 of the registered PD, page 65 supply/demand indexes that Project Participant has performed in a detailed research, is anticipated that there are no leakage from the implementation of the project activity.

$$Ly = 0$$

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)
2014 (01/07/2014-31/12/2014)	69,916	3,817	0	66,099
Total	69,916	3,817	0	66,099

*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.

APPENDIX A: EMISSION FACTOR FOR CHILEAN CENTRAL INTERCONECTED SYSTEM-SIC, 2014

	Power plants	**FUEL TYPE**	**Net annual operation corrected by CDEC-SIC (MWh)**
	Run of the river		
1	Los Molles	Hydro	23,412
2	Sauce Andes	Hydro	4,651
3	Aconcagua Ublanco	Hydro	13,961
4	Aconcagua Ujuncal	Hydro	107,042
5	Los Quilos	Hydro	186,649
6	Florida	Hydro	90,376
7	Maitenes	Hydro	108,540
8	Alfalfal	Hydro	694,244
9	Queltehues	Hydro	307,176
10	Puntilla	Hydro	95,913
11	Volcan	Hydro	89,861
12	Los Morros	Hydro	11,513
13	Sauzal 50Hz	Hydro	386,364
14	Sauzal 60Hz	Hydro	0
15	Sauzalito	Hydro	68,023
16	Curillinque	Hydro	504,974
17	San Ignacio	Hydro	174,098
18	Loma Alta	Hydro	223,833
19	Rucue	Hydro	765,480
20	Pullinque	Hydro	218,701
21	Pilmaiquén	Hydro	249,997
22	Capullo	Hydro	67,020
23	Peuchén	Hydro	91,050
24	Mampil	Hydro	143,547
25	Chacabuquito	Hydro	112,206
26	Antuco	Hydro	1,281,925
27	Abanico	Hydro	258,581
28	Isla	Hydro	401,815
29	Machicura	Hydro	429,635
30	Eyzaguirre	Hydro	4,978
31	Quilleco	Hydro	315,016
32	El Rincón	Hydro	1,705
33	Chiburgo	Hydro	59,155
34	Palmucho	Hydro	241,176
35	Hornitos	Hydro	164,648
36	Puclaro	Hydro	1,526
37	Ojos de Agua	Hydro	48,176
38	Coya	Hydro	87,672
39	Lircay	Hydro	122,580
40	El Manzano	Hydro	26,291
41	Pehui	Hydro	7,456
42	Truful Truful	Hydro	5,630
43	La Paloma	Hydro	0
44	Trueno	Hydro	24,946
45	San Clemente	Hydro	15,997
46	Los Bajos	Hydro	33,329
47	Auxiliar del Maipo	Hydro	21,828
48	La Higuera	Hydro	459,352
	Run of the river		
49	Juncalito	Hydro	2,952
50	El Tártaro	Hydro	0
51	Guayacán	Hydro	75,731
52	Confluencia	Hydro	374,872
53	Mariposas	Hydro	23,150
54	Los Corrales	Hydro	6,026
55	Los Corrales II	Hydro	5,524
56	Carena	Hydro	64,024
57	Diuto	Hydro	24,735
58	Dongo	Hydro	21,887
59	Mallarauco	Hydro	25,341
60	Licán	Hydro	85,175
61	Chacayes	Hydro	446,674
62	Muchi	Hydro	3,047
63	La Arena	Hydro	17,959
64	Reca	Hydro	8,596
65	Purísima	Hydro	2,312
66	Allipén	Hydro	18,117
67	El Canelo	Hydro	17,398
68	Nalcas	Hydro	28,524
69	Callao	Hydro	11,401
70	Rucatayo	Hydro	269,084
71	Renaico	Hydro	47,293
72	Providencia	Hydro	26,349
73	Don Walterio	Hydro	22,901
74	Robleria	Hydro	15,928
75	MC1	Hydro	44,040
76	MC2	Hydro	11,675
77	Ensenada	Hydro	5,127
78	Río Huasco	Hydro	4,322
79	San Andrés	Hydro	103,350
80	El Llano	Hydro	4,518
81	Las Vertientes	Hydro	10,384
82	Laja 1	Hydro	59,349
83	Los Hierros	Hydro	104,654
84	Maisan	Hydro	1,900
85	Los Padres	Hydro	4,410
86	Alto Renaico	Hydro	0
87	Quillaileo	Hydro	545
88	Pichilonco	Hydro	1,548
89	Donguil	Hydro	1,386
90	María Elena	Hydro	2,086
91	Collil	Hydro	2,184
92	Doña Hilda	Hydro	342
93	El Arrayán	Hydro	248
94	Contra	Hydro	1,247
95	Boquiamargo	Hydro	4,778
96	Los Colonos	Hydro	1,221

	Power plants	**FUEL TYPE**	**Net annual operation corrected by CDEC-SIC (MWh)**	**FUEL CONSUMPTION**	**UNIT**
	Thermics				
97	Taltal 2 GNL	LNG	114,017	34.547	MM-m3std
98	Taltal 2	Natural Gas	0	NO GENERATION IN 2014	
99	Taltal 2 Diesel	Diesel	1,254	0.319	000'ton
100	Taltal 1 GNL	LNG	76,748	23.255	MM-m3std
101	Taltal 1	Natural Gas	0	NO GENERATION IN 2014	
102	Taltal 1 Diesel	Diesel	7,356	1.872	000'ton
103	D. Almagro	Diesel	204	0.069	000'ton
104	El Salvador	Diesel	77	0.026	000'ton
105	Guacolda 1	Coal	1,111,660	400.198	000'ton
106	Guacolda 2	Coal	1,170,503	421.381	000'ton
107	Guacolda 3	Coal	1,097,217	384.026	000'ton
108	Guacolda 4	Coal	1,139,333	398.767	000'ton
109	Huasco TG	Diesel	393	0.137	000'ton
110	Huasco TG IFO	IFO 180	90	0.034	000'ton
111	L.Verde TG	Diesel	0	NO GENERATION IN 2014	
112	Los Vientos TG	Diesel	10,064	2.701	000'ton
113	Nehuenco	Natural Gas	0	NO GENERATION IN 2014	
114	Nehuenco Diesel	Diesel	228,247	37.056	000'ton
115	Nehuenco GNL	LNG	1,055,742	208.298	MM-m3std
116	Nehuenco TG 9B	Natural Gas	0	NO GENERATION IN 2014	
117	Nehuenco TG 9B Diesel	Diesel	4,721	1.311	000'ton
118	Nehuenco TG 9B GNL	LNG	1,979	0.625	MM-m3std
119	Nehuenco II	Natural Gas	0	NO GENERATION IN 2014	
120	Nehuenco II Diesel	Diesel	104,476	16.956	000'ton
121	Nehuenco II GNL	LNG	1,891,163	342.679	MM-m3std
122	San Isidro	Natural Gas	0	NO GENERATION IN 2014	
123	San Isidro Diesel	Diesel	19,929	3.797	000'ton
124	San Isidro GNL	LNG	1,698,099	344.714	MM-m3std
125	San Isidro II	Natural Gas	3	0.001	MM-m3std
126	San Isidro II Diesel	Diesel	38,367	6.623	000'ton
127	San Isidro II GNL	LNG	2,324,468	419.889	MM-m3std
128	Ventanas 1	Coal	707,526	293.623	000'ton
129	Ventanas 2	Coal	1,116,847	443.388	000'ton
130	Nueva Ventanas	Coal	1,998,541	759.445	000'ton
131	L.Verde	Coal	0	NO GENERATION IN 2014	
132	Nueva Renca GNL	LNG	414,530	83.929	MM-m3std
133	Nueva Renca FA	LPG	22,370	4.426	000'ton
134	Nueva Renca FA GNL	LNG	3,668	0.926	MM-m3std
135	Nueva Renca	LNG	0	NO GENERATION IN 2014	
136	Nueva Renca Diesel	Diesel	708,058	135.355	000'ton

	Power plants	FUEL TYPE	Net annual operation corrected by CDEC-SIC (MWh)	FUEL CONSUMPTION	UNIT
	Thermics				
137	Renca U1	Diesel	0	NO GENERATION IN 2014	
138	Renca U2	Diesel	0	NO GENERATION IN 2014	
139	Campiche	Coal	1,973,623	770.131	000'ton
140	Constitución A.	Biomass	29,585	NO FOSSIL FUEL	
141	Constitución A. IFO	Fuel oil 6	0	NO GENERATION IN 2014	
142	Petropower	Petcoke	444,843	200.179	000'ton
143	Laja	Biomass	36,245	NO FOSSIL FUEL	
144	Bocamina	Coal	477,434	181.425	000'ton
145	Bocamina 2	Coal	0	NO GENERATION IN 2014	
146	Arauco	Biomass	86,655	NO FOSSIL FUEL	
147	San Fco. Mostazal	Diesel	91	0.028	000'ton
148	Cholguán	Biomass	75,106	NO FOSSIL FUEL	
149	Cholguán IFO	Fuel oil 6	0	NO GENERATION IN 2014	
150	Licantén	Biomass	23,572	NO FOSSIL FUEL	
151	Licantén LN	Biomass	21,387	NO FOSSIL FUEL	
152	Valdivia	Biomass	200,372	NO FOSSIL FUEL	
153	Valdivia Biomasa	Biomass	123,691	NO FOSSIL FUEL	
154	Valdivia IFO	Fuel oil 6	1,558	0.499	000'ton
155	Antilhue TG	Diesel	59,168	13.765	000'ton
156	Horcones TG	Natural Gas	0	NO GENERATION IN 2014	
157	Horcones Diesel	Diesel	9	0.003	000'ton
158	TG_Coronel	Natural Gas	2,411	NO GENERATION IN 2014	
159	TG_Coronel Diesel	Diesel	20,601	5.161	000'ton
160	Nueva Aldea	Biomass	82,941	NO FOSSIL FUEL	
161	Nueva Aldea 2	Diesel	0	NO GENERATION IN 2014	
162	Nueva Aldea 3	Biomass	274,810	NO FOSSIL FUEL	
163	Viñales	Biomass	178,458	NO FOSSIL FUEL	
164	Candelaria 1	Natural Gas	0	NO GENERATION IN 2014	
165	Candelaria 1 Diesel	Diesel	6,773	1.840	000'ton
166	Candelaria 1 GNL	LNG	2,115	0.665	MM-m3std
167	Candelaria 2	Natural Gas	0	NO GENERATION IN 2014	
168	Candelaria 2 Diesel	Diesel	5,936	1.612	000'ton
169	Candelaria 2 GNL	LNG	796	0.250	MM-m3std
170	Curanilahue	Diesel	95	0.022	000'ton
171	Lebu	Diesel	146	0.035	000'ton
172	Cañete	Diesel	189	0.046	000'ton
173	Los Sauces	Diesel	554	0.134	000'ton
174	Los Sauces II	Diesel	243	0.061	000'ton

	Power plants	**FUEL TYPE**	**Net annual operation corrected by CDEC-SIC (MWh)**	**FUEL CONSUMPTION**	**UNIT**
	Thermics				
175	Traiguen	Diesel	158	0.038	000'ton
176	Victoria	Diesel	0	NO GENERATION IN 2014	
177	Curacautin	Diesel	704	0.155	000'ton
178	Ancud	Diesel	0	NO GENERATION IN 2014	
179	Collipulli	Diesel	0	0.000	000'ton
180	Quellon	Diesel	0	NO GENERATION IN 2014	
181	Yungay G1	Natural Gas	0	NO GENERATION IN 2014	
182	Yungay G2	Natural Gas	0	NO GENERATION IN 2014	
183	Yungay G3	Natural Gas	0	NO GENERATION IN 2014	
184	Yungay Diesel 1	Diesel	87	0.024	000'ton
185	Yungay Diesel 2	Diesel	57	0.014	000'ton
186	Yungay Diesel 3	Diesel	0	NO GENERATION IN 2014	
187	Yungay 4 CC	Diesel	53	0.016	000'ton
188	Casablanca 1	Diesel	39	0.010	000'ton
189	Casablanca 2	Diesel	0	NO GENERATION IN 2014	
190	Las Vegas	Diesel	95	0.023	000'ton
191	Curauma	Diesel	81	0.021	000'ton
192	Concon	Diesel	111	0.027	000'ton
193	Escuadrón (ex FPC)	Biomass	77,824	NO FOSSIL FUEL	
194	Constitución 1	Diesel	1,569	0.442	000'ton
195	Maule	Diesel	588	0.166	000'ton
196	Monte Patria	Diesel	0	0.000	000'ton
197	Punitaqui	Diesel	36	0.010	000'ton
198	Esperanza 1	Diesel	23	0.006	000'ton
199	Esperanza 2	Diesel	38	0.009	000'ton
200	Esperanza TG	Diesel	0	NO GENERATION IN 2014	
201	Degan	Diesel	340	0.074	000'ton
202	Olivos	Diesel	6,556	1.477	000'ton
203	Totoral	Diesel	105	0.024	000'ton
204	Quintay	Diesel	203	0.047	000'ton
205	Placilla	Diesel	148	0.034	000'ton
206	Chiloé	Diesel	0	NO GENERATION IN 2014	
207	Quellon II	Diesel	1,624	0.386	000'ton
208	Colmito	Diesel	5,861	1.461	000'ton
209	Los Pinos	Diesel	127,882	24.684	000'ton
210	Chuyaca	Diesel	1,505	0.358	000'ton
211	Chuyaca 2	Diesel	0	NO GENERATION IN 2014	

	Power plants	**FUEL TYPE**	**Net annual operation corrected by CDEC-SIC (MWh)**	**FUEL CONSUMPTION**	**UNIT**
	Thermics				
212	Skretting	Diesel	2	0.000	000'ton
213	Cenizas	Diesel	0	NO GENERATION IN 2014	
214	Santa Lidia	Diesel	293	0.078	000'ton
215	Trapén	Diesel	25,422	5.586	000'ton
216	Los Espinos	Diesel	45,146	9.959	000'ton
217	San Gregorio	Diesel	77	0.017	000'ton
218	Linares Norte	Diesel	35	0.008	000'ton
219	Biomar	Diesel	0	NO GENERATION IN 2014	
220	Eagon	Diesel	459	0.102	000'ton
221	Salmofood I	Diesel	0	NO GENERATION IN 2014	
222	Salmofood II	Diesel	0	NO GENERATION IN 2014	
223	Teno	Diesel	11,968	2.630	000'ton
224	Newen Diesel	Diesel	0	NO GENERATION IN 2014	
225	Newen Butano	LPG	23,629	5.807	000'ton
226	Newen Propano	LPG	860	0.209	000'ton
227	Newen Gas Natural	Natural Gas	20	0.068	MM-m3std
228	Newen Mezcla Butano/	LPG	0	NO GENERATION IN 2014	
229	Watts I	Diesel	5	0.001	000'ton
230	Watts II	Diesel	11	0.002	000'ton
231	Multiexport I	Diesel	3	0.000	000'ton
232	Multiexport II	Diesel	4	0.001	000'ton
233	Los Álamos	Diesel	7	0.002	000'ton
234	Cardones (ex-Tierra Ama	Diesel	41	0.010	000'ton
235	Quintero DIESEL A	Diesel	0	NO GENERATION IN 2014	
236	Quintero DIESEL B	Diesel	0	NO GENERATION IN 2014	
237	Quintero GNL A	LNG	96,464	30.962	MM-m3std
238	Quintero GNL B	LNG	148,893	45.853	MM-m3std
239	Louisiana Pacific	Diesel	22	0.005	000'ton
240	El Peñón	Diesel	63,868	14.117	000'ton
241	San Lorenzo de D. de Al	Diesel	110	0.038	000'ton
242	San Lorenzo de D. de Al	Diesel	39	0.015	000'ton
243	San Lorenzo de D. de Al	Diesel	172	0.056	000'ton
244	Tapihue	Natural Gas	1,591	0.472	MM-m3std
245	Termopacífico	Diesel	3,246	0.702	000'ton
246	Loma Los Colorados	Biomass	3,499	NO FOSSIL FUEL	
247	Loma Los Colorados II	Biomass	130,695	NO FOSSIL FUEL	

	Power plants	**FUEL TYPE**	**Net annual operation corrected by CDEC-SIC (MWh)**	**FUEL CONSUMPTION**	**UNIT**
	Thermics				
248	Emelda U1	IFO 180	97	0.029	000'ton
249	Emelda U2	IFO 180	48	0.015	000'ton
250	Colihues IFO	IFO 380	30,891	6.868	000'ton
251	Colihues DIE	Diesel	0	NO GENERATION IN 2014	
252	Curicó	Coal	0	NO GENERATION IN 2014	
253	Punta Colorada IFO	IFO 380	22,093	5.059	000'ton
254	Punta Colorada Diesel	Diesel	620	0.125	000'ton
255	Cabrero	Biomass	55,016	NO FOSSIL FUEL	
256	Calle Calle	Diesel	3,183	0.704	000'ton
257	Cem Bio Bio IFO	Fuel oil 6	25,857	5.693	000'ton
258	Cem Bio Bio DIESEL	Diesel	478	0.092	000'ton
259	Polincay	Diesel	0	NO GENERATION IN 2014	
260	Southern	Diesel	1	0.000	000'ton
261	Lautaro	Diesel	28	0.008	000'ton
262	HBS	Biomass	2,847	NO FOSSIL FUEL	
263	Tomaval	LNG	2,910	0.000	MM-m3std
264	Skretting Osorno	Diesel	31	0.006	000'ton
265	Energía Pacífico	Biomass	95,773	NO FOSSIL FUEL	
266	Lonquimay	Diesel	164	0.044	000'ton
267	Tirúa	Diesel	49	0.020	000'ton
268	Lautaro-Comasa	Biomass	192,434	NO FOSSIL FUEL	
269	Lautaro-Comasa 2	Biomass	51,161	NO FOSSIL FUEL	
270	Danisco	Diesel	0	0.000	000'ton
271	Contulmo	Diesel	188	0.042	000'ton
272	JCE	Diesel	28	0.006	000'ton
273	Santa María	Coal	2,424,526	866.349	000'ton
274	Estancilla	Diesel	85	0.020	000'ton
275	Trebal Mapocho	Biomass	41,221	NO FOSSIL FUEL	
276	Laja CMPC	Biomass	84,297	NO FOSSIL FUEL	
277	Tamm	Biomass	318	NO FOSSIL FUEL	
278	Ancali	Biomass	6,316	NO FOSSIL FUEL	
279	Santa Fe	Biomass	429,698	NO FOSSIL FUEL	
280	Santa Marta	Biomass	97,343	NO FOSSIL FUEL	
281	Santa Irene	Biomass	2,895	NO FOSSIL FUEL	
282	Las Pampas	Biomass	1,315	NO FOSSIL FUEL	
283	CMPC Pacífico	Biomass	175,967	NO FOSSIL FUEL	
284	Leon (Ex Coelemu)	Biomass	17,873	NO FOSSIL FUEL	
285	Energía Bio Bio	Biomass	40,592	NO FOSSIL FUEL	
286	Biocruz	Biomass	3,065	NO FOSSIL FUEL	
287	CMPC Santa Fe	Biomass	4,516	NO FOSSIL FUEL	

	Power plants	**FUEL TYPE**	**Net annual operation corrected by CDEC-SIC (MWh)**
	Reservoirs		**12,661,019**
288	El Toro	Hydro	944,157
289	Rapel	Hydro	478,836
290	Canutillar	Hydro	961,551
291	Cipreses	Hydro	270,207
292	Colbun	Hydro	1,957,369
293	Pehuenche	Hydro	2,269,059
294	Pangue	Hydro	1,835,108
295	Ralco	Hydro	2,617,045
290	Angostura	Hydro	1,288,991
	Wind		**1,210,614**
291	Canela 1	Wind	27,331
292	Canela 2	Wind	129,530
293	Lebu (Cristoro)	Wind	11,805
294	Totoral (eólica)	Wind	88,599
295	Monte Redondo	Wind	108,597
296	Ucuquer	Wind	19,108
297	Ucuquer 2	Wind	8,104
298	Talinay	Wind	228,856
299	Punta Colorada eólico	Wind	21,469
300	Negrete	Wind	94,948
301	El Arrayán	Wind	183,873
302	San Pedro	Wind	77,764
303	Eólica Los Cururos	Wind	149,229
304	Eólica Punta Palmeras	Wind	27,636
305	Eólica Taltal	Wind	29,561
	Solar		**373,786**
306	Tambo Real	Sun	3,772
307	SDGx01	Sun	1,442
308	Salvador RTS	Sun	5,266
309	Llanos de Llampos	Sun	218,498
310	Solar San Andrés	Sun	99,136
311	Santa Cecilia	Sun	5,631
312	Techos de Altamira	Sun	22
313	Solar Diego de Almagr	Sun	25,589
314	Solar PSF Pama	Sun	2,040
315	Solar PSF Lomas Color	Sun	2,181
316	Solar Las Terrazas	Sun	851
317	Solar PV Salvador	Sun	6,480
318	Solar Hornitos	Sun	474
319	Solar Chañares	Sun	2,342

APPENDIX B: MONITORING PLAN, CRITICAL EQUIPMENT

Name	***Parameter***	***TAG - PTV***	***Manufacturer***	***Model***	***Serial number***	***Span***	***Accuracy***
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%
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%
Temperature transmitter High pressure line	$HC_{BL,y}$	663-TT-0157	ENDRESS + HAUSER	TH53-8A23E2E2B31AK	266161	0-600°C	±0.75%
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
Flow transmitter high pressure line	$HC_{BL,y}$	665-FT-9030	ROSEMOUNT	2051CD2F02A1A55Q4	33712	(0 a 200) inH2O	±0.05% of span
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
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
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
Flow transmitter Medium pressure line	$HC_{BL,y}$	665-FT-9051	ROSEMOUNT	2051CD2F02A1AS5Q4 - 0305RC32B11B4	107763	0 – 40 ton/h	±0.05% of span
Temperature transmitter Medium pressure line	$HC_{BL,y}$	665-TT-9026	ROSEMOUNT	644HFNAJ6Q4	0271897	0-450 ºC	±0.03% of span
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
Steam flow transmitter Low pressure line	$HC_{BL,y}$	665-FT-9019	ROSEMOUNT	2051CD2F02A1AS5Q4	33709 0033709	0 – 30 ton/h	±0.05% of span
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
Temperature transmitter Medium pressure line	$HC_{BL,y}$	665-TT-9024	ROSEMOUNT	644HFNAJ6Q4	0271896	0-450 ºC	±0.03% of span
Feed water conditions pressure transmitter	$HC_{BL,y}$	663-PT-0106	ENDRESS + HAUSER	PMD75-ARC1WB1UBGAU	D500BE0109C	0 – 120 bar (G)	±0.075%
Feed water conditions temperature transmitter	$HC_{BL,y}$	663-TT-0111	ROSEMOUNT	644HFNAJ6Q4	265913	0-200 ºC	±0.03% of span

Name	***Parameter***	***TAG - PTV***	***Manufacturer***	***Model***	***Serial number***	***Span***	***Accuracy***
Energy meter Gross power generation	$EL_{PJ,gross,y}$	8600-10	SCHNEIDER ELECTRIC	ION 8600	LT-1012A701-01	kWh-kVARH Entregada	± 0.2%
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%
Energy meter Import power generation	$EL_{PJ,imp,y}$	8600-2_3	SCHNEIDER ELECTRIC	ION 8600	MT-1010A242-01	kWH-kVARH Recibida	± 0.2%
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%
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%
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%
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%
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%
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
Digital weight meter	Moisture content	-	Sartorius	TE1502S	27402265	0 - 1500 gr	
Oven	Moisture content	-	MEMMERT	UFE 600	G611.0831	30 - 250°C	±0.5 °C
Electronic moisture analyser	Moisture content	-	Sartorius	MA 150C	27008246	40 - 180°C 0-150 gr	±0.05%
Fossil fuel Flow transmitter	FCi,j,y	663-FT-508	ENDRESS + HAUSER	83F40-AABSAAACBAAK	D606EA16000	0-70 Ton/Hr	±0.1%
Fossil fuel Flow transmitter	FCi,j,y	663-FT-522	ENDRESS + HAUSER	33F25-AABSAAACBAAK	D606E916000	0-70 Ton/Hr	±0.5%