



**Monitoring report form**  
**(Version 05.1)**

*Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.*

**MONITORING REPORT**

<b>Title of the project activity</b>	VALDIVIA BIOMASS POWER PLANT	
<b>UNFCCC reference number of the project activity</b>	UNFCCC REF. N°: 1787	
<b>Version number of the monitoring report</b>	1	
<b>Completion date of the monitoring report</b>	18/08/2016	
<b>Monitoring period number and duration of this monitoring period</b>	Monitoring period #6 is from 01/01/2015 to 31/03/2016 (both days included).	
<b>Project participant(s)</b>	CELULOSA ARAUCO Y CONSTITUCIÓN S.A.	
<b>Host Party</b>	Chile.	
<b>Sectoral scope(s)</b>	Scope 1	
<b>Selected methodology(ies)</b>	ACM0006 ver. 5 - "Consolidated methodology for electricity generation from biomass residues".  ACM0002 Ver. 6, "Consolidated methodology for grid-connected electricity generation from renewable sources".	
<b>Selected standardized baseline(s)</b>	Not applicable	
<b>Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD</b>	Estimated amount of GHG emission reductions from 01 January of 2015 to 31 March of 2016: <b>169,435(tCO<sub>2eq</sub>)</b> .	
<b>Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period</b>	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	Not applicable	<b>158,782 (tCO<sub>2eq</sub>)</b> .

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

The project activity consists of a 550,000 (ADt/year)<sup>1</sup> pulp mill with a 61 MW of surplus power capacity to the grid. This surplus capacity allows the pulp mill to operate as a grid-connected power plant. The mill is located in the X Region of Chile.

The surplus electric power capacity of the mill is a result of the following initiatives:

- The installation of a high capacity biomass power boiler, designed for electric power generation.
- The construction of a more efficient pulp mill, capable of generating surplus electric power to the grid.

The project activity is designed to use black liquor and additional biomass from forest operations (bark and sawdust) for power cogeneration in the new pulp mill facility. The project activity is presented by Celulosa Arauco y Constitución S.A. (from now on, Arauco), a leading forestry and pulp-producing company in Chile.

Though modern pulp mills tend to be self-sufficient in heat and electric power generation, the Valdivia pulp mill was deliberately designed to generate a considerable amount of surplus power to the grid. This surplus is generated by burning black liquor in the recovery boiler and biomass from forest operations (from own and third party sources) in a power boiler, both inside the pulp mill facility. All the biomass consumed by the project activity is generated from sustainable forest operations. The additional electric power generation capacity of the pulp mill is a result of particular modifications of the mill that enable it to generate additional power to the grid. Such capacity would have not been available to the grid with a more conventional business-as-usual pulp mill design.

The reduction in greenhouse gas emissions is therefore accomplished through the displacement of grid electricity by carbon neutral surplus electricity generated by the pulp mill. An additional reduction of greenhouse gases is accomplished by the additional consumption of biomass from forest operations (a mix of sawdust and bark) to increase the surplus power generation of the mill. In a baseline scenario, this additional amount of biomass would not be used for energy purposes and would be dumped in piles for natural decay or burned in the open air in an uncontrolled manner.

Considering the higher cost of building a pulp mill with surplus power capacity, the decision of building such power plant relied on the possibility of not relying on the SIC grid for electric power, on selling excess power to the grid and on the potential benefits from being a CDM project activity.

The Valdivia project activity assists Chile's sustainable growth by providing electricity to the SIC grid through biomass power generation, which is a clean and renewable energy source. The Project Participant believes that biomass power generation constitutes a sustainable source of power generation that brings clear advantages to mitigate global warming. By using the available natural resources in a more efficient way, the Valdivia CDM project activity helps promote the development of renewable energy sources in Chile, in particular the use of biomass generated as a by-product of the forestry industry, which has a significant potential in the country. The Valdivia CDM project is a good example to demonstrate the viability of electricity generation as a source of revenue not only to the pulp industry, but also to all forest-related industries. It is worthy to highlight, however, that very few pulp mills in Chile have this additional power generation capacity. This makes the Valdivia pulp mill quite unique and particular in its type.

---

<sup>1</sup> ADt stands for "Air Dry ton".

Relevant dates for the project activity:

Date	Key events
September 2001	Start date
February 2004	Commissioning date
01/04/2009 to 31/12/2009.	The 1 <sup>st</sup> monitoring period.
01/01/2010 to 31/12/2010.	The 2 <sup>nd</sup> monitoring period.
01/01/2011 to 31/12/2012.	The 3 <sup>rd</sup> monitoring period.
01/01/2013 to 31/12/2013.	The 4 <sup>th</sup> monitoring period.
01/01/2014 to 31/12/2014.	The 5 <sup>th</sup> monitoring period.
01/01/2015 to 31/03/2016 (both days are included)	The 6 <sup>th</sup> monitoring period.

Total Net emission reductions

From Jan 1<sup>st</sup> 2015 to March 31<sup>st</sup> 2016: 158,782(tCO<sub>2</sub>eq)

## A.2. Location of project activity

The project activity is located in Chile, X Region of Valdivia, commune of San José de la Mariquina, in the province of Valdivia. It is located in km 788 of the 5-Sur highway in the Rucao sector. The Valdivia Region can be directly accessed from Santiago through the 5-Sur or Panamericana Sur highway. The project site is located in the following geographical coordinates 39°33'51" S and 72°53'41"W.

## A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
<b>Chile (Host)</b>	<b>Celulosa Arauco y Constitución S.A.</b>	<b>No</b>
<b>United Kingdom of Great Britain and Northern Ireland</b>	<b>Celulosa Arauco y Constitución S.A.</b>	<b>No</b>

## A.4. Reference of applied methodology and standardized baseline

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

- ACM0006 (Version 05), "Consolidated methodology for electricity generation from biomass residues".

The project activity also relies on the following methodologies and tools:

- ACM0002 (Version 06), "Consolidated methodology for grid-connected electricity generation from renewable sources".
- "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 02.2)
- "Tool for the demonstration and assessment of additionality" (Version 04)

**A.5. Crediting period of project activity**

Starting date of the first crediting period	01/04/2009
End date of the first crediting period	31/03/2016
Length of the first crediting period	Seven (7) years
Maximum length of the crediting period	3 x Seven (7) years

**A.6. Contact information of responsible persons/ entities**

Entity responsible for completing the CDM-MR-FORM:	Arauco Celulosa y Constitución S.A.
Contact person:	Christian Rodríguez
Mailing address:	Arauco Bioenergía S.A. Av. El Golf 150 Piso 7 Las Condes, Santiago Chile
Telephone number:	+56 2 2462-3888
E-mail address:	Christian.Rodriguez@arauco.cl

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

The project activity has been completed as planned and described in the Project Design Document (PDD). The starting date of the operation of the project activity was 01/04/2009 and it has operated as described in the CDM PDD.

Information on the operation of the project activity during the monitoring period is presented in table below:

	Out of service day	Back in operation	Number of hours	Comments
<b>Shutdown</b>				
Power boiler	-	-	-	-
Recovery boiler	-	-	-	-
Turbo generator 1	-	-	-	-
Turbo generator 2	11-05-2015	19-05-2015	176.9	Valve of steam extraction failure
<b>Maintenance Stoppage</b>				
Power boiler	23-11-2015	01-12-2015	202.0	General stoppage
Recovery boiler	21-11-2015	03-12-2015	280.7	General stoppage
Turbo generator 1	21-11-2015	03-12-2015	283.5	General stoppage
Turbo generator 2	24-06-2015	01-07-2015	151.3	Maintenance stoppage
Turbo generator 2	23-11-2015	02-12-2015	205.0	General stoppage

During the monitored period the following instruments were replaced or taken out of service:

TAG	Parameter	Old serial number.	Old Model number	New serial number.	N° Modelo Nuevo	Replacement date
352-FT-463	Magnetic flow meter	193441	8705TPA030C1W0 NAG1	289089	8705TPA030C1W0N0 G1	20/11/2015
352-FT-464	Magnetic flow meter in black liquor ring.	193442	8705TPA030C1W0 NAG1	272644	8705TPA030C1W0N0 G1	03/09/2015

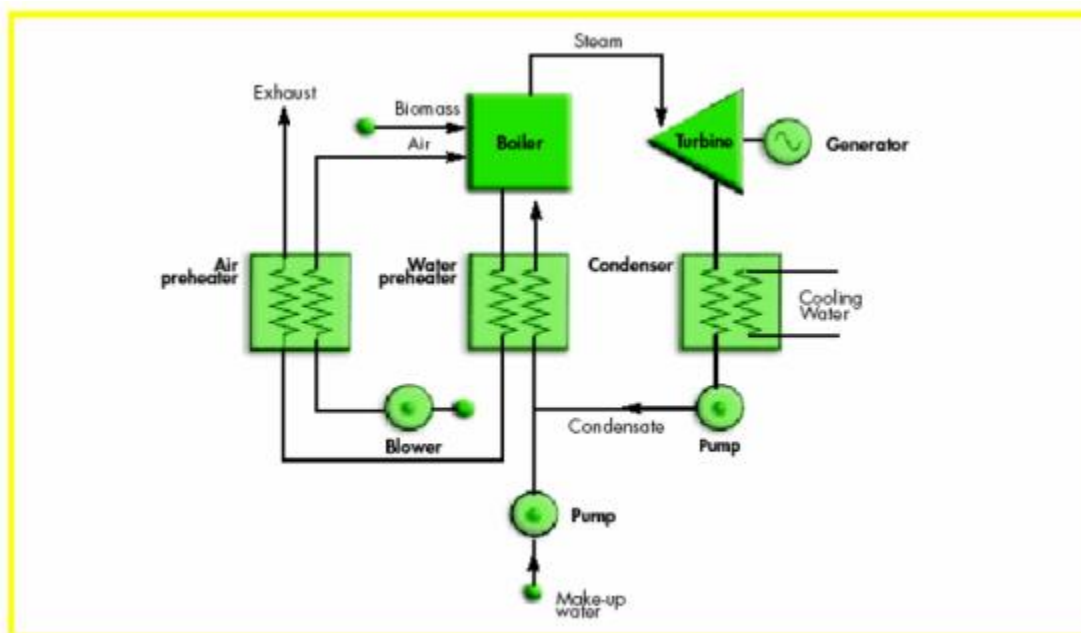
#### Description of the installed technology and equipment

The technology used in this project (which is also the predominant technology everywhere in 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.

The steam-Rankine cycle involves heating pressurized water, with the resulting steam expanding to drive a turbine-generator, 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 flue gases to preheat combustion air, and a deaerator must be used to remove dissolved oxygen from water before it enters the boiler.

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 vapour 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 (Figure 1). 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.

**Figure 1: Schematic diagram of a biomass-fired steam-Rankine cycle for cogeneration using a condensing-extraction steam turbine.**



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

## B.2. Post registration changes

### B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

#### B.2.2. Corrections

None

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

None

#### B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

No

### B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

The Project Participant presented a request for deviation of the baseline methodology during Validation process, so that two compatible baseline scenarios (N°3 and N°4) could be simultaneously applied to the proposed project activity. In this case, the additional net electric power generation of the project activity involving simultaneously scenarios N°3 and N°4, would be determined by following the indications of baseline scenario N°4, using formula N°14, which is used with some minors modifications included in page 120, Annex 3 of the registered PDD.

The approval date of the request for deviation was on December 13, 2007, and details of this approval are included in page 111, Annex 3 of the registered PDD.

**B.2.6. Changes to project design of registered project activity**

None.

**B.2.7. Types of changes specific to afforestation or reforestation project activity**

None

**SECTION C. Description of monitoring system**

The Project Participant, Arauco, 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.

Arauco is responsible for the operation and the monitoring of the project activity. 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. Support and consultancy regarding the CDM obligations is provided by Arauco Bioenergía S.A.<sup>2</sup>

Data collection procedures:

The highest attention is demanded by the parameters that should be continuously monitored by the Project Participant. These parameters are the most important data for the calculation of the achieved emission reduction.

The parameters such as the quantity of biomass residue used ( $BF_{k,y}$ ,  $BF_{T,k}$ ), fossil fuel consumption ( $FF_i$ ), quantity of heat generated ( $Q_{\text{projectplant}}$ ) and net quantity of electricity generated data ( $EG_{\text{projectplant}}$ ) are monitored continuously, online and fully integrated with the Distributed Control System (DCS) of the Valdivia pulp mill. The data is downloaded by the IP system and inserted automatically in an Excel spread sheet, and finally data is aggregated and reported monthly in the emission reduction calculation sheet.

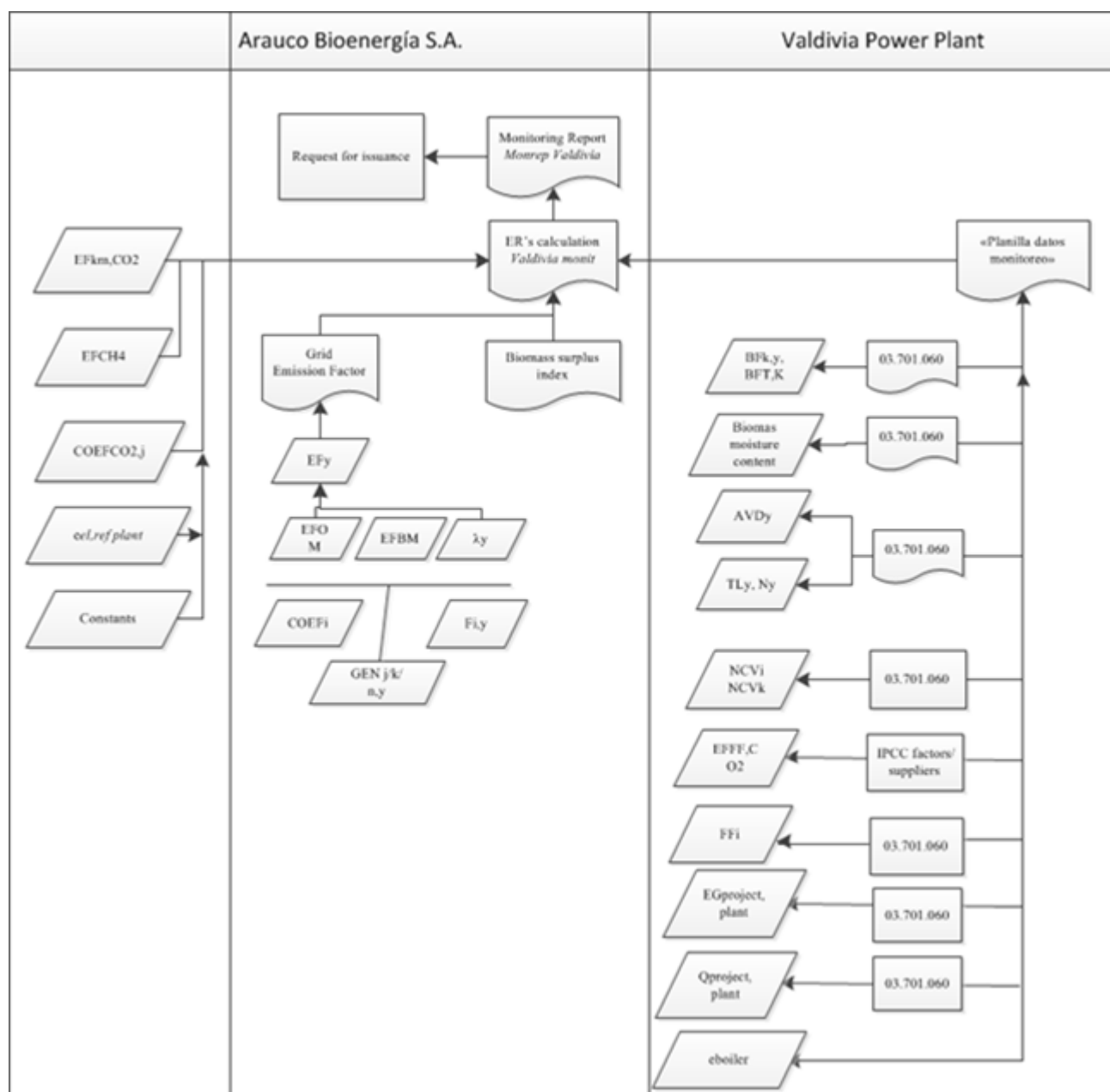
Biomass truckloads transported to the power plant are weighed by weighbridges installed at the Valdivia plant entrance. Data about return trip distance between biomass fuel supply sites and the project site and data about on-site use of transport fuel are informed by third parties.

The information is partially processed and stored on-site, and is sent to Arauco Bioenergía S.A. in Santiago for further and final processing (table formats, reports, etc.) that allow calculating the resulting emission reductions.

The following diagram describes the monitoring system:

---

<sup>2</sup> Arauco Bioenergía S.A. is the new name of Arauco Generación S.A.



The Project Participant informs that in document of # 03.701.060 is described the procedure of monitoring the CDM parameters used in the emission reduction calculations.

#### Procedure for emergency case:

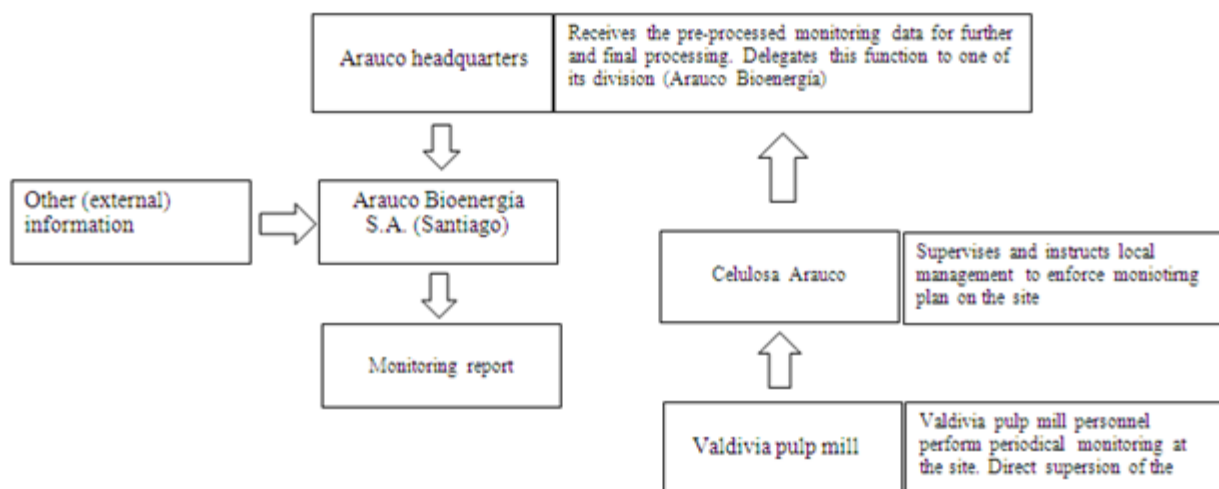
In case of unforeseen problems or failures of the data recording system the operating staffs informs the responsible person for the monitoring. In cases where no data are available due to failures of the monitoring equipment the responsible person for the monitoring decides as soon as possible which actions will be undertaken to minimise the amount of not registered GHG emission reduction. Furthermore, procedures in case of failures of monitoring equipment/instruments and IT systems, such as IP21, Lab21, and SRR are described in procedure 03.701.060.



As mentioned in the registered PDD, Arauco Bioenergía S.A. is responsible for gathering and processing all the monitored data for the emission reduction calculation for the monitored period which is normally carried out every year.

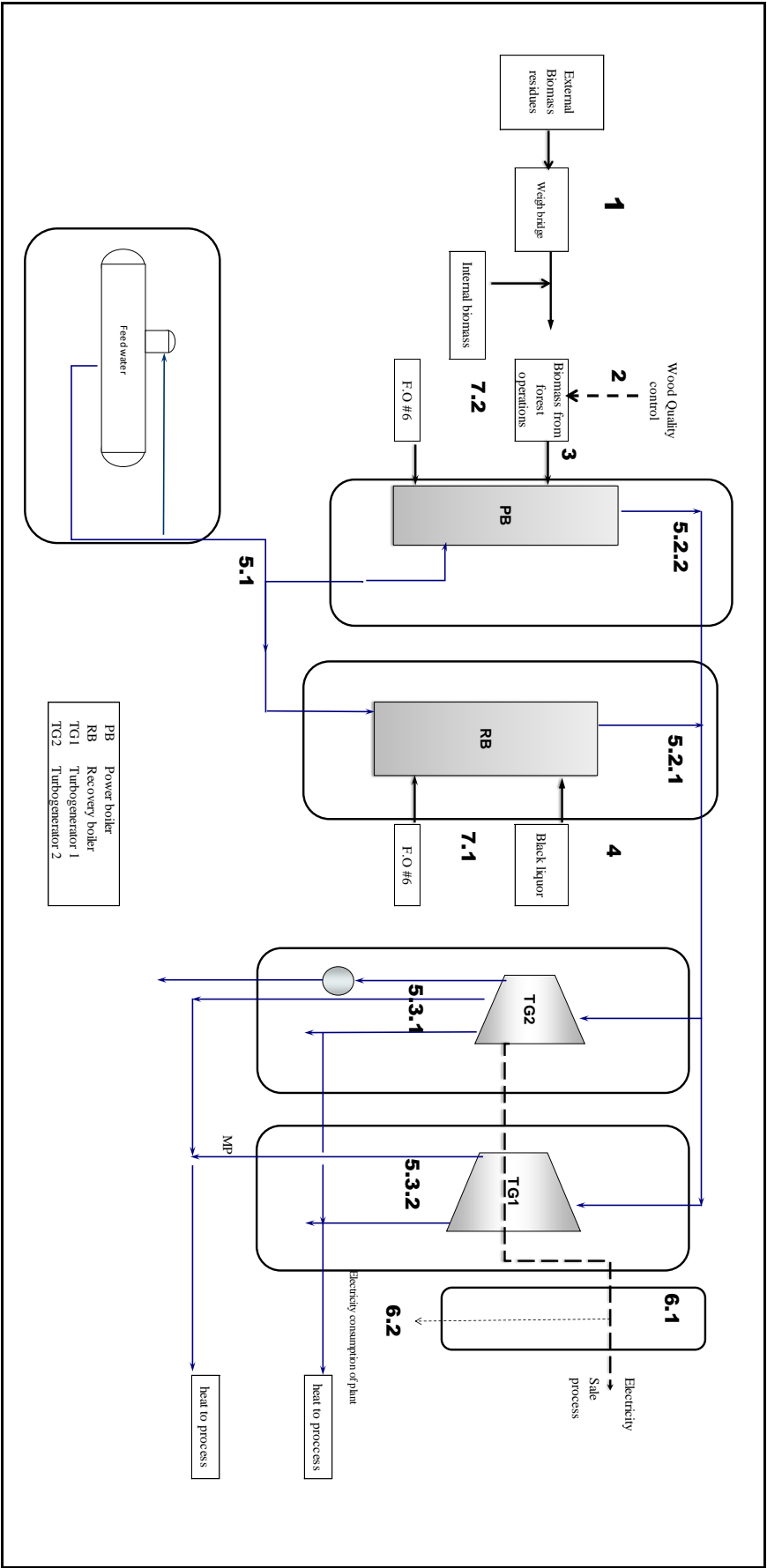
The monitoring information flow implemented by Arauco Bioenergía S.A. for the Valdivia CDM project activity is presents as follows:

Monitoring information flow of Valdivia Power Plant project activity



Calibration results of monitoring instruments for the monitoring period are presented in the following table:

ITEM	INSTRUMENT	VARIABLE	ITEM	MEASURED ERROR GREATER THAN ADMISSIBLE ERROR (YES/NO)	ADJUSTMENT MADE (YES / NO)
1	Weighbridge #1 South	TL <sub>1</sub>	330-WT-050	YES	YES
	Weighbridge #2 Center	TL <sub>1</sub>	330-WT-051	NO	NO
	Weighbridge #3 North	TL <sub>1</sub>	330-WT-052	ARE EQUAL	YES
2	Digital Scale	Moisture content of BF <sub>1,4</sub>	310-81-1150	NO	NO
	Digital Scale	Moisture content of BF <sub>1,4</sub>	310-81-1151	NO	NO
	Digital Scale	Moisture content of BF <sub>1,4</sub>	310-81-1213	ARE EQUAL	YES
	Drying Oven ULE 700 (400 - 500 L)	Moisture content of BF <sub>1,4</sub>	310-81-1154	NO	NO
	Drying Oven ULE 700 (400 - 500 L)	Moisture content of BF <sub>1,4</sub>	310-81-1155		
	Drying Oven ULE 700 (400 - 500 L)	Moisture content of BF <sub>1,4</sub>	310-81-1156		
3	Weightmeter	BF <sub>1,4</sub>	331-WT-005	NO	NO
4	Magnetic Flow Transmitter	BF <sub>1,4</sub>	352-FT-461	NO	NO
	Magnetic Flow Transmitter	BF <sub>1,4</sub>	352-FT-462	YES	YES
	Magnetic Flow Transmitter	BF <sub>1,4</sub>	352-FT-463	YES	YES
	Magnetic Flow Transmitter	BF <sub>1,4</sub>	352-FT-464	NO	NO
	Refractometer	Moisture content of BF <sub>1,4</sub>	352DT435A	NO	NO
	Refractometer	Moisture content of BF <sub>1,4</sub>	352DT435B	NO	NO
5.1.	Temperature Transmitter	Temperature of BF <sub>1,4</sub>	352TT430	NO	NO
	Pressure Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	362PT930	NO	NO
5.2.1.	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT901	YES	YES
5.2.2.	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT902	YES	YES
5.3.1.	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT910	NO	NO
	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT913	NO	NO
5.3.2.	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT914	YES	YES
	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT920	NO	NO
6.1.	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT923	NO	NO
	Differential Pressure Flow Transmitter	Q <sub>grain</sub> at plant <sub>1,4</sub>	365FT924	NO	NO
6.2.	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI203	NO	NO
	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI104	NO	NO
6.3.	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI105	NO	NO
	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI101	NO	NO
6.4.	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI102	NO	NO
	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI107	NO	NO
6.5.	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI201	NO	NO
	Energy Meter	EG <sub>grain</sub> at plant <sub>1,4</sub>	368JI205	NO	NO
7.1.	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	352FT653	CALIB NOT REQUIRED	YES (zero adjustment)
	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	352FT657	CALIB NOT REQUIRED	YES (zero adjustment)
7.2.	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	352FT681	CALIB NOT REQUIRED	YES (zero adjustment)
	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	352FT685	CALIB NOT REQUIRED	YES (zero adjustment)
7.3.	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	352FT823	CALIB NOT REQUIRED	YES (zero adjustment)
	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	363FT507	CALIB NOT REQUIRED	YES (zero adjustment)
7.4.	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	363FT510	CALIB NOT REQUIRED	YES (zero adjustment)
	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	363FT515	CALIB NOT REQUIRED	YES (zero adjustment)
7.5.	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	363FT518	CALIB NOT REQUIRED	YES (zero adjustment)
	Maz Flow Transmitter	FF <sub>grain</sub> at plant <sub>1,4</sub>	363FT518	CALIB NOT REQUIRED	YES (zero adjustment)



## SECTION D. Data and parameters

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

<b>Data / Parameter:</b>	<b>GWP<sub>CH4</sub></b>
Unit:	(tCO <sub>2</sub> e/tCH <sub>4</sub> )
Description:	Global Warming Potential for CH <sub>4</sub> .
Source of data:	IPCC
Value(s) applied:	25 (tCO <sub>2</sub> e/tCH <sub>4</sub> )
Choice of data or measurement methods and procedures:	IPCC
Purpose of data:	Calculation of baseline emissions.
Additional comment:	--

<b>Data / Parameter:</b>	<b><math>\varepsilon_{el,reference\ plant}</math></b>
Unit:	(%)
Description:	Average net energy efficiency of power in the reference power cogeneration plant that would use the biomass residues fired in the project plant in the absence of the project activity.
Source of data:	The electric efficiency of the Valdivia baseline mill was calculated from the KSH energy / mass balances
Choice of data or measurement methods and procedures:	Please refer to the revised PDD.
Value(s) applied:	11.971 %
Purpose of data:	Calculation of baseline emissions.
Additional comment:	---

<b>Data / Parameter:</b>	<b>Additional electric power consumption of the project mill</b>
Unit:	(%)
Description:	This is the additional electric power consumption of the project pulp mill with surplus power capacity generation to the grid with respect to a baseline pulp mill, which does not have surplus electric power capacity to the grid. This marginal higher power consumption is derived from the installation of the equipment that enables the project pulp mill to generate additional power (for example: the installation of a higher biomass capacity power boiler in the project mill, compared to the one that would have been installed in a baseline pulp mill).
Source of data:	Energy/mass balance performed by KSH Consulting.
Choice of data or measurement methods and procedures:	Energy/mass balance performed by KSH Consulting.

Value(s) applied:	Constant 4.59% of the total energy consumed by the pulp mill in the project scenario.
Purpose of data:	Calculation of baseline emissions.
Additional comment:	This variable is used to determine the net quantity of electricity generated in the project plant during the year.

<b>Data / Parameter:</b>	<b>Fuel oil consumption per unit of combusted biomass in the Valdivia mill power boiler</b>
Unit:	(kg of fuel oil/m <sup>3</sup> st)
Description:	This parameter refers to the amount of fuel oil that is normally co-fired in a fluidized bed biomass boiler. It considers normal operational reasons such as start-up operations and the wet condition of biomass in winter.
Source of data:	Historic fossil fuel and biomass consumption data from the Valdivia biomass power plant.
Choice of data or measurement methods and procedures:	Historic fossil fuel and biomass consumption data from the Valdivia biomass power plant.
Value(s) applied:	3.43 (kg of fuel oil/m <sup>3</sup> st)
Purpose of data:	Calculation of project emissions.
Additional comment:	In this case it is used to determine the fossil fuel consumption due to additional consumption of biomass from forest operations (sawdust and bark) in the power boiler.

## D.2. Data and parameters monitored

<b>Data / Parameter:</b>	<b>BF<sub>k,y</sub> (and BF<sub>T,k,y</sub>)</b>
Unit:	Tons of dry mater.
Description:	Quantity of biomass residue type k combusted in the project plant during the year y.
Measured/ Calculated / Default:	Measured.
Source of data:	<p>The project activity combusts two types of biomass residues: Black liquor from the pulping operation and a mix of sawdust and bark from forest operations.</p> <p><u>Biomass residues of type: Black liquor</u></p> <p>This variable was monitored continuously (online, each five seconds) and fully integrated with the Distributed Control System (DCS) using dedicated flow meters for measuring continuously black liquor flow (l/s) in combination with two (2) refract meters to measure average concentration (%) of solids, and one (1) transmitter to measure black liquor temperature (°C).</p> <p>To determine the dry biomass flow (tons of Dry Solids (tDS)), the total wet flow is automatically multiplied by the average concentration (%) of solids (in the DCS) by using the equation shown below.</p> <p style="text-align: center;">Black liquor (tDS/s) = black liquor flow (l/s) * (%) solids*density of black liquor (tDS/l).</p> <p>Black liquor flow (tDS/s) to the recovery boiler is transmitted to the pulp mill's DCS. This information is stored in the pulp mill's databases. The Operation Manager collects checks and informs the monitored integrated flow values to the person in charge of calculating emission reductions of the project activity in Arauco Bioenergía S.A.</p>

	<p><u>Biomass residues (mix of sawdust and bark) from forest operations</u></p> <p>Biomass from forest operations (in wet tons) combusted in the power boiler is directly monitored via an on-line weighmeter located at the entrance of the power boiler. This instrument transmits the monitored data to the pulp mill Distributed Control System (DCS). As in the previous case, the registered values are integrated collected and informed by the Operation Manager to the person in charge of calculating emission reductions of the project activity in Arauco Bioenergía S.A.</p> <p>Please note that according to the approved monitoring plan of the registered PDD (page 79), biomass residues (<math>BF_{T,k,y}</math>) used in equation N°4 of ACM0006 (Version 05) correspond to the fraction of <math>BF_{k,y}</math> attributable to the project activity that must be brought by truck from outside the plant. This fraction of <math>BF_{k,y}</math> is also utilized for the calculation of project emissions due to transportation of biomass residues to the power plant. This amount is duly measured (weight and volume) at the entrance of the power plant.</p>									
Value(s) of monitored parameter:	<p><u>Black liquor:</u></p> <table border="1" data-bbox="472 680 1331 800"> <tr> <td data-bbox="472 680 760 716"></td><td data-bbox="760 680 1045 716">2016</td><td data-bbox="1045 680 1331 716">2015</td></tr> <tr> <td data-bbox="472 716 760 751"></td><td data-bbox="760 716 1045 751">From 01Jan-31March</td><td data-bbox="1045 716 1331 751">From 01Jan to 31Dec</td></tr> <tr> <td data-bbox="472 751 760 800">Total</td><td data-bbox="760 751 1045 800">262,774</td><td data-bbox="1045 751 1331 800">1,026,899</td></tr> </table> <p>Period 01Jan to 31Dec, 2015  <u>Biomass residues (mix of sawdust and bark):</u> 176,523 (BDt or bone dry tons)</p> <p>Of 176,523 (BDt), only 101,690 (BDt) correspond to biomass attributable to the project activity that was brought to the power plant by trucks.</p> <p>Period 01Jan to 31March, 2016</p> <p><u>Biomass residues (mix of sawdust and bark):</u> 49,124 (BDt or bone dry tons)  Of 49,124 (BDt), only 23,747 (BDt) corresponds to biomass attributable to the project activity that was brought to the power plant by trucks.</p>		2016	2015		From 01Jan-31March	From 01Jan to 31Dec	Total	262,774	1,026,899
	2016	2015								
	From 01Jan-31March	From 01Jan to 31Dec								
Total	262,774	1,026,899								

Monitoring equipment:	<p><u>Black liquor:</u></p> <p>352FT461  Type: Magnetic flow transmitter Rosemount 8742C  Accuracy class: +/-0.25%  Serial number: Transmitter: 0860144486  Sensor: 0269172  Calibration frequency: 12 months  Calibration dates: 03/12/2013  Date of last calibration: 10/11/2014  Validity: 09/11/2015</p> <p>352FT462  Type: Magnetic flow transmitter Rosemount 8732E  Accuracy class: +/-0.25%  Serial numbers: 0312404  Calibration frequency: 12 months  Calibration dates: 03/12/2013  Date of last calibration: 10/11/2014  Validity: 09/11/2015</p> <p>352FT463  Type: Magnetic flow transmitter Rosemount 8732E  Accuracy class: +/-0.25%  Serial numbers: 0312403  Calibration frequency: 12 months  Calibration dates: 03/12/2013  Date of last calibration: 10/11/2014  Validity: 09/11/2015</p> <p>352FT464  Type: Magnetic flow transmitter Rosemount 8732E  Accuracy class: +/-0.25%  Serial numbers: 0312399  Calibration frequency: 12 months  Calibration dates: 03/12/2013  Date of last calibration: 10/11/2014  Validity: 09/11/2015</p> <p>352TT430  Type: Temperature Transmitter. ROSEMOUNT  3144PD1A1NAB4M5F5C8C4Q4  Accuracy class: +/- 0.21°C  Serial number: 0618822  Calibration frequency: 1 year  Calibration dates: 27/11/2013  Date of last calibration: 13/11/2014  Validity: 12/11/2015</p> <p>352DT435A  Type: Refract meter. K-PATENTS IT-RE-GP  Accuracy class: +/- 0.1%  Serial number: 2002-D42-5099  Calibration frequency: 2 Years  Calibration dates: 04/11/2013, 06/05/2014  Date of last calibration: 05/11/2014  Validity: 04/11/2016</p>
-----------------------	---

	<p>352DT435B  Type: Refract meter. K-PATENTS IT-RE-GP  Accuracy class: +/- 0.1%  Serial number: 2002-D43-5100  Calibration frequency: 2 Years  Calibration dates: 05/11/2013, 05/05/2014  Date of last calibration: 05/11/2014  Validity: 04/11/2016</p> <p><u>Biomass residues (mix of sawdust and bark) from forest operations</u></p> <p>331-WT-005  Type: Weight meter. RAUTE PRECISION WB910  Accuracy class: +/- 0.6kg  Serial number: 2472377  Calibration frequency: 1 year  Calibration dates: 13/11/2012, 10/04/2014  Date of last calibration: 16/10/2014  Validity: 15/10/2015</p>
Measuring/ Reading/ Recording frequency:	<p>The measurements of biomass residues of type black liquor are taken continuously (each five seconds) online and fully integrated with the Distributed Control System (DCS). Data of biomass consumption is aggregated and reported monthly in the emission reduction calculation sheet.</p> <p>Biomass residues from forestry operations are continuously measured by a proper instrument and the data obtained are fully integrated with the DCS. Data are recorded and aggregated monthly in the emission reduction calculation sheet.</p>
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	<p>Both biomass types (black liquor and biomass from forest operations) were measured by proper and dedicated meters.</p> <p>All meters were calibrated and maintained according to the manufacturer's specifications and/or according to proper industry standards. Maintenances and calibrations were planned according to a specific schedule, which is part of the quality system implemented in the pulp mill.</p> <p><u>Biomass residues (mix of sawdust and bark) from forest operations.</u></p> <p>The mix of biomass residues measured by a dedicated weighmeter was cross-checked against the energy/mass balance. Using the monitored data, the energy/mass balance indicated a power boiler efficiency of 69.34%, which is well within the range specified in the power boiler manual [61.99% - 87.31%]. According to this, the monitored value of the biomass residues combusted in the power boiler is acceptable.</p> <p>In addition to the above, the measured value of biomass combusted was monthly cross-checked against purchase records, internal biomass production and stock changes (topographic studies). A difference of 19.9% was obtained for the monitored period.</p> <p><u>Black liquor</u></p> <p>The black liquor consumption measurements (tDS) were cross-checked against the total pulp production in the pulp mill (ADT) and the energy/mass balance of the recovery boiler. Results of this comparison are presented below:</p>



	<p>With the monitored data, the efficiency obtained for the recovery boiler was 72.9%. This value is compared with the average efficiency value of 64.0% specified for this boiler by the manufacturer. The difference is considered a reasonable deviation.</p> <p>Additionally, the Project Participant calculated an operational index of 1.87 (tDS/ADT), which also compares very closely with the range of [2.0 +/-0.5.]</p>
Purpose of data:	Baseline and project emissions calculations.
Additional comment:	---

<b>Data / Parameter:</b>	<b>Moisture content of the biomass residues</b>
Unit:	(%) of water content (humid basis).
Description:	Moisture content of each biomass residue type k.
Measured/ Calculated / Default:	Measured.
Source of data:	<p><u>Black liquor</u>: On-site measurements. For more details, please refer to the BF<sub>k,y</sub> parameter.</p> <p><u>Biomass residues from forestry operations</u>: On-site measurements.</p>
Value(s) of monitored parameter:	<p><u>Black liquor</u>: This biomass type is directly measured in dry-solid terms (tDS).</p> <p><u>Biomass residues from forest operations</u>: 58.7%</p> <p>The Project Participant informs that applied values are weight averaged for the monitoring period.</p>

Monitoring equipment:	<p><u>Black liquor:</u></p> <p>The equipment used to measure this parameter was described in full under parameter BF<sub>k,y</sub>.</p> <p><u>Biomass residues (mix of sawdust and bark) from forest operations</u></p> <p>310-81-1150  Type: Digital Scale. METTLER TOLEDO PG12001  Accuracy class: +/- 0.1 g  Serial number: 1122192799  Calibration frequency: 6 Months  Calibration dates: 09/10/2013, 07/01/2014, 14/04/2014, 11/07/2014  Date of last calibration: 08/10/2014  Validity: 07/04/2015</p> <p>310-81-1151  Type: Digital Scale. METTLER TOLEDO PG12001  Accuracy class: +/- 0.1 g  Serial number: 1122192802  Calibration frequency: 6 Months  Calibration dates: 10/10/2013, 13/01/2014, 14/04/2014, 14/07/2014  Date of last calibration: 08/10/2014  Validity: 07/04/2015</p> <p>310-81-1154  Type: Drying Oven. MEMMERT ULE700  Accuracy class: +/- 1 °C  Serial number: G703.0095  Calibration frequency: Calibration is not required according to the manufacturer.</p> <p>310-81-1155  Type: Drying Oven MEMMERT ULE700  Accuracy class: +/- 1 °C  Serial number: G703.0096  Calibration frequency: Calibration is not required according to the manufacturer.</p> <p>310-81-1156  Type: Drying Oven. MEMMERT ULE700  Accuracy class: +/- 1 °C  Serial number: G703.0098  Calibration frequency: Calibration is not required according to the manufacturer.</p>
Measuring/ Reading/ Recording frequency:	<p>As stated before, black liquor is directly monitored in dry basis.</p> <p>Daily samples of biomass residues from forestry operations (mix of sawdust and bark) are taken to determine their moisture content. Moisture content analysis is performed in Valdivia's own laboratory with calibrated digital scales and drying ovens.</p>
Calculation method (if applicable):	Not applicable.

QA/QC procedures:	<p><u>Black liquor:</u></p> <p>Proper instruments were used to measure moisture content. All of them received periodic maintenance and calibration, according to the manufacturer's recommendation. For more details about the calibration of these instruments, please refer to parameter BF<sub>k,y</sub>, QA/QC procedure section.</p> <p>In addition to the above, the Project Participant carried out moisture content measurements in the Valdivia laboratory in order to cross-check the dry black liquor flows recorded in the DCS.</p> <p>As shown in the table below, a deviation of 0.51% was obtained for 2015 which is deemed a reasonable value.</p> <table border="1"> <thead> <tr> <th>Parameter</th><th>Laboratory samples (%)</th><th>Measurements recorded in the DCS (%)</th><th>Deviation (%)</th></tr> </thead> <tbody> <tr> <td>Annual 2015 average moisture content [ 01Jan to 31Dec, 2015]</td><td>28.4</td><td>27.9</td><td>0.5</td></tr> <tr> <td>Average moisture content [ 01Jan to 31March, 2016]</td><td>30.3</td><td>28.7</td><td>1.57</td></tr> </tbody> </table> <p><u>Biomass residues (mix of sawdust and bark) from forest operations</u></p> <p>In this case, proper calibration according to the manufacturer of all instruments used to determine moisture content of biomass residues from forestry operations was duly performed during the monitored period. Please refer to page 14 of this Monitoring Report, which presents a table with the corresponding calibration results.</p>	Parameter	Laboratory samples (%)	Measurements recorded in the DCS (%)	Deviation (%)	Annual 2015 average moisture content [ 01Jan to 31Dec, 2015]	28.4	27.9	0.5	Average moisture content [ 01Jan to 31March, 2016]	30.3	28.7	1.57
Parameter	Laboratory samples (%)	Measurements recorded in the DCS (%)	Deviation (%)										
Annual 2015 average moisture content [ 01Jan to 31Dec, 2015]	28.4	27.9	0.5										
Average moisture content [ 01Jan to 31March, 2016]	30.3	28.7	1.57										
Purpose of data:	Baseline emission and project emission calculations.												
Additional comment:	--												

<b>Data / Parameter:</b>	EF <sub>CH<sub>4</sub>,BF</sub>
Unit:	(tCH <sub>4</sub> /GJ)
Description:	CH <sub>4</sub> emission factor for the combustion of biomass residues in the project plant.
Measured/ Calculated / Default:	Default.
Source of data:	ACM0006 (Version 5), page 25/63, Table 4: "Default CH <sub>4</sub> emission factors for combustion of biomass residues". According to the baseline methodology, the chosen factor is corrected for uncertainty using Table 5 in page 26/63 of the ACM0006 (Version 5).
Value(s) of monitored parameter:	<p>30.0 (Kg CH<sub>4</sub>/TJ) or 0.00003 (tCH<sub>4</sub>/GJ) for biomass from forest operations, with an associated conservativeness factor of 1.02. This results in an adjusted default emission factor of 30.6 (Kg CH<sub>4</sub>/TJ) or 0.0000306 (tCH<sub>4</sub>/GJ).</p> <p>The reason for which the conservativeness factor 1.02 was chosen in this case can be found in section B.6, page 54 of the registered PDD.</p>

Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	In this case, the project participant used the default factor provided by the ACM0006 (Version 05).
Purpose of data:	Project emissions calculations.
Additional comment:	---

Data / Parameter:	AVD <sub>y</sub>								
Unit:	(Km)								
Description:	Average round-trip distance between biomass fuel supply sites and the project site.								
Measured/ Calculated / Default:	Measured.								
Source of data:	Calculations based on records provided by the Valdivia Pulp mill Procurement Department.  The information used to perform the corresponding calculations comes from Forestal Valdivia (an Arauco subsidiary) and the Valdivia pulp mill Procurement Department R-Maderas database.								
Value(s) of monitored parameter:	<table><tr><td>Monitored parameter</td><td>01Jan to 31Dec, 2015</td><td>01Jan to 31March, 2016</td></tr><tr><td>AVD<sub>y</sub></td><td>89.1 km</td><td>116.4</td></tr></table> The Project Participant would like to note that the value applied is a weighted average calculation for the round trip. For more details, please see the corresponding emission reduction calculation spread sheet.			Monitored parameter	01Jan to 31Dec, 2015	01Jan to 31March, 2016	AVD <sub>y</sub>	89.1 km	116.4
Monitored parameter	01Jan to 31Dec, 2015	01Jan to 31March, 2016							
AVD <sub>y</sub>	89.1 km	116.4							
Monitoring equipment:	Not applicable.								
Measuring/ Reading/ Recording frequency:	The distance travelled by each truck transporting biomass from forestry operations residues was continuously recorded at the entrance of the Valdivia plant and registered in the R-Maderas database.								
Calculation method (if applicable):	This parameter is determined for the monitored period by calculating a weighted average distance, which considers the transported biomass amounts and the corresponding distances of each supply center to the Valdivia biomass power plant. This weighted average is multiplied by two in order to determine the weighted average distance, round trip.								

QA/QC procedures:	Biomass residues from forest operations were brought from known suppliers which have known locations (e.g. road distances to the plant are also known). The QA/QC procedure in this case is carried out at the entrance of the Valdivia power plant and is applied in such a way that no truck with biomass residues from forestry operations is allowed if it does not come from a known and registered supplier (for which the road distance is also known). During the monitored period, no trucks from unspecified/unregistered sites were allowed, so no discrepancies were detected in this case.
Purpose of data:	Project emission calculations.
Additional comment:	--

<b>Data / Parameter:</b>	<b>N<sub>y</sub></b>
Unit:	---
Description:	Number of truck trips for the transportation of biomass.
Measured/ Calculated / Default:	Calculated.
Source of data:	The Superintendence of Fiber monitored and recorded each type of raw material (including biomass residues from forestry operations) dispatched to the mill. This information was stored in the mill's information system and the person in charge of reporting this information extracted the number of trucks that arrived at the mill with biomass residues (mix of sawdust and bark) and reported this information to the person in charge of calculating the emission reductions of the project activity in Arauco Bioenergía S.A.
Value(s) of monitored parameter:	2015: 5,933 trips 2016: 2,058 trips
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	All trucks that brought third party biomass residues were continuously recorded each day at the entrance of the plant in the R-Maderas database system.
Calculation method (if applicable):	This parameter is calculated as a ratio between the total wet biomass attributable to the project activity and transported to the Valdivia biomass power plant and the average truck load used for the transportation of the biomass to the power plant.

QA/QC procedures:	<p>The Project Participant verified the consistency of this variable with the quantity of biomass combusted (e.g. by the relation with previous years). Historical consumption records have been checked by the project participant, as shown in the table below:</p> <table border="1" data-bbox="607 275 1200 646"> <thead> <tr> <th>Year (Jan to Dec)</th><th>Average N° of trips Per year</th></tr> </thead> <tbody> <tr><td>2015(see note 1)</td><td>5,933</td></tr> <tr><td>2014(see note 2)</td><td>8,680</td></tr> <tr><td>2013</td><td>4,702</td></tr> <tr><td>2012</td><td>3,212</td></tr> <tr><td>2011</td><td>2,593</td></tr> <tr><td>2010</td><td>2,904</td></tr> <tr><td>2009</td><td>4,008</td></tr> <tr><td>2008</td><td>3,444</td></tr> </tbody> </table> <p>Notes:</p> <p>1) The average number of trips decreased in 2015 compared with previous year 2014. By doing so, fuel oil increased compared to previous year as well.</p> <p>2) The average number of trips during the monitored period (2014) is higher than in previous years. This is due to a higher consumption of biomass residues in the power boiler. Increased biomass consumption is related to the installation of the biomass dryer, which has allowed to reduce biomass moisture content. By doing so, part of the energy that was previously supplied by fossil fuel is now supplied by biomass residues. This is evidenced in the following table, in which the ratio of fossil fuel to biomass is shown.</p> <table border="1" data-bbox="519 953 1286 1360"> <thead> <tr> <th></th><th>Total biomass (BDt)</th><th>3rd Party biomass (BDt)</th><th>N<sub>y</sub></th><th>Total fossil fuel used in the power boiler (t)**</th><th>Fossil fuel (ton FO /BDt)</th></tr> </thead> <tbody> <tr><td>2015<sup>(1)</sup></td><td>176,523</td><td>62,123</td><td>5,933</td><td>4,727</td><td>0.026</td></tr> <tr><td>2014<sup>(2)</sup></td><td>182,632</td><td>92,327</td><td>8,680</td><td>1,393</td><td>0.008</td></tr> <tr><td>2013<sup>(3)</sup></td><td>163,327</td><td>62,395</td><td>4,702</td><td>6,033</td><td>0.037</td></tr> <tr><td>2012</td><td>137,738</td><td>29,318</td><td>3,212</td><td>9,848</td><td>0.071</td></tr> <tr><td>2011</td><td>123,651</td><td>19,553</td><td>2,593</td><td>8,812</td><td>0.071</td></tr> <tr><td>2010</td><td>121,555</td><td>25,283</td><td>2,904</td><td>7,097</td><td>0.058</td></tr> </tbody> </table> <p>(1) In 2015 the 22% of pulp mill production came from euca campaign. This had two major impacts on the performance of the biomass drier and at fuel oil consumption: first, under euca campaign biomass drier performance decreased and so the biomass combusted in the boiler. Second, since euca has lower calorific value than under pine campaign, additional fuel was required due to operational reasons.</p> <p>(2) In 2014, eucalyptus was processed only in January and February and represented only 10% of the year's production, thus improving the dryer's performance and the amount of biomass residues that could be combusted in the power boiler</p> <p>(3) The biomass dryer started full operation in March 2013, but it is not as efficient with eucalyptus residue. This affected its performance since 26% of 2013's production came from eucalyptus.</p> <p>** Value taken from the power boiler's energy balance, not to be confused with FF<sub>projectplant,y</sub> (a calculated parameter).</p>	Year (Jan to Dec)	Average N° of trips Per year	2015(see note 1)	5,933	2014(see note 2)	8,680	2013	4,702	2012	3,212	2011	2,593	2010	2,904	2009	4,008	2008	3,444		Total biomass (BDt)	3rd Party biomass (BDt)	N <sub>y</sub>	Total fossil fuel used in the power boiler (t)**	Fossil fuel (ton FO /BDt)	2015 <sup>(1)</sup>	176,523	62,123	5,933	4,727	0.026	2014 <sup>(2)</sup>	182,632	92,327	8,680	1,393	0.008	2013 <sup>(3)</sup>	163,327	62,395	4,702	6,033	0.037	2012	137,738	29,318	3,212	9,848	0.071	2011	123,651	19,553	2,593	8,812	0.071	2010	121,555	25,283	2,904	7,097	0.058
Year (Jan to Dec)	Average N° of trips Per year																																																												
2015(see note 1)	5,933																																																												
2014(see note 2)	8,680																																																												
2013	4,702																																																												
2012	3,212																																																												
2011	2,593																																																												
2010	2,904																																																												
2009	4,008																																																												
2008	3,444																																																												
	Total biomass (BDt)	3rd Party biomass (BDt)	N <sub>y</sub>	Total fossil fuel used in the power boiler (t)**	Fossil fuel (ton FO /BDt)																																																								
2015 <sup>(1)</sup>	176,523	62,123	5,933	4,727	0.026																																																								
2014 <sup>(2)</sup>	182,632	92,327	8,680	1,393	0.008																																																								
2013 <sup>(3)</sup>	163,327	62,395	4,702	6,033	0.037																																																								
2012	137,738	29,318	3,212	9,848	0.071																																																								
2011	123,651	19,553	2,593	8,812	0.071																																																								
2010	121,555	25,283	2,904	7,097	0.058																																																								
Purpose of data:	Project emission calculations.																																																												
Additional comment:	---																																																												

<b>Data / Parameter:</b>	TL <sub>y</sub>
Unit:	(ton/truck)
Description:	Average truckload of the trucks used for the transportation of biomass from forest operations to the pulp mill.
Measured/ Calculated / Default:	Measured.
Source of data:	The Superintendence of Fibre monitored this parameter by measuring the truckloads at the project mill's weighbridges. The value was determined by calculating the average truckload in tons for the trucks that delivered biomass residues from forest operations to the power plant.
Value(s) of monitored parameter:	<p>[01Jan to 31March, 2015] 25.3 ton/truck [01Jan to 31March, 2016] 23.3 ton/truck</p> <p>The Project Participant would like to note that the applied value is an average considering truck load and the amount of biomass from third party suppliers.</p> <p>Also, please note that the value reported here is the original one. Due to the delayed calibration of the power boiler's weigh meter, the value applied to emission reduction calculations is slightly different. See section "Additional comment" under parameter BF<sub>k,y</sub>.</p>
Monitoring equipment:	<p>330-WT-050 Type: Weighbridge #1 South METTLER TOLEDO JAGXTREME Accuracy class: +/- 30 kg Serial number: 5311768-5HD Calibration frequency: 1 Year Calibration dates: 24/11/2013, 28/05/2014 Date of last calibration: 21/11/2014 Validity: 20/11/2015</p> <p>330-WT-051 Type: Weighbridge #2 Center METTLER TOLEDO JAGXTREME Accuracy class: +/- 30 kg Serial number: 5311767-5HD Calibration frequency: 1 Year Calibration dates: 24/11/2013, 28/05/2014 Date of last calibration: 21/11/2014 Validity: 20/11/2015</p> <p>330-WT-052 Type: Weighbridge #3 North METTLER TOLEDO JAGXTREME Accuracy class: +/- 30 kg Serial number: 5311771-5HD Calibration frequency: 1 Year Calibration dates: 24/11/2013, 28/05/2014 Date of last calibration: 21/11/2014 Validity: 20/11/2015</p>
Measuring/ Reading/ Recording frequency:	All trucks that carried third party biomass residues to the Valdivia mill were continuously recorded at the entrance of the plant in the R-Maderas database system and truck loads were reported on a monthly basis for emission reduction calculation purposes.
Calculation method (if applicable):	Not applicable.

QA/QC procedures:	The weighbridges at the pulp mill received periodic maintenance and calibration according to proper industry standards. All data was found correct and consistent. Refer to table with the corresponding calibration results informed in this report.
Purpose of data:	Project emission calculations.
Additional comment:	Option 1 was used to estimate CO <sub>2</sub> emissions from transportation of biomass to the Valdivia power plant.

<b>Data / Parameter:</b>	EF <sub>km,CO2,y</sub>
Unit:	(tCO <sub>2</sub> /km)
Description:	Average CO <sub>2</sub> emission factor for the trucks during year y.
Measured/ Calculated / Default:	Calculated.
Source of data:	<p>The Project Participant used the following sources to determine this parameter:</p> <p>Truck performance (Km/lt) from transportation subcontractors for each truck during the monitored period.</p> <p>Fossil fuel density: Fossil fuel laboratory analysis.</p> <p>Fossil fuel net calorific value: Fossil fuel laboratory analysis.</p> <p>Fossil fuel carbon content: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 1-4.</p> <p>Fossil fuel fraction of carbon oxidized: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 1-4.</p>
Value(s) of monitored parameter:	<p>[01Jan to 31March, 2015] 0.001284 (tCO<sub>2</sub>/km)</p> <p>[01Jan to 31March, 2016] 0.001229 (tCO<sub>2</sub>/km)</p>
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	<p>This parameter is calculated and recorded annually. Please note the following detail below:</p> <p>Truck performance (Km/lt): Monitored and recorded monthly during the monitored period.</p> <p>Fossil fuel density: Monitored twice a year (taking three samples each time) and recorded annually.</p> <p>Fossil fuel net calorific value: Monitored twice a year (taking three samples each time) and recorded annually.</p> <p>Fossil fuel carbon content: Default value from IPCC.</p> <p>Fossil fuel fraction of carbon oxidized: Default value from IPCC.</p>
Calculation method (if applicable):	<p>The calculation method is as follows:</p> $EF_{km,FF} = [1/(\text{average fuel performance of trucks (km/l)}) * \text{Diesel fuel density (kg/l)/1,000}] * [EF_{CO2,FF,Diesel} (tCO_2/GJ) * NCV_{Diesel} (GJ/ton)]$ <p>Where:</p> $EF_{CO2,FF} (tCO_2/GJ): \text{Carbon content of diesel (tC/TJ)} * \text{Fraction of carbon oxidized} * CO_2 / C \text{ conversion factor (tCO}_2\text{/tC)} * (1TJ/1000GJ).$
QA/QC procedures:	In this case, it was not possible to compare the monitored parameter EF <sub>km,CO2,y</sub> with the



corresponding default factor for heavy truck transportation, since the corresponding CO<sub>2</sub> emission factor for heavy truck transportation is not available in the 2006 IPCC manual.

However, the Project Participant compared this monitored parameter with the CO<sub>2</sub> emission factor of trucks observed in other biomass power plants by Arauco, also registered in the CDM.

Year	CO <sub>2</sub> emission factor of trucks (kg CO <sub>2</sub> /km).		
	Valdivia Project Plant	Nueva Aldea Biomass Power Plant Phase 1, Ref:0258	Trupan Biomass Power Plant, Ref:0259
2016	1.229	---	---
2015	1.284	---	---
2014	1.285	---	---
2013	1.258	---	---
2012	1.319	---	1.044
2011	1.250	1.351	1.170
2010	1.271	1.347	1.130
2009	1.260	1.351	1.348
2008	---	1.451	1.397

As can be seen in the table above, the monitored value is consistent with the truck emission factors observed in the other biomass power plants and therefore it was deemed acceptable in this case.

Additionally, the Project Participant compared the average truck fuel performance with the ones observed in other biomass power plants by Arauco. Result of this comparison was deemed acceptable, as shown in the table below.

Year	Average truck's fuel performance (km/l)		
	Valdivia Project Plant	Nueva Aldea Biomass Power Plant Phase 1, Ref:0258	Trupan Biomass Power Plant, Ref:0259
2016	2.16	---	---
2015	2.07	---	---
2014	2.08	---	---
2013	2.11	---	---
2012	2.13	---	2.60
2011	2.13	1.98	2.34
2010	2.10	1.98	2.36
2009	2.10	1.95	1.98
2008	---	1.84	1.91

Additionally, the Project Participant compared local NCV<sub>Diesel</sub> values used with the ones provided by the 2006 IPCC.

Year	NCV <sub>Diesel</sub> (GJ/ton)	
	Valdivia Project Plant	2006 IPCC Values
2016	42.88	43.0 [Lower: 41.4 Upper: 43.3]
2015	42.88	
2014	42.83	
2013	43.01	
2012	42.51	
2011	42.77	
2010	42.90	

According to the value above, the Project Participant deemed the monitored NCV within the acceptable range.

Purpose of data:	Project emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	$EF_{CO_2,FF,i}$
Unit:	(tCO <sub>2</sub> /GJ)
Description:	CO <sub>2</sub> emission factor for fossil fuel type i.
Measured/ Calculated / Default:	Calculated.
Source of data:	The Project Participant used the following sources to determine this parameter:  Fossil fuel carbon content: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 1-4. Fossil fuel fraction of carbon oxidized: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 1-4.
Value(s) of monitored parameter:	Diesel: 0.07407 (tCO <sub>2</sub> /GJ)  Fuel oil: 0.07737 (tCO <sub>2</sub> /GJ)
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	$EF_{CO_2,FF,Diesel}$ (tCO <sub>2</sub> /GJ): Carbon content of diesel (tC/TJ) * Fraction of carbon oxidized* CO <sub>2</sub> / C conversion factor (tCO <sub>2</sub> /tC) * (1TJ/1000GJ)  <u>where:</u>  $EF_{CO_2,FF,Diesel}$ (tCO <sub>2</sub> /GJ) = 20.2 (tC/TJ) * 100% * 44/12 (tCO <sub>2</sub> /tC) * (1GJ/1000TJ).  $EF_{CO_2,FF,FO}$ (tCO <sub>2</sub> /GJ): Carbon content of FO (tC/TJ) * Fraction of carbon oxidized* CO <sub>2</sub> / C conversion factor (tCO <sub>2</sub> /tC) * (1TJ/1000GJ)  <u>where:</u>  $EF_{CO_2,FF,FO}$ (tCO <sub>2</sub> /GJ) = 21.1 (tC/TJ) * 100% * 44/12 (tCO <sub>2</sub> /tC) * (1TJ/1000GJ).
QA/QC procedures:	The Project Participant used the most updated IPCC default factors to calculate the fossil fuel coefficients. In this case, values were obtained from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 1-4.
Purpose of data:	Project emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	$FF_{project\ plant,i,y}$
Unit:	(ton/year)
Description:	Quantity of fossil fuel type i combusted in the biomass residue fired power plant during the year y.

Measured/ Calculated / Default:	Measured.												
Source of data:	<p>The Project Participant used the following information sources to determine this parameter:</p> <ul style="list-style-type: none"> <li>Specific consumption factor of 3.43 (kg of fuel oil/m<sup>3</sup>st of forestry biomass residues): Corresponds to the historic fossil fuel consumption per unit of biomass from forestry operations used in the power boiler of the Valdivia biomass power plant. This variable is obtained from the revised PDD.</li> <li>Biomass residues from forestry operations related to the implementation of the CDM project activity: This biomass amount is calculated using the total biomass consumption in the power boiler and the equations derived from the approved methodology deviation of the ACM0006 (Version 5) presented in Annex 3 of the revised PDD.</li> <li>Fuel oil used in the power boiler attributable to the project activity: This corresponds to the amount of fossil fuel used in the power boiler to enhance the surplus power generation to the grid.</li> <li>Fuel oil used in the recovery boiler attributable to the project activity: This corresponds to the amount of fossil fuel used in the recovery boiler to enhance the surplus power generation to the grid. This fossil fuel amount is directly monitored by the power plant operators in the Valdivia biomass power plant.</li> </ul>												
Value(s) of monitored parameter:	<p>Fossil fuel consumption associated to additional biomass residues from forestry operations: 2,638.5 ton (01Jan to 31Dec, 2015) and 660.8 (01Jan to 31March, 2016)</p> <p>Fossil fuel consumption in the power and recovery boilers related to additional surplus power generation to the grid:</p> <table border="1"> <thead> <tr> <th>01Jan to 31March, 2016</th><th>01Jan to 31Dec, 2015</th><th>Description</th></tr> <tr> <th>Measured value (ton/year)</th><th>Measured value (ton/year)</th><th>Parameter</th></tr> </thead> <tbody> <tr> <td>88.8</td><td>711.1</td><td>Additional Fuel Oil consumption in the power boiler for power generation.</td></tr> <tr> <td>781.1</td><td>2,224.8</td><td>Additional Fuel Oil consumption in the recovery boiler for power generation.</td></tr> </tbody> </table>	01Jan to 31March, 2016	01Jan to 31Dec, 2015	Description	Measured value (ton/year)	Measured value (ton/year)	Parameter	88.8	711.1	Additional Fuel Oil consumption in the power boiler for power generation.	781.1	2,224.8	Additional Fuel Oil consumption in the recovery boiler for power generation.
01Jan to 31March, 2016	01Jan to 31Dec, 2015	Description											
Measured value (ton/year)	Measured value (ton/year)	Parameter											
88.8	711.1	Additional Fuel Oil consumption in the power boiler for power generation.											
781.1	2,224.8	Additional Fuel Oil consumption in the recovery boiler for power generation.											

Monitoring equipment:	<p>352FT653 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ Accuracy class: +/- 0.5% Serial number transmitter: 3010822 Serial number sensor: 723360 Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p>
	<p>352FT657 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ Accuracy class: +/- 0.5% Serial number transmitter: 3010807 Serial number sensor: 728932 Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p>
	<p>352FT681 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ Accuracy class: +/- 0.5% Serial number transmitter: 3010892 Serial number sensor: 723912 Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p>
	<p>352FT685 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ Accuracy class: +/- 0.5% Serial number transmitter: 3012133 Serial number sensor: 729075 Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p>
	<p>352FT823 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ Accuracy class: +/- 0.5% Serial number transmitter: 3011047 Serial number sensor: 728916 Calibration frequency: According to manufacturer, calibration is not required for this instrument..</p>
	<p>363FT507 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ Accuracy class: +/- 0.5% Serial number transmitter: 3010656 Serial number sensor: 728840 Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p>
	<p>363FT510 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ Accuracy class: +/- 0.5% Serial number transmitter: 3010755 Serial number sensor: 728933 Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p>
	<p>363FT515 Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ</p>

	<p>Accuracy class: +/- 0.5%</p> <p>Serial number transmitter: 3012292</p> <p>Serial number sensor: 728929</p> <p>Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p> <p>363FT518</p> <p>Mass Flow Transmitter MICROMOTION 2700R11EBASZAZ</p> <p>Accuracy class: +/- 0.5%</p> <p>Serial number transmitter: 3010764</p> <p>Serial number sensor: 728954</p> <p>Calibration frequency: According to manufacturer, calibration is not required for this instrument.</p>
Measuring/ Reading/ Recording frequency:	Fossil fuel consumption amounts were continuously measured and recorded on-line by the pulp mill's DCS. The recorded data was aggregated monthly and yearly for emission reduction calculations.
Calculation method (if applicable):	<p>Fossil fuel consumption in the power and recovery boilers was measured using on-line Coriolis mass flow meters. Data obtained was registered on-line by the pulp mill's DCS and recorded in databases.</p> <p>As defined in the revised PDD, the consideration of fossil fuel consumption for emission reduction calculations is limited only to the additional fossil fuel consumption associated to the implementation of the CDM project activity. As previously mentioned, this includes additional fossil fuel consumption due to additional biomass consumption in the power boiler and additional fuel oil consumption in the power and recovery boilers for surplus power generation to the grid:</p> <p><u>Additional fossil fuel consumption used to burn additional biomass consumption related to the project activity:</u></p> <p>According to the revised PDD, the Project Participant used the specific consumption factor (i.e. 3.43 kg fuel/m<sup>3</sup>st)<sup>3</sup> which contemplates historic fossil fuel consumption per unit of biomass consumed in the Valdivia plant. Hence, the additional fossil fuel was determined by multiplying the specific consumption factor by the additional biomass residues from forestry operations associated to the implementation of the CDM project activity. The additional biomass residue amount was calculated using the equations of the approved ACM0006 (Version 5) deviation.</p> <p><u>The additional fossil fuel consumption in the power and recovery boilers used to enhance surplus power generation to the grid:</u></p> <p>The corresponding shift operator registered the accumulated Fuel Oil consumption given by the Delta V system at every hour (o'clock time) for the two boilers. In the case of the recovery boiler, the Fuel Oil consumption for the hour where extra fuel was used to enhance surplus power generation to the grid was determined by the difference of two consecutive records taken at o'clock time.</p> <p>In the case of the power boiler, empirical curves were used to calculate the amount of Fuel Oil consumed for surplus power generation.</p>

<sup>3</sup> (m<sup>3</sup>st) Volume unit commonly used in the Chilean forestry industry to express a cubic meter of biomass like sawdust, bark or chips that also contain a certain % of air and moisture that are not previously determined or quantified.

QA/QC procedures:	<p>The Project Participant performed consistency checks of the fossil fuel consumption amounts against the energy/mass balance in the recovery and power boilers. Additionally, the measured value was compared with fossil fuel stock variations and purchased amounts.</p> <p><u>Energy/mass balance consistency check</u></p> <p>The resulting average efficiency of the recovery boiler was 72.9% which is higher than the average efficiency value of 64.05 % specified for this boiler by the manufacturer. The calculated efficiency is considered reasonable.</p> <p>The efficiency obtained for the power boiler during the monitoring period was 68.34%, which is a reasonable value when compared with the manufacturer's range [61.99% - 87.31%]. In this way, consistency of fossil fuel measurements was confirmed.</p> <p><u>Purchase and stock variations check</u></p> <p>The total measurements of Fuel Oil in the plant were cross-checked with purchases and stock variations. A difference of 1.97% was obtained which is deemed a reasonable deviation.</p>
Purpose of data:	Project emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	<b>FF<sub>project site,i,y</sub></b>
Unit:	(ton)
Description:	Quantity of fossil fuel type i combusted at the project site for other purposes that are attributable to the project activity during the year y.
Measured/ Calculated / Default:	Measured.
Source of data:	<p>The Project Participant used the following information source to determine this parameter:</p> <ul style="list-style-type: none"> <li>– Data supplied by front loader operators (biomass transportation subcontractors) of the Valdivia biomass power plant.</li> </ul>
Value(s) of monitored parameter:	<p>Diesel: 56.6 ton (01Jan to 31Dec, 2015) and 13.9 ton (01Jan to 31March, 2016)</p> <p>(See additional comment below)</p>
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	This parameter is monitored daily. The subcontractors aggregate and record this parameter on a monthly basis.
Calculation method (if applicable):	<p>External subcontractors provide the service for the transportation of the biomass residues from forestry operations in the Valdivia biomass power plant site. Every month this entity provides the total amount of fossil fuel consumed as well as the operational hours of the front loader and/or bulldozers used to transport the biomass residues to the power boiler.</p> <p>The Project Participant then uses this total amount of fossil fuel used for the transportation of biomass residues and scales it down to the transportation of the biomass residues attributable to the implementation of the CDM project activity. This adjustment is performed using the total amount of biomass residues from forestry operations and the fraction of this biomass amount that is attributable to the CDM project activity. This biomass amount is determined using the equations of the approved</p>

	<p>deviation of the ACM0006 (Version 5). The calculation is performed as follows:</p> <p>Diesel used for on-site biomass transportation due to the CDM project activity = Total Diesel consumption for on-site biomass transportation * (Biomass residues from forestry operations associated to the implementation of the CDM project activity/Total biomass residues combusted in the power boiler).</p>																						
QA/QC procedures:	<p>The Project Participant carried out consistency checks based on monthly and annual operational indices (e.g. check whether front loader fossil fuel consumption divided by the operation hours resulted in a reasonable index, comparable to the ones observed in previous years).</p> <p>The operational index obtained for 2015 was compared against historical operational indices which resulted in a reasonable value, as shown in table below:</p> <table border="1" data-bbox="662 588 1133 970"> <thead> <tr> <th>Year (Jan-Dec)</th><th>Index (lt/hrs-year)</th></tr> </thead> <tbody> <tr> <td>2016 (see note)</td><td>12.61</td></tr> <tr> <td>2015</td><td>12.35</td></tr> <tr> <td>2014</td><td>12.56</td></tr> <tr> <td>2013</td><td>13.44</td></tr> <tr> <td>2012</td><td>11.86</td></tr> <tr> <td>2011</td><td>12.07</td></tr> <tr> <td>2010</td><td>12.15</td></tr> <tr> <td>2009</td><td>12.24</td></tr> <tr> <td>2008</td><td>13.94</td></tr> <tr> <td>2007</td><td>13.94</td></tr> </tbody> </table> <p>Note: This is the average operational index obtained for the first quarter of 2016, which results reasonable compared against historical indices.</p>	Year (Jan-Dec)	Index (lt/hrs-year)	2016 (see note)	12.61	2015	12.35	2014	12.56	2013	13.44	2012	11.86	2011	12.07	2010	12.15	2009	12.24	2008	13.94	2007	13.94
Year (Jan-Dec)	Index (lt/hrs-year)																						
2016 (see note)	12.61																						
2015	12.35																						
2014	12.56																						
2013	13.44																						
2012	11.86																						
2011	12.07																						
2010	12.15																						
2009	12.24																						
2008	13.94																						
2007	13.94																						
Purpose of data:	Project emission calculations.																						
Additional comment:	---																						

<b>Data / Parameter:</b>	<b>EG<sub>project plant,y</sub></b>
Unit:	(MWh/yr)
Description:	Net quantity of electricity generated in the project plant during the year y.
Measured/ Calculated / Default:	Measured and calculated.
Source of data:	<p>The Project Participant used the following information source to determine this parameter:</p> <ul style="list-style-type: none"> <li>Valdivia power plant on-line direct measurements of the gross electric power generated in the Valdivia biomass power plant. Measurements are continuously stored in the DCS database system.</li> <li>Additional electric power consumption of the project mill: 4.59 % of the total electricity consumption of the project pulp mill. This value comes from the revised PDD and is used to calculate the net quantity of electricity generated in the project plant.</li> <li>Total power consumption of the project pulp mill: On-line direct measurements which are continuously stored in the DCS database system of the Valdivia biomass power plant.</li> </ul>
Value(s) of monitored parameter:	680,864 (MWh/y) (01Jan to 31 Dec, 2015) and 180,867 MWh (01Jan to 31March, 2016).

Monitoring equipment:	<p>368JI101  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0211A-633-11  Calibration frequency: 7 Years  Date of penultimate calibration: 27/11/2002  Date of last calibration: 24/04/2009  Validity: 23/04/2016</p>
	<p>368JI102  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0211A-626-11  Calibration frequency: 7 Years  Date of penultimate calibration: 27/11/2002  Date of last calibration: 23/04/2009  Validity: 22/04/2016</p>
	<p>368JI104  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0211A-632-11  Calibration frequency: 7 Years  Date of penultimate calibration: 28/11/2002  Date of last calibration: 21/04/2009  Validity: 20/04/2016</p>
	<p>368JI105  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0212A-006-11  Calibration frequency: 7 Years  Date of penultimate calibration: 02/12/2002  Date of last calibration: 21/04/2009  Validity: 20/04/2016</p>
	<p>368JI107  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0211A-611-11  Calibration frequency: 7 Years  Date of penultimate calibration: 27/11/2002  Date of last calibration: 22/04/2009  Validity: 21/04/2016</p>
	<p>368JI201  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0212A-205-11  Calibration frequency: 7 Years  Date of penultimate calibration: 04/12/2002  Date of last calibration: 24/04/2009  Validity: 23/04/2016</p>
	<p>368JI203  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0212A-044-11</p>



	<p>Calibration frequency: 7 Years  Date of penultimate calibration: 04/12/2002  Date of last calibration: 24/04/2009  Validity: 23/04/2016</p> <p>368JI205  Type: Energy Meter POWER MEASUREMENT ION7300  Accuracy class: +/- 0.5%  Serial number: PA-0212A-045-11  Calibration frequency: 7 Years  Date of penultimate calibration: 04/12/2002  Date of last calibration: 23/04/2009  Validity: 22/04/2016</p>
Measuring/ Reading/ Recording frequency:	The electric power generation and total internal electricity consumption of the project pulp plant were continuously measured using dedicated energy meters. Measurements were recorded in the DCS database system every two minutes and aggregated and registered monthly for the emission reduction calculation of the monitored period.
Calculation method (if applicable):	<p>The net quantity of electricity generated in the project plant was determined using the following equation:</p> $EG_{\text{project plant}} (\text{MWh}) = \text{Gross electric power generation (MWh)} - [\text{Total internal electricity consumption of the project plant} * (4.59 \%)] (\text{MWh}).$ <p>As defined in the revised PDD, and stated in the approved methodology deviation, the additional energy consumption (attributable to the project activity) was determined by multiplying the total internal electricity consumption measured by the Project Participant by a factor of 4.59 %. The resulting value (second term of the right side of the equation above) is subtracted from the gross electricity generation of the Valdivia biomass power plant, thus allowing to determine the net quantity of electricity generated in the project plant.</p>
QA/QC procedures:	<p>All electricity meters received maintenance and calibration according to the manufacturer's recommendation and/or proper industry standards.</p> <p>According to methodology ACM0006 (Version 5), page 56/63 the consistency of metered net electricity generation shall be cross-checked with the quantity of fuel fired in the project plant. This means, check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years.</p> <ul style="list-style-type: none"> <li>Black liquor index: Electricity generation associated to black liquor/black liquor (dry basis) (MWh/tDS) = 0.58 (MWh/tDS). The result is deemed reasonable when compared with the range [0.39 - 0.59].</li> <li>Biomass residues from forest operations index: Electricity generation associated to forest biomass residues/Biomass residues from forestry operations (dry basis) (MWh/BDt) = 0.74 (MWh/BDt). The result is deemed reasonable when compared with the range [0.59 – 0.93].</li> </ul> <p>According the revised PDD, the Project Participant must also perform the consistency check considering the total power generation and the monitored amount of steam passing through the turbines. This is shown below for each of the two turbines of the Valdivia power plant:</p> <p>TG1: The average annual index of 0.147 (MWh/t steam) is within the historical range of [0.13 - 0.15] (MWh/t steam). As a result, the observed index calculated during the</p>

	<p>monitoring period is deemed acceptable.</p> <p>TG2: The average annual index of 0.242 (MWh/t steam) is within the historical range of [0.18 - 0.27] (MWh/t steam). As a result, the observed index calculated during the monitoring period is also deemed acceptable.</p> <p>Finally, according to the revised PDD, the consistency of metered net electricity generation shall also be cross-checked with receipts from electricity sales of the Valdivia power plant.</p> <p>The consistency of metered net electricity generation sold to the grid was cross-checked comparing the amount of electricity obtained from the energy bus balance with receipts from electricity sales and consumption. A deviation of 0.44 % was obtained, which resulted in an acceptable deviation.</p>
Purpose of data:	Baseline emission calculations.
Additional comment:	It must be noted that the net electricity generation of the project plant calculated from the equation above is used to determine the net increased electricity generation of the Valdivia biomass power plant derived from implementing CDM initiatives N°1 and N°2 as described in the PDD.

<b>Data / Parameter:</b>	<b>Q<sub>project plant,y</sub></b>
Unit:	(GJ)
Description:	Net quantity of heat generated from firing biomass in the project mill.
Measured/ Calculated / Default:	Measured.
Source of data:	<p>The Project Participant used the following information sources to determine this parameter:</p> <ul style="list-style-type: none"> <li>High, medium and low pressure steam flows generated and used in the Valdivia biomass power plant: On-site measurements.</li> <li>Steam thermodynamic conditions: Predefined set points (established in the pulping process) of steam temperature and pressure as required (i.e. in the case of superheated steam).</li> </ul>
Value(s) of monitored parameter:	7,138,628 GJ (01Jan to 31March, 2015) and 1,950,707 GJ (01Jan to 31March, 2016).

Monitoring equipment:	<p>365FT901  Type: Differential Pressure Flow Transmitter ABB 2600T  Accuracy class: +/- 0.075%  Serial number: 6408030356  Calibration frequency: 3 Years  Calibration dates: 10/11/2012  Date of last calibration: 27/11/2013  Validity: 26/11/2016</p> <p>365FT902  Type: Differential Pressure Flow Transmitter ABB 2600T  Accuracy class: +/- 0.075%  Serial number: 5003010902  Calibration frequency: 3 Years  Calibration dates: 11/11/2012  Date of last calibration: 26/11/2013  Validity: 25/11/2016</p> <p>365FT910  Type: Differential Pressure Flow Transmitter ABB 2600T  Accuracy class: +/- 0.075%  Serial number: 5003010903  Calibration frequency: 3 Years  Calibration dates: 11/11/2012  Date of last calibration: 27/11/2013  Validity: 26/11/2016</p> <p>365FT913  Type: Differential Pressure Flow Transmitter ABB 2600T  Accuracy class: +/- 0.075%  Serial number: 5003010904  Calibration frequency: 3 Years  Calibration dates: 11/11/2012  Date of last calibration: 27/11/2013  Validity: 26/11/2016</p> <p>365FT914  Type: Differential Pressure Flow Transmitter ABB 2600T  Accuracy class: +/- 0.075%  Serial number: 6408013775  Calibration frequency: 3 Years  Calibration dates: 24/11/2014  Date of last calibration: 24/11/2014  Validity: 23/11/2017</p> <p>365FT920  Type: Differential Pressure Flow Transmitter ABB 2600T  Accuracy class: +/- 0.075%  Serial number: 5003010906  Calibration dates: 11/11/2012  Date of last calibration: 28/11/2013  Validity: 27/11/2016</p> <p>365FT923  Type: Differential Pressure Flow Transmitter ABB 2600T  Accuracy class: +/- 0.075%  Serial number: 5003009136</p>
-----------------------	--

	<p>Calibration frequency: 3 Years  Calibration dates: 05/02/2013, 05/04/2013  Date of last calibration: 28/11/2013  Validity: 27/11/2016</p> <p>365FT924  Type: Differential Pressure Flow Transmitter ABB 264DSGSSB2A3  Accuracy class: +/- 0.075%  Serial number: 6410006727  Calibration frequency: 3 Years  Calibration dates: 10/11/2012  Date of last calibration: 28/11/2013  Validity: 27/11/2016</p> <p>362PT980  Type: Pressure Transmitter ROSEMOUNT 3051S2TG4A2E11F1AA01B4  Accuracy class: +/- 0.025% of span  Serial number: 0075788  Calibration frequency: 5 Years  Calibration dates: 10/11/2012  Date of last calibration: 26/11/2013  Validity: 25/11/2018</p> <p>362TT965  Type: Temperature Transmitter ROSEMOUNT 3244MV  Accuracy class: +/- 0.10 °C  Serial number: 430676  Calibration frequency: 1 Year  Date of penultimate calibration: 07/06/2012, 01/04/2013  Date of last calibration: 18/06/2014  Validity: 17/06/2015</p>
Measuring/ Reading/ Recording frequency:	The variables used to determine this parameter were monitored continuously using proper instruments. The data obtained was recorded in the power plant DCS and was aggregated monthly for emission reduction calculation purposes.
Calculation method (if applicable):	<p>The algorithm used is shown in section E.1 Baseline emissions calculation of the Monitoring Report and in page 118 of the registered PDD.</p> <p>This algorithm was part of the methodology deviation presented for the Valdivia CDM project activity, which was approved by the Executive Board on December 13, 2007.</p>
QA/QC procedures:	<p>All relevant steam flow meters received maintenance and calibration according to proper industry standards.</p> <p>According to the revised PDD, the consistency of metered steam flows was compared with an ad-hoc energy/mass balance and/or operational indices of the mill (e.g. for each of the boilers --recovery and power boiler-- check whether the amount of steam produced divided by the amount of fuels fired results in reasonable values compared to the ones observed in previous years).</p> <p><u>QA/QC 1:</u> The Project Participant checked the consistency of metered steam flows against the annual energy balance of the power and recovery boilers.</p> <p>The efficiency obtained for the power boiler during the monitored period was 68.34 %, which resulted in a reasonable value when compared with the manufacturer's acceptance range [61.99% - 87.31%].</p> <p>The resulting average efficiency of the recovery boiler was 72.9% with minimal deviation from the 64.05% recommended by the manufacturer.</p>

Considering the results presented above, the monitored variables used for the calculation of this parameter were deemed acceptable by the Project Participant.

QA/QC 2: The Project Participant checked consistency of metered heat flows against operational indices of the mill. Results are presented below:

Operational index of the recovery boiler: (ton of steam/ tDS)

The annual operational index was 3.41 (tons of steam/tDS) which is a reasonable value when compared with the historical acceptance range value of [3.5 +/- 0.5] (ton of steam/tDS)] for the recovery boiler.

Operational index of the power boiler: (ton of steam/ BDt)

The annual operational index was 4.35 (tons of steam/BDt), which resulted in a reasonable value compared with the historical acceptance range of [4.7 +/-0.5] (ton of steam/BDt) for the power boiler.

Considering the results obtained above, the monitored variables used for the calculation of this parameter were considered acceptable by the Project Participant.

QA/QC 3:

In accordance with the methodology, the Project Participant shall check the consistency of metered net heat generation with 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 previous years).

Year (Jan-Dec)	Index (GJ/BDt)
2016 (see note 1)	7.91
2015 (see note 1)	7.65
2014 (see note 2)	8.08
2013	9.29
2012	9.45
2011	9.03
2010	9.46
2009	9.22

Notes:

Reasons that explain the low index in 2015 and partly in 2016 are described as follows:

- (1) In 2015 the 22% of pulp mill production came from euca campaign. This had two major impacts, first on the performance of the biomass drier and second, in fuel oil amount consumed for operational reasons: first, under euca campaign biomass drier performance decreased. In addition, a higher consumption of biomass residues would be required since euca has lower calorific value than pine. Also additional fuel would be required due to operational reasons to add the energy not provided by the biomass combusted.
- (2) Due to the installation of the biomass dryer, which led to a higher consumption of biomass residues, this index had a lower value in 2014.

Purpose of data:	Baseline and Project emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	<b>NCV<sub>i</sub></b>																																				
Unit:	(GJ/ton)																																				
Description:	Net calorific value of the fossil fuel type i.																																				
Measured/ Calculated / Default:	Measured.																																				
Source of data:	<p>The Project Participant used the following information sources to determine this parameter:</p> <ul style="list-style-type: none"> <li>Net calorific value measurements carried out by reputed laboratories.</li> </ul>																																				
Value(s) of monitored parameter:	<p><u>First semester (Jan-June 2015) measurements:</u></p> <table border="1"> <thead> <tr> <th>Date of Samples</th><th>Diesel (Kcal/kg)</th><th>FO #6 (Kcal/kg)</th></tr> </thead> <tbody> <tr> <td>Jan 15, 2015</td><td>10,239</td><td>9,689</td></tr> <tr> <td>Jan 15, 2015</td><td>10,227</td><td>9,681</td></tr> <tr> <td>Jan 15, 2015</td><td>10,240</td><td>9,667</td></tr> <tr> <td>Average (Kcal/kg)</td><td>10,235</td><td>9,679</td></tr> <tr> <td>Average (GJ/ton)</td><td>42.85</td><td>40.52</td></tr> </tbody> </table> <p><u>Second semester (July-Dec 2015) measurements:</u></p> <table border="1"> <thead> <tr> <th>Date of Samples</th><th>Diesel (Kcal/kg)</th><th>FO #6 (Kcal/kg)</th></tr> </thead> <tbody> <tr> <td>July 27, 2015</td><td>10,248</td><td>9,625</td></tr> <tr> <td>July 27, 2015</td><td>10,217</td><td>9,628</td></tr> <tr> <td>July 27, 2015</td><td>10,273</td><td>9,628</td></tr> <tr> <td>Average (Kcal/kg)</td><td>10,246</td><td>9,627</td></tr> <tr> <td>Average (GJ/ton)</td><td>42.90</td><td>40.31</td></tr> </tbody> </table>	Date of Samples	Diesel (Kcal/kg)	FO #6 (Kcal/kg)	Jan 15, 2015	10,239	9,689	Jan 15, 2015	10,227	9,681	Jan 15, 2015	10,240	9,667	Average (Kcal/kg)	10,235	9,679	Average (GJ/ton)	42.85	40.52	Date of Samples	Diesel (Kcal/kg)	FO #6 (Kcal/kg)	July 27, 2015	10,248	9,625	July 27, 2015	10,217	9,628	July 27, 2015	10,273	9,628	Average (Kcal/kg)	10,246	9,627	Average (GJ/ton)	42.90	40.31
Date of Samples	Diesel (Kcal/kg)	FO #6 (Kcal/kg)																																			
Jan 15, 2015	10,239	9,689																																			
Jan 15, 2015	10,227	9,681																																			
Jan 15, 2015	10,240	9,667																																			
Average (Kcal/kg)	10,235	9,679																																			
Average (GJ/ton)	42.85	40.52																																			
Date of Samples	Diesel (Kcal/kg)	FO #6 (Kcal/kg)																																			
July 27, 2015	10,248	9,625																																			
July 27, 2015	10,217	9,628																																			
July 27, 2015	10,273	9,628																																			
Average (Kcal/kg)	10,246	9,627																																			
Average (GJ/ton)	42.90	40.31																																			
Monitoring equipment:	Not applicable.																																				
Measuring/ Reading/ Recording frequency:	Every six months, taking at least three samples for each measurement.																																				
Calculation method (if applicable):	Not applicable.																																				
QA/QC procedures:	The measured net calorific values were found consistent with the corresponding IPCC default values.																																				
Purpose of data:	Project emission calculations.																																				
Additional comment:	---																																				

<b>Data / Parameter:</b>	<b>NCV<sub>k</sub></b>
Unit:	(GJ/ton)
Description:	Net calorific value of biomass residue type k.

Measured/ Calculated / Default:	Measured.																																														
Source of data:	<p>The Project Participant used the following information sources to determine this parameter:</p> <ul style="list-style-type: none"> <li>Net calorific value measurements carried out by reputed laboratories.</li> </ul>																																														
Value(s) of monitored parameter:	<p><u>First semester (Jan-June 2013) measurements:</u></p> <p>Black liquor: 12.32 (GJ/ton) Sawdust &amp; bark mix: 18.15 (GJ/ton)</p> <p><u>Second semester (July-Dec 2013) measurements:</u></p> <p>Black liquor: 12.35 (GJ/ton) Sawdust &amp; bark mix: 18.18 (GJ/ton)</p>																																														
Monitoring equipment:	Not applicable.																																														
Measuring/ Reading/ Recording frequency:	Every six months, taking at least three samples for each measurement. All NCVs were determined on dry basis of biomass.																																														
Calculation method (if applicable):	<p style="text-align: center;"><b><u>Black liquor</u></b></p> <p>In accordance with the methodology, the required black liquor samples were collected with the purpose of measuring their Net Calorific Value in the laboratory. Results are presented below:</p> <p style="text-align: center;"><u>First period (Jan-June 2015): Black liquor Net Calorific Value</u></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Date of Samples</th><th>NCV(pine) (GJ/ton)</th><th>Date of Samples</th><th>NCV(euca) (GJ/ton)</th></tr> </thead> <tbody> <tr> <td>Jan 15, 2015</td><td>12.82</td><td>Feb 10, 2013</td><td>11.04</td></tr> <tr> <td>Jan 15, 2015</td><td>12.74</td><td>Feb 10, 2013</td><td>11.23</td></tr> <tr> <td>Jan 15, 2015</td><td>12.78</td><td>Feb 10, 2013</td><td>11.20</td></tr> <tr> <td>Average</td><td>12.78</td><td>Average</td><td>11.16</td></tr> </tbody> </table> <p style="text-align: center;"><u>Second period (July-Dec 2015): Black liquor Net Calorific Value</u></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Date of Samples</th><th>NCV(pine) (GJ/ton)</th><th>Date of Samples</th><th>NCV(euca) (GJ/ton)</th></tr> </thead> <tbody> <tr> <td>July 13, 2015</td><td>12.59</td><td>June 24, 2015</td><td>11.94</td></tr> <tr> <td>July 13, 2015</td><td>12.47</td><td>June 24, 2015</td><td>11.80</td></tr> <tr> <td>July 13, 2015</td><td>12.56</td><td>June 24, 2015</td><td>11.84</td></tr> <tr> <td>Average</td><td>12.54</td><td>Average</td><td>11.86</td></tr> </tbody> </table> <p>A weighted average calculation is used considering percentage of pulp mill production (ADt) and the average net calorific value of pine and eucalyptus to determine the most representative net calorific value for black liquor. Results of these calculations are presented below:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Parameter</th><th>First period (Jan-June 2015)</th><th>Second period (July-Dec 2015)</th></tr> </thead> <tbody> <tr> <td>NCV (Black liquor)</td><td>12.52</td><td>12.35</td></tr> </tbody> </table>	Date of Samples	NCV(pine) (GJ/ton)	Date of Samples	NCV(euca) (GJ/ton)	Jan 15, 2015	12.82	Feb 10, 2013	11.04	Jan 15, 2015	12.74	Feb 10, 2013	11.23	Jan 15, 2015	12.78	Feb 10, 2013	11.20	Average	12.78	Average	11.16	Date of Samples	NCV(pine) (GJ/ton)	Date of Samples	NCV(euca) (GJ/ton)	July 13, 2015	12.59	June 24, 2015	11.94	July 13, 2015	12.47	June 24, 2015	11.80	July 13, 2015	12.56	June 24, 2015	11.84	Average	12.54	Average	11.86	Parameter	First period (Jan-June 2015)	Second period (July-Dec 2015)	NCV (Black liquor)	12.52	12.35
Date of Samples	NCV(pine) (GJ/ton)	Date of Samples	NCV(euca) (GJ/ton)																																												
Jan 15, 2015	12.82	Feb 10, 2013	11.04																																												
Jan 15, 2015	12.74	Feb 10, 2013	11.23																																												
Jan 15, 2015	12.78	Feb 10, 2013	11.20																																												
Average	12.78	Average	11.16																																												
Date of Samples	NCV(pine) (GJ/ton)	Date of Samples	NCV(euca) (GJ/ton)																																												
July 13, 2015	12.59	June 24, 2015	11.94																																												
July 13, 2015	12.47	June 24, 2015	11.80																																												
July 13, 2015	12.56	June 24, 2015	11.84																																												
Average	12.54	Average	11.86																																												
Parameter	First period (Jan-June 2015)	Second period (July-Dec 2015)																																													
NCV (Black liquor)	12.52	12.35																																													

Note: Please, refer to section "Additional comments" below.

A description of the weighted average calculations performed to ensure the representativeness of the net calorific value of black liquor is presented here:

First period (Jan-June 2015):

NCV (Black liquor) 12.32 (GJ/tDS) = [72% \* 12.78 (GJ/tDS) + 28%\*11.16(GJ/tDS)].

Second period (July-Dec 2015):

NCV (Black liquor) 12.35 (GJ/tDS)= [72% \* 12.54 (GJ/tDS) + 28% \* 11.86]

**Biomass residues (mix of sawdust and bark) from forest operations.**

In accordance with the methodology, the required residual biomass samples were collected with the purpose of measuring their net calorific value in the laboratory. Results are presented below:

	Date of samples	Biomass residues	NCV (kcal/kg)	(GJ/ton)
1 <sup>st</sup> Period	Jan 01, 2015	mix of sawdust and bark.	4,367	18.24
1 <sup>st</sup> Period	Jan 01, 2015	mix of sawdust and bark.	4,324	18.10
1 <sup>st</sup> Period	Jan 01, 2015	mix of sawdust and bark.	4,311	18.05
Net calorific value (dry basis)				18.15

	Date of samples	Biomass residues	NCV (kcal/kg)	(GJ/ton)
2 <sup>nd</sup> Period	Aug 03, 2015	mix of sawdust and bark.	4,356	18.24
2 <sup>nd</sup> Period	Aug 03, 2015	mix of sawdust and bark.	4,310	18.05
2 <sup>nd</sup> Period	Aug 03, 2015	mix of sawdust and bark.	4,361	18.26
Net calorific value (dry basis)				18.18

Note: Please, refer to Section Additional comments below.

QA/QC procedures:

The Project Participant cross-checked the consistency of the measured values with the default values by the IPCC and other similar biomass power plants by Arauco located in the South part of the country. The values were found consistent.

Biomass type: Black liquor

Source	NCV (GJ/Kg)
Values applied	12.32(1 <sup>st</sup> semester) 12.35(2 <sup>nd</sup> semester) Average: 12.43
Default values IPCC 2006,Chapter 1, Volume 2	Range [5.9 – 23.0]
Historical value 2013 of Valdivia Biomass Power Plant Ref: 1787	11.75(1 <sup>st</sup> semester) 11.85(2 <sup>nd</sup> semester)
Historical value 2012 of Valdivia Biomass	12.06 (1 <sup>st</sup> semester)



Power Plant Ref: 1787	13.25 (2 <sup>nd</sup> semester)
Historical value 2011 of Valdivia Biomass Power Plant Ref: 1787	11.96(1 <sup>st</sup> semester) 12.24(2 <sup>nd</sup> semester)
Historical value 2010 of Valdivia Biomass Power Plant Ref: 1787	12.01(1 <sup>st</sup> semester) 12.22(2 <sup>nd</sup> semester)
Historical value 2012 (other registered CDM project Nueva Aldea Biomass Power plant Phase 2, Ref:0356)	10.70
Historical value 2011 (other registered CDM project Nueva Aldea Biomass Power plant Phase 2, Ref:0356)	10.70
Historical value 2010 (other registered CDM project Nueva Aldea Biomass Power plant Phase 2, Ref:0356)	10.29
Historical value 2009 (other registered CDM project Nueva Aldea Biomass Power plant Phase 2, Ref:0356)	10.35

Biomass type: mix of sawdust and bark from forest operations

Source	NCV (GJ/Kg)
Values applied	18.15 (1 <sup>st</sup> semester) 18.18 (2 <sup>nd</sup> semester) Average: 18.16
Default values IPCC 2006, Chapter 1, Volume 2.	Range [7.9 – 31]
Historical value 2013 of Valdivia Biomass Power Plant. Ref: 1787	17.63 (1 <sup>st</sup> semester) 18.02 (2 <sup>nd</sup> semester)
Historical value 2012 of Valdivia Biomass Power Plant. Ref: 1787	18.65 (1 <sup>st</sup> semester) 17.87 (2 <sup>nd</sup> semester)
Historical value 2011 of Valdivia Biomass Power Plant. Ref: 1787	18.62 (1 <sup>st</sup> semester) 16.93 (2 <sup>nd</sup> semester)
Historical value 2010 of Valdivia Biomass Power Plant. Ref: 1787	16.53 (1 <sup>st</sup> semester) 18.83 (2 <sup>nd</sup> semester)
Historical value 2011 (other registered CDM project: Nueva Aldea Biomass Power Plant Phase 1, Ref: 0258)	16.47
Historical value 2010 (other registered CDM project: Nueva Aldea Biomass Power Plant Phase 1, Ref: 0258)	16.95
Historical value 2009 (other registered CDM project: Nueva Aldea Biomass Power Plant Phase 1, Ref: 0258)	17.98
Historical value 2008 (other registered CDM project: Nueva Aldea Biomass Power Plant Phase 1, Ref:0258)	17.97
Historical value 2012 (other registered CDM project: Trupan Biomass Power Plant in Chile, Ref: 0259)	18.32
Historical value 2011 (other registered CDM project: Trupan Biomass Power Plant in Chile, Ref: 0259)	17.68
Historical value 2010 (other registered CDM project: Trupan Biomass Power Plant in Chile, Ref: 0259)	17.86
Historical value 2009 (other registered CDM project: Trupan Biomass Power Plant in Chile, Ref: 0259)	17.93
Historical value 2008 (other registered CDM project: Trupan Biomass Power Plant in Chile, Ref: 0259)	18.59

According to the values above, the Project Participant deemed the monitored NCV values within the acceptable ranges.

Purpose of data:	Baseline and Project emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	$EF_{\text{burning,CH}_4,k,y}$
Unit:	(tCH <sub>4</sub> /GJ)
Description:	CH <sub>4</sub> emission factor for uncontrolled burning of the biomass residue type k during year y.
Measured/ Calculated / Default:	Measured once at the start of the project activity.
Source of data:	<p>The Project Participant used the following information sources to determine this parameter:</p> <ul style="list-style-type: none"> <li>Measurement report from U.S. Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, Montana, USA: "Methane Emissions from Burning Sawmill Residues in South Central Chile".</li> </ul> <p>In this case, the Project Participant used a measured value for this parameter rather than the default methane emission factor provided by the baseline methodology. This was clearly stated in page 87 of the registered PDD. The Project Participant did not use the measured value in the registered PDD, since it was not available when the PDD of the Valdivia CDM project activity was written.</p>
Value(s) of monitored parameter:	Biomass residues from forest operations (sawdust and bark mix from sawmills, pulp mills, etc.): 0.0008742 (tCH <sub>4</sub> /GJ) or 874.2 (Kg CH <sub>4</sub> /TJ). This value includes the adjustment of a conservativeness factor of 0.94.
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.

QA/QC procedures:	<p>The measured CH<sub>4</sub> emission factor for uncontrolled burning of biomass residues was compared with IPCC default values as presented in the table:</p> <table border="1"> <thead> <tr> <th>Parameter</th><th>UNITs</th><th>2009 measured value.<sup>(1)</sup></th><th>IPCC default value.<sup>(2)</sup></th></tr> </thead> <tbody> <tr> <td>CH<sub>4</sub> factor for biomass uncontrolled burning.</td><td>(tCH<sub>4</sub>/BDt)</td><td>0.0172</td><td>0.0027</td></tr> <tr> <td>CH<sub>4</sub> factor for biomass uncontrolled burning.</td><td>(tCH<sub>4</sub>/GJ)</td><td>0.000930</td><td>0.000300</td></tr> </tbody> </table> <p><sup>(1)</sup> Measurement report issued by ISDA Forest Service, Rocky Mountain Research.  <sup>(2)</sup> Default value according to the default values by the 2006 IPCC.</p> <p>As can be seen, the measured value is considerably higher than the IPCC default value. However, as explained below, this comparison is not relevant in this case, since the default emission factor does not reflect the real methane emissions that occur in this case when the biomass residues are burned in the open air, under very low oxygen presence, in the south part of the country.</p> <p>The Project Participant hired a highly reputed US institution to carry out two measurements for this emission factor: one in September of 2006 and another one in March, 2009. The 2009 measurement was carried out at the end of the dry season (summer), in which the piled biomass residues are drier. This facilitates the combustion of the biomass residues, which leads to a lower methane emission factor (there is less smouldering in the combustion of the biomass residues) than if the biomass residues were more humid (as it happened with the 2006 measurement). The following table shows the 2006 and 2009 measurements for the CH<sub>4</sub> emission factor:</p> <table border="1"> <thead> <tr> <th></th><th></th><th>2009 measured value</th><th>2006 measured value.</th></tr> </thead> <tbody> <tr> <td>CH<sub>4</sub> factor for biomass uncontrolled burning.</td><td>(tCH<sub>4</sub>/BDt)</td><td>0.0172</td><td>0.0137</td></tr> <tr> <td>CH<sub>4</sub> factor for biomass uncontrolled burning.</td><td>(tCH<sub>4</sub>/GJ)</td><td>0.000930</td><td>0.0007405</td></tr> </tbody> </table> <p>Considering the results of the two measurements and the fact that the 2009 measurement (used in the Valdivia emission reduction calculation) was carried out under the <u>most conservative conditions possible</u>, the Project Participant deemed the 2009 measured value representative and appropriate in this case.</p>	Parameter	UNITs	2009 measured value. <sup>(1)</sup>	IPCC default value. <sup>(2)</sup>	CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /BDt)	0.0172	0.0027	CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /GJ)	0.000930	0.000300			2009 measured value	2006 measured value.	CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /BDt)	0.0172	0.0137	CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /GJ)	0.000930	0.0007405
Parameter	UNITs	2009 measured value. <sup>(1)</sup>	IPCC default value. <sup>(2)</sup>																						
CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /BDt)	0.0172	0.0027																						
CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /GJ)	0.000930	0.000300																						
		2009 measured value	2006 measured value.																						
CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /BDt)	0.0172	0.0137																						
CH <sub>4</sub> factor for biomass uncontrolled burning.	(tCH <sub>4</sub> /GJ)	0.000930	0.0007405																						
Purpose of data:	Baseline emission calculations.																								
Additional comment:	---																								

<b>Data / Parameter:</b>	$\theta_{\text{boiler}}$
Unit:	(%)
Description:	Average net energy efficiency of heat generation in the boiler that would generate heat in the absence of the project activity.
Measured/ Calculated / Default:	In this case, the Project Participant used the ASME PTC 4.1 standard for determining the boiler efficiency that would have been used in the baseline scenario.
Source of data:	The boiler efficiency was determined based on a similar and comparable plant owned by Arauco according to the ASME PTC 4.1 standard.

Value(s) of monitored parameter:	100%
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Once at the beginning of the project activity.
Calculation method (if applicable):	As per the ASME PTC 4.1 standard.
QA/QC procedures:	<p>According to worldwide reputed consultants and equipment supplier in the Energy sector, the efficiency values for these types of boilers are:</p> <ul style="list-style-type: none"> <li>• Andritz: Efficiency range for a biomass residues boiler (85% - 90%).</li> <li>• Metso: Average efficiency for a biomass residue boiler: 88%.</li> </ul> <p>The efficiency value used for the biomass boiler that would have been used in the baseline is similar to the efficiency values presented above. Furthermore and as indicated in the "Comment section below", the 85% efficiency value used by the Project Participant in this emission reduction calculation is the most conservative efficiency value among the values suggested by the consulting companies above that can be used for the Valdivia project in this case.</p>
Purpose of data:	Baseline emission calculations.
Additional comment:	However, considering that the efficiency value stated in the PDD is 100%, the baseline power boiler never existed, so measuring its efficiency is impossible and manufacturer's information is not available the PP has decided to maintain consistency and apply the 100% efficiency value in the emission reduction calculation for this monitoring period.

<b>Data / Parameter:</b>	--
Unit:	(m <sup>3</sup> st)
Description:	Quantity of biomass residues of type k that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region.
Measured/ Calculated / Default:	--
Source of data:	<p>This parameter was determined based on official data and statistics from:</p> <ul style="list-style-type: none"> <li>• Various reports from INFOR "National Forestry Institute",</li> <li>• Environmental Impact Assessment reports from the Environmental National Authority (CONAMA),</li> <li>• The Instituto Nacional de Estadísticas INE (in English: National Institute of Statistics).</li> <li>• Arauco internal information.</li> </ul>
Value(s) of monitored parameter:	See table in the leakage section of this Monitoring Report.
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually.

Calculation method (if applicable):	Not applicable.
QA/QC procedures:	---
Purpose of data:	Leakage emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	---
Unit:	(m <sup>3</sup> st)
Description:	Quantity of available biomass residues of type k in the region.
Measured/ Calculated / Default:	---
Source of data:	<p>This parameter was determined based on official data and statistics from:</p> <ul style="list-style-type: none"> <li>• Various reports from INFOR “National Forestry Institute”,</li> <li>• Environmental Impact Assessment reports from the Environmental National Authority (CONAMA),</li> <li>• The Instituto Nacional de Estadísticas INE (in English: National Institute of Statistics).</li> <li>• Arauco internal information.</li> </ul>
Value(s) of monitored parameter:	See table in the leakage section of this Monitoring Report.
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	---
Purpose of data:	Leakage emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	EC <sub>PJ,y</sub>
Unit:	(MWh)
Description:	On-site electricity consumption attributable to the project activity during the year y.
Measured/ Calculated / Default:	Measured.
Source of data:	There was no on-site electricity consumption attributable to the project activity during the monitored period.
Value(s) of monitored parameter:	0 (MWh/yr)
Monitoring equipment:	Not applicable since there were no such type of electricity consumptions in this case. Please see clarification below in the “Additional comment” section.
Measuring/ Reading/ Recording frequency:	Continuously.

Calculation method (if applicable):	Not applicable.
QA/QC procedures:	There was no on-site electricity consumption attributable to the project activity during the monitored period.
Purpose of data:	Project emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	<b>EF<sub>grid,y</sub></b>
Unit:	(tCO <sub>2</sub> /MWh)
Description:	CO <sub>2</sub> emission factor for grid electricity during the year y.
Measured/ Calculated / Default:	Calculated.
Source of data:	<p>The Project Participant used the following information sources to determine this parameter:</p> <ul style="list-style-type: none"> <li>• CDEC SIC dispatch centre reports.</li> <li>• Ministry of Energy reports.</li> <li>• 2006 IPCC lower values.</li> </ul>
Value(s) of monitored parameter:	xxxx tCO <sub>2</sub> /Mwh
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	<p>The grid emission factor corresponds to the Combined Margin of the SIC grid for the monitored period (full year data). The equation used for this calculation is equation N° 10 of the ACM0002 (Version 06).</p> <p>Arauco Bioenergía S.A. is responsible for performing the calculations to determine the grid emission factor according to the last version of the ACM0002. Official and publicly available information is used for that purpose.</p>
QA/QC procedures:	The data and results were found consistent with other official statistics and reports (i.e. Ministry of Energy, CDEC SIC dispatch reports).
Purpose of data:	Baseline emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	<b>EF<sub>OM,y</sub></b>
Unit:	(tCO <sub>2</sub> /MWh)
Description:	CO <sub>2</sub> Operating Margin emission factor of the grid.
Measured/ Calculated / Default:	Calculated.

Source of data:	The Project Participant used the following information sources to determine this parameter: <ul style="list-style-type: none"> <li>• CDEC SIC Dispatch Centre reports.</li> <li>• Ministry of Energy reports.</li> <li>• 2006 IPCC lower values.</li> </ul>
Value(s) of monitored parameter:	xxxx tCO <sub>2</sub> /Mwh
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	In this case, the OM emission factor is calculated using the simple/adjusted method equation, N° 4 of the ACM0002 (Version 06). The justification for the chosen OM calculation method is presented in detail in page 48 of the registered PDD.
QA/QC procedures:	The data and results were found consistent with other official statistics and reports (i.e. Ministry of Energy, CDEC SIC Dispatch Centre reports).
Purpose of data:	Baseline emission calculations.
Additional comment:	---

<b>Data / Parameter:</b>	<b>EF<sub>BM,y</sub></b>
Unit:	(tCO <sub>2</sub> /MWh)
Description:	CO <sub>2</sub> Build Margin emission factor of the grid.
Measured/ Calculated / Default:	Calculated.
Source of data:	The Project Participant used the following information sources to determine this parameter: <ul style="list-style-type: none"> <li>• CDEC SIC Dispatch Centre reports.</li> <li>• Ministry of Energy reports.</li> <li>• 2006 IPCC lower values.</li> </ul>
Value(s) of monitored parameter:	xxx tCO <sub>2</sub> /Mwh
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	This variable is calculated according to equation N° 9 of the ACM0002 (Version 06).
QA/QC procedures:	The data and results were found consistent with other official statistics and reports (i.e. Ministry of Energy, CDEC SIC Dispatch Centre reports).
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data/Parameter	$F_{i,y}$
Unit	Refer to the CO <sub>2</sub> grid emission factor calculation Excel sheet.
Description	Amount of each fossil fuel consumed by each power source/plant.
Measured/Calculated /Default	Measured.
Source of data	The Project Participant used the following information sources to determine this parameter:  CDEC SIC Dispatch Centre reports. Ministry of Energy reports.
Value(s) of monitored parameter	Refer to the CO <sub>2</sub> grid emission factor calculation Excel sheet.
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Annually.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Not applicable. This information comes from official sources.
Purpose of data	Baseline emission calculations.
Additional comment	---



<b>Data/Parameter</b>	<b>COEF<sub>i</sub></b>												
Unit	Units in (tCO <sub>2</sub> /000ton) except Natural Gas (tCO <sub>2</sub> /MMm <sup>3</sup> ).												
Description	Emission factor coefficient of each fossil fuel type consumed by each power plant/source in the relevant grid.												
Measured/Calculated /Default	Calculated.												
Source of data	This factor was calculated using IPCC default values (Carbon content and fraction of carbon oxidized) and local national data (Net calorific values of the corresponding fossil fuels).												
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th>Fuel type</th><th>01Jan, 2015 to 31March, 2016</th></tr> </thead> <tbody> <tr> <td>Coal</td><td>2,814 (tCO<sub>2</sub>/000ton)</td></tr> <tr> <td>Petcoke</td><td>2,857 (tCO<sub>2</sub>/000ton)</td></tr> <tr> <td>Diesel</td><td>3,378 (tCO<sub>2</sub>/000ton)</td></tr> <tr> <td>Natural gas</td><td>2,193 (tCO<sub>2</sub>/MMm<sup>3</sup>)</td></tr> <tr> <td>IFO 180</td><td>3,401 (tCO<sub>2</sub>/000ton)</td></tr> </tbody> </table>	Fuel type	01Jan, 2015 to 31March, 2016	Coal	2,814 (tCO <sub>2</sub> /000ton)	Petcoke	2,857 (tCO <sub>2</sub> /000ton)	Diesel	3,378 (tCO <sub>2</sub> /000ton)	Natural gas	2,193 (tCO <sub>2</sub> /MMm <sup>3</sup> )	IFO 180	3,401 (tCO <sub>2</sub> /000ton)
Fuel type	01Jan, 2015 to 31March, 2016												
Coal	2,814 (tCO <sub>2</sub> /000ton)												
Petcoke	2,857 (tCO <sub>2</sub> /000ton)												
Diesel	3,378 (tCO <sub>2</sub> /000ton)												
Natural gas	2,193 (tCO <sub>2</sub> /MMm <sup>3</sup> )												
IFO 180	3,401 (tCO <sub>2</sub> /000ton)												
Monitoring equipment	Not applicable.												
Measuring/Reading/ Recording frequency	Annually.												
Calculation method (if applicable)	<p> <math>COEF_{CO_2,i} (tCO_2/000ton) = NCV_i (TJ/000ton) * \text{Carbon content of fuel type } i (tC/TJ) * \text{Fraction of carbon oxidized} * CO_2 / C \text{ conversion factor } (tCO_2/tC)</math> </p> <p>Where:</p> <ul style="list-style-type: none"> <li>COEF<sub>CO<sub>2</sub>,coal</sub> (tCO<sub>2</sub>/000ton) = 29.3 (TJ/000ton) * 26.2 * (44/12)</li> <li>COEF<sub>CO<sub>2</sub>,Petcoke</sub> (tCO<sub>2</sub>/000ton) = 29.3 (TJ/000ton) * 26.6 * (44/12)</li> <li>COEF<sub>CO<sub>2</sub>,Diesel</sub> (tCO<sub>2</sub>/000ton) = 45.6 (TJ/000ton) * 20.2 * (44/12)</li> <li>COEF<sub>CO<sub>2</sub>,Nat Gas</sub> (tCO<sub>2</sub>/000ton) = 39.1 (TJ/MMm<sup>3</sup>) * 15.3 * (44/12)</li> <li>COEF<sub>CO<sub>2</sub>,IFO 180</sub> (tCO<sub>2</sub>/000ton) = 44.0 (TJ/000ton) * 21.1 * (44/12)</li> </ul> <p>Note that local measurements of net calorific values presented in units of (TJ/000tons) because IPCC values are published in the units of (TJ/Gg), equivalent to (TJ/000 tons). This explains why parameter COEF<sub>CO<sub>2</sub>,i</sub> is presented in units of tons of CO<sub>2</sub> per thousand tons (tCO<sub>2</sub>/000ton).</p>												
QA/QC procedures	Local NCV values were duly compared with IPCC default and/or lower values. Local values were found consistent. Carbon content and % of carbon oxidized were taken from the IPCC.												
Purpose of data	Baseline emission calculations.												
Additional comment	---												

<b>Data/Parameter</b>	<b>GEN<sub>j/k/n,y</sub></b>
Unit	(MWh)
Description	Electricity generation of each power source/plant j, k or n.
Measured/Calculated /Default	Measured.
Source of data	This information was directly obtained by the CDEC-SIC Dispatch Centre.
Value(s) of monitored parameter	Refer to the CO <sub>2</sub> grid emission factor calculation Excel sheet.
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Annually.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	The Project Participant used official data from the CDEC-SIC Dispatch Centre. The data was found to be consistent with official studies (e.g. CDEC-SIC Yearbook.).
Purpose of data	Baseline emission calculations.
Additional comment	---

<b>Data/Parameter</b>	<b>--</b>
Unit	(Text)
Description	Identification of power source/plant for the OM.
Measured/Calculated /Default	Determined based on official data.
Source of data	This information was directly obtained by the CDEC-SIC Dispatch Centre.
Value(s) of monitored parameter	Refer to the CO <sub>2</sub> grid emission factor calculation excel sheet for the calculation of this emission factor.
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Annually.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Not applicable. This information comes from official sources.
Purpose of data	Baseline emission calculations.
Additional comment	---

<b>Data/Parameter</b>	--
Unit	Text.
Description	Identification of power source/plant for the BM.
Measured/Calculated /Default	Determined based on official data.
Source of data	This information was directly obtained by the CDEC-SIC Dispatch Centre.
Value(s) of monitored parameter	Refer to the CO <sub>2</sub> grid emission factor calculation excel sheet for the calculation of this emission factor.
Monitoring equipment	Not Applicable.
Measuring/Reading/ Recording frequency	Annually.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Not applicable. This information comes from official sources.
Purpose of data	Baseline emission calculations.
Additional comment	---

<b>Data/Parameter</b>	$\lambda_y$
Unit	(Number)
Description	Fraction of time during which low-cost/must-run sources are on the margin.
Measured/Calculated /Default	Calculated.
Source of data	This factor was calculated from information directly obtained from the CDEC-SIC Dispatch Centre.
Value(s) of monitored parameter	0
Monitoring equipment	Not Applicable.
Measuring/Reading/ Recording frequency	Annually.
Calculation method (if applicable)	As per the corresponding methodology ACM0002 (Version 06)
QA/QC procedures	The data used for the calculation of this parameter comes from official sources. The calculation was double-checked in this case.
Purpose of data	Baseline emission calculations.
Additional comment	---

Data/Parameter	GEN <sub>j/k/l,y</sub> IMPORTS
Unit	(KWh)
Description	Electricity imports to the project electricity system.
Measured/Calculated /Default	Not applicable.
Source of data	This information was directly obtained by the CDEC-SIC Dispatch Centre.
Value(s) of monitored parameter	0 (KWh).  To date, the SIC system is not interconnected with any other transmission system, either of Chile or of any other country.
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Not applicable.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	To date, the SIC system is not interconnected with any other transmission system, either of Chile or of any other country.
Purpose of data	Baseline emission calculations.
Additional comment	---

Data/Parameter	COEF <sub>j/k/l,y</sub> IMPORTS
Unit	(tCO <sub>2</sub> /ton) or (tCO <sub>2</sub> /m <sup>3</sup> )
Description	CO <sub>2</sub> emission coefficient of fuels used in connected electricity systems (if imports occur).
Measured/Calculated /Default	Not applicable.
Source of data	This information was directly obtained by the CDEC-SIC Dispatch Centre.
Value(s) of monitored parameter	0 (tCO <sub>2</sub> /ton) or 0 (tCO <sub>2</sub> /m <sup>3</sup> ). Since there are no imports in the SIC, this variable is currently not used in the emission reduction calculation.
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Not applicable.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	To date, the SIC system is not interconnected with any other transmission system, either of Chile or of any other country.
Purpose of data	Baseline emission calculations.
Additional comment	---

<b>Data/Parameter</b>	<b>EF<sub>CO2,LE</sub></b>
Unit	(tCO <sub>2</sub> /GJ)
Description	CO <sub>2</sub> emission factor of the most carbon intensive fuel used in the country.
Measured/Calculated /Default	Default value.
Source of data	The most carbon intensive fuel type can be obtained from official national communication sources (e.g. CNE, CDEC-SIC). In case such information is not available, IPCC default values will be used instead.
Value(s) of monitored parameter	Since leakage was 0 during the monitored period, this parameter was not used in the corresponding emission reduction calculation.
Monitoring equipment	Not applicable.
Measuring/Reading/Recording frequency	Not applicable.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	The Project Participant had no need to use this variable, since it was possible to show that the project activity did not cause leakage in the influence area of the power plant.
Purpose of data	Leakage emission calculations.
Additional comment	---

### D.3. Implementation of sampling plan

Not applicable

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

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

Differences in baseline and project emission calculations included in tables below are due to the fact that all calculations are done directly in Excel spread sheets, which implies a decimal precision that is not carried over onto Word-formatted tables because decimals are truncated and rounded down. Exact resulting values can be viewed directly in the emission reduction calculation spread sheet.

#### 1. Baseline emissions due to electricity displacement

In this case, the project participant used a modified version of equation N° 14 of the ACM0006 (Version 05), according to the PDD, page 120, to determine the net quantity of increased electricity as a result of the project activity. This modification was part of a request for deviation that pursued the simultaneous application of CDM project initiatives N° 1 and N° 2, which was approved by the Executive Board in December 13<sup>th</sup>, 2007.

$$EG_y = EG_{\text{project plant}} - \varepsilon_{\text{el, other plant(s)}} * (1/3.6) * \sum (BF_{k,y} * NCV_k)$$

Where:

EG<sub>y</sub>: Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during year y (MWh). In this case, the project plant would incorporate the net quantity of increased electric generation capacity derived from implementing CDM project initiatives N°1 and N°2, simultaneously.

**EG<sub>project plant</sub>:** Net quantity of electricity generated in the project plant during year (MWh). In this case, the project plant would incorporate the net quantity of increased electric generation capacity derived from implementing CDM project initiatives N°1 and N°2, simultaneously. Refer to the parameter in section D.2. Data and parameters monitored of this monitoring report.

**E<sub>el, other plant(s)</sub>:** Average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass residues fired in the project plant in the absence of the project activity ( $MWh_{el}/MWh_{biomass}$ ). In this case, the baseline power plant electric efficiency calculation considers a business-as-usual pulp mill (reference plant), in which the project initiatives N°1 and N°2 are not implemented. For more details please see pages 10 and 11 of the registered PDD.

**BF<sub>k,y</sub>:** Quantity of biomass residue type k combusted in the project plant during the year y (tons of dry matter or litter). In this case, the project plant would combust a higher amount of biomass from forest operations (CDM project initiative N°1) but the same amount of black liquor (CDM project initiative N°2) than the baseline plant (reference plant). This variable includes both types of biomass fired in the project plant.

**NCV<sub>k</sub>:** Net calorific value of the biomass residue type k (GJ/ton of dry matter or GJ/liter). In this case, the NCV for each type of biomass would be monitored and considered in the calculation: the NCV of biomass from forest operations (CDM project initiative N°1) and the NCV of black liquor (CDM project initiative N°2).

According to the above, the net electricity displaced by the project activity is calculated as follows:

**Data:**

Parameters	Units	2015 01Jan to 31 Dec	2016 01Jan to 31March
(1) Gross electricity generated in the project plant	(MWh/y)	700,338	185,922
(2) Total internal electricity consumption	(MWh/y)	424,163	110,102
(3) Additional power consumption percentage due to the project activity	%	4.59%	4.59%
(4) Average net energy efficiency of electricity generation baseline plant	%	11.971%	11.971%
(5) Quantity of black liquor combusted in the project plant (dry basis).	(tDS/y)	1,026,899	262,774
(6) Quantity of biomass from forest ops. Combusted in the project plant (dry basis).	(BDt/y)	176,523	49,124
(7) Net calorific value of black liquor (dry basis).	(GJ/ton)	12.34	12.80
(8) Net calorific value of biomass from forest operations (dry basis).	(GJ/ton)	18.16	18.15

**Calculations:**

	Calculations	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(9) Net quantity of electricity generated in the project plant	(1)-(2)*(3)	(MWh/y)	680,864	180,867
(10) Electric power generated in the baseline mill	$(4)*((5)*(7)+(6)*(8))* (1/3,600)$	(MWh/y)	544,819	141,522
(11) Net quantity of increased electricity.	(9)-(10)	(MWh/y)	136,046	39,345

Using the values of the net quantity of increased electricity generation and the CO<sub>2</sub> emission factor of the grid, it is possible to calculate the emission reductions due to displacement of electricity for the monitored period using equation N° 9 of the ACM0006 (Version 05):

$$ER_{\text{electricity},y} = EG_y * EF_{\text{electricity},y}$$

Where:

- $EG_y$  : Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh).
- $ER_{\text{electricity},y}$  : Emission reductions due to displacement of electricity during the year y (tCO<sub>2</sub>/yr).
- $EF_{\text{electricity},y}$  : CO<sub>2</sub> emission factor for the electricity displaced due to the project activity during the year y (tCO<sub>2</sub>/MWh).

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(1) Combined margin for the SIC grid	(tCO <sub>2</sub> /MWh)	xxx	xxx
(2) Electricity displaced by the project activity(adjusted)	(MWh/y)	152,970	39,345

Calculations:

	Calculations	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(3) Total grid emission savings (adjusted)	(1)*(2)	(tCO <sub>2</sub> /y)	93,872	27,148

Determination of the emission factor of the grid electricity generation:

The parameter EF should be determined as the combined margin CO<sub>2</sub> emission factor for the grid to which the project activity is connected in year y, calculated according to the ACM0002 (version 06). This calculation is presented below:

a) Operating Margin calculations:

In this case the OM emission factor is calculated using the simple/adjusted method --equation N°4 of the ACM0002 (Version 06). The Project Participant used ex-post data to calculate this parameter, that is, the coefficient was calculated in the year in which the project generation occurs, which is 2015 in this case.

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

$$\lambda_y = \lambda_{2014} = 0.00000$$

The rest of the parameters used to calculate the  $EF_{grid}$  for 2015 were obtained from the CDEC-SIC dispatch center (official and public information). The calculation is as follows:

- CO<sub>2</sub> emission of non-low cost/must-run power sources:

$$\sum_{i,j} F_{i,j,2014} \cdot COEF_{i,j} = 17,121,276 \text{ (tCO}_2\text{/y)}$$

- The total power generation in the SIC by non-low-cost/must-run power sources in 2015:

$$\sum_j GEN_{j,2014} = 23,957,647 \text{ (Mwh/y)}$$

- The CO<sub>2</sub> emissions of low-cost/must run power sources in 2015. 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:

$$\sum_{i,k} F_{i,k} \cdot COEF_{i,k} = 548,476 \text{ (tCO}_2\text{/y)}$$

- Total power generation in the SIC by low-cost/must-run resources for 2015:

$$\sum_k GEN_{k,2014} = 28,328,214 \text{ (Mwh/y)}$$

Replacing the above values in the equation used to calculate the EF for 2015, the operating margin results:

$$EF_{OM,2014} = (1 - 0.00000) \cdot \frac{17,121,276}{23,957,647} \text{ (tCO}_2\text{/Mwh)} + 0.00000 \cdot \frac{548,476}{28,328,214} \text{ (tCO}_2\text{/Mwh)}$$

$$EF_{OM,2014} = EF_{OM,simple\ adjusted,2014} = 0.715 \text{ (tCO}_2\text{/Mwh)}$$

b) Build Margin calculation

According to 2014 SIC data, the group of plants that accounts for the largest generation that year are the ones responsible for the 20% of the total generation. These plants are considered to calculate the Build Margin for 2015:

$$EF_{BM,2014} = 0.637 \text{ (tCO}_2\text{/Mwh)}$$

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  $EF_{OM,y}$  and the Build Margin  $EF_{BM,y}$ , for 2014, and assuming the default value of 0.5 for the weights  $W_{OM}$  and  $W_{BM}$ , it is possible to calculate  $EF_{grid\ CM,y}$  for the year 2014:

$$EF_{2014} = 0.5 \times 0.715 + 0.5 \times 0.637 = 0.676 \text{ (tCO}_2\text{/Mwh)}$$



## 2. Baseline emissions due to uncontrolled burning of anthropogenic sources of biomass residues

To calculate this emission source, it is necessary first to calculate the quantity of biomass residues used as a result of the project activity. In this case, this is done using equation N° 30 of the ACM0006 (Version 05). As mentioned before, the proposed project activity only involves additional use of biomass from forest operations in the power boiler.

$$BF_{PJ,k,y} = BF_{k,y} - \frac{Q_{\text{project plant},y}}{\varepsilon_{\text{boiler}} * NCV_k}$$

Where:

- $BF_{PJ,k,y}$  : Incremental quantity of biomass residue type k used as a result of the project activity in the project plant during the year y (tons of dry matter or liter).
- $BF_{k,y}$  : Quantity of biomass residue type k combusted in the project plant during the year y (tons of dry matter or liter).
- $Q_{\text{project plant},y}$  : Quantity of heat generated in the cogeneration project plant from firing biomass residues during year y (GJ).
- $\varepsilon_{\text{boiler}}$  : Energy efficiency of the boiler that would be used in the absence of the project activity.

Since in the project mill, the power boiler and the recovery boiler generate high-pressure steam at the same thermodynamic conditions, the best way to determine the heat that is attributable to the power boiler, is to multiply the total amount of heat generated in the mill by the fraction of high-pressure steam generated by the power boiler with respect to the total high-pressure steam generated in the mill by both boilers. This algorithm was part of the request for deviation approved by the Executive Board for the Valdivia project activity.

$$Q_{\text{project plant},y} = [(HP \text{ Steam PB}) / (HP \text{ Steam PB} + HP \text{ Steam RB})] * \text{Process heat}$$

Where:

- HP Steam PB : Total high-pressure steam generated in the power boiler (tons/time unit).
- HP Steam RB: Total high-pressure steam generated in the recovery boiler (tons/time unit).
- Process heat : Total heat consumed in the pulping process (GJ/time unit).

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(1) Total high-pressure steam generated by the recovery boiler	(ton/y)	3,661,385	946,969
(2) Total high-pressure steam generated by the power boiler	(ton/y)	861,096	237,703
(3) Total biomass residues from forest operations combusted in the power boiler.	(BDt/y)	176,523	49,124
(4) Net calorific value of biomass from forest operations (dry basis).	(GJ/ton)	18.16	18.15
(5) Quantity of process heat generated in the cogeneration project plant.	(GJ/y)	7,138,628	1,950,707

(6) Energy efficiency of the boiler used in the absence of the project activity.	%	100%	100%
--	---	------	------

Calculations:

	Calculations.	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(7) Process heat attributable to the power boiler	$[(2)/(1)+(2)]*(5)$	(GJ/y)	1,359,219	391,406
(8) Biomass used to generate heat	$(7)/((4)*(6))$	(BDt/y)	74,833	21,570
(9) Incremental biomass use (adjusted)	$(3)-(8)$	(BDt/y)	101,690	27,554

With the above calculation, it is possible to calculate the baseline emissions due to uncontrolled burning of anthropogenic sources of biomass residues using equation N° 34 of the ACM0006 (Version 05):

$$BE_{\text{Biomass},y} = GWP_{\text{CH}_4} * \sum BF_{\text{PJ},k,y} * NCV_k * EF_{\text{burning,CH}_4,k,y}$$

Where

$BE_{\text{biomass},y}$ :	Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y (tCO <sub>2e</sub> /y).
$GWP_{\text{CH}_4}$ :	Global Warming Potential of methane valid for the commitment period (tCO <sub>2e</sub> /tCH <sub>4</sub> ).
$BF_{\text{PJ},k,y}$ :	Incremental quantity of biomass residue type k used as a result of the project activity in the project plant during the year y (tons of dry matter or liter).
$NCV_k$ :	Net calorific value of the biomass residue type k (GJ/ton of dry matter or GJ/liter).
$EF_{\text{burning,CH}_4,k,y}$ :	CH <sub>4</sub> emission factor for uncontrolled burning of the biomass residue type k during the year y (tCH <sub>4</sub> /GJ).

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(1) Additional biomass from forest operations due to the project activity (adjusted)	(BDt/y)	101,690	27,554
(2) Adjusted CH <sub>4</sub> emission factor for uncontrolled burning of biomass from forest ops.	(tCO <sub>2eq</sub> /000ton)	397	397

## Notes:

The Project Participant would like to note that an adjustment factor of 0.94 was chosen for the (original) measurement CH<sub>4</sub> emission factor following the indication of Table N° 6 of the ACM0006 (Version 05).

Calculations:

		Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(3) Emissions	$(1)*(2)*$ (ton/1000 kg)	(tCO <sub>2eq</sub> )	40,367	10,927

Total baseline emissions

	2015 01Jan to 31Dec	2016 01Jan to 31March
Emission sources	(tCO <sub>2</sub> eq)	(tCO <sub>2</sub> eq)
Carbon dioxide emissions due to electricity displacement	105,549	27,148
Methane emissions due to uncontrolled biomass burning avoidance	40,367	10,927
<b>Total emissions</b>	<b>145,916</b>	<b>38,075</b>

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

Project emissions are calculated through the following equation:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH_4} * PE_{Biomass,CH_4,y}$$

Where:

$PET_y$ :	CO <sub>2</sub> emissions during the year y due to transport of the biomass residues to the project plant (tCO <sub>2</sub> /y).
$PEFF_y$ :	CO <sub>2</sub> emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity (tCO <sub>2</sub> /y).
$PEEC,y$ :	CO <sub>2</sub> emissions during the year y due to electricity consumption at the project site that is attributable to the project activity (tCO <sub>2</sub> /y).
$GWP_{CH_4}$ :	Global Warming Potential for methane valid for the relevant commitment period.
$PE_{Biomass,CH_4,y}$ :	CH <sub>4</sub> emissions from the combustion of biomass residues during the year y (tCH <sub>4</sub> /y).

1. Carbon dioxide emissions from biomass residues transportation to the power plant

This emission source is calculated using equation N° 4 of the ACM0006 (Version 05).

$$PET_y = \frac{\sum_k BF_{k,y}}{TL_y} * AVD_y * EF_{km,CO_2,y}$$

Where:

$PET_y$ :	CO <sub>2</sub> emissions during the year y due to transport of the biomass residues to the project plant (tCO <sub>2</sub> /yr)
$N_y$ :	Number of truck trips during the year y
$AVD_y$ :	Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year y (km)

$EF_{km,CO_2,y}$  : Average CO<sub>2</sub> emission factor for the trucks measured during the year y (tCO<sub>2</sub>/km)

$BF_{k,y}$  : Quantity of biomass residue type k combusted in the project plant during the year y (tons of dry matter or liter)

$TL_y$  : Average truck load of the trucks used (tons or liter) during the year y.

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(1) Biomass bought from 3 <sup>rd</sup> parties (dry)	(BDt/y)	62,123	19,867
(2) Biomass average humidity (wet basis)	%	58.66%	51.8%
(3) Average load for 1 trip (adjusted) (see notes)	(ton/truck)	25.3	23.3
(4) Average round trip distance between the biomass supply sites and the plant	(km)	89.1	116.4
(5) Emission factor for heavy truck transportation (see notes).	(kgCO <sub>2</sub> /km)	1.284	1.229

Calculations:

		Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(6) Biomass transported (wet)	(1)/[1 – (2)]	(wet ton)	150,263	48,055
(7) Number of trips needed for the Plant per year	(6) / (3)	(trips)	5,933	2,058
(8) Total distance travelled, considering round trip	(4)*(7)	(km)	528,798	239,690
(9) Total emissions	(5)*(8)* (1ton/1,000kg)	(tCO <sub>2</sub> )	<b>679</b>	<b>295</b>

2. Carbon dioxide emissions from on-site consumption of fossil fuels

This emission source is calculated using equation N° 6 of the ACM0006 (Version 05).

$$PEFF_y = \sum (FF_{project\ plant,i,y} + FF_{project\ site,i,y}) * NCV_i * COEF_i$$

Where:

$FF_{project\ plant,i,y}$  : Quantity of fossil fuel type i combusted in the biomass residue fired power plant during the year y (mass or volume unit per year).

$FF_{project\ site,i,y}$  : Quantity of fossil fuel type i combusted at the project site for other purposes that are attributable to the project activity during the year y (mass or volume unit per year).

$NCV_i$  : Net calorific value of fossil fuel type i (GJ / mass or volume unit).

$COEF_i$  : CO<sub>2</sub> emission factor for fossil fuel type i (tCO<sub>2</sub>/GJ).

The proposed project activity implies additional fossil fuel consumption due to:

- Fossil fuel consumption in the recovery boiler: In this case, the Fuel Oil consumed associated to the project activity is related to additional electric power generation of the power plant.

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(1) Fossil fuel used in the recovery boiler attributable to the project activity	(ton)	2,225	781
(2) Fossil fuel net calorific value (average)	(GJ/ton)	40.42	40.42
(3) Fossil fuel CO <sub>2</sub> emission factor	(tCO <sub>2</sub> /GJ)	0.07737	0.07737

Calculations:

		Units	2015 01Jan to 31Dec	2016 01Jan to 31March
<b>(4) Total emissions</b>	<b>(1)*(2)*(3)</b>	<b>(tCO<sub>2</sub>)</b>	<b>6,956</b>	<b>2,442</b>

- Fossil fuel consumption in the power boiler: In this case, there is fuel oil consumption associated to the project activity due to operational reasons and due to power generation reasons.

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(5) Fuel oil used due to operational reasons.	(ton)	2,638.5	660.8
(6) Fuel oil consumption due to power generation reasons.	(ton)	711.1	88.75
(7) Fuel oil used in the power boiler attributable to the project activity [(5)+(6)]	(ton)	3,349.6	749.6
(8) Fossil fuel net calorific value (average)	(GJ/ton)	40.42	40.42
(9) Fossil fuel CO <sub>2</sub> emission factor	(tCO <sub>2</sub> /GJ)	0.07737	0.07737

Calculations:

		Units	2015 01Jan to 31Dec	2016 01Jan to 31March
<b>(10) Total emissions</b>	<b>[(5)+(6)]*(8)*(9)</b>	<b>(tCO<sub>2</sub>)</b>	<b>10,473</b>	<b>2,344</b>

- Fossil fuel consumption due to on-site biomass residues from forest operations transportation: This fossil fuel consumption is related to the transportation of the additional biomass from forest operations (mix of sawdust and bark) that is attributed to the project activity (e.g. generation of additional power).

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(10) Diesel used for on-site biomass transportation due to the project activity.	(ton)	56.6	13.9

(11) Fossil fuel net calorific value (average)	(TJ/000ton) or (GJ/ton)	42.88	42.88
(12) Fossil fuel CO <sub>2</sub> emission factor.	(tCO <sub>2</sub> /GJ)	0.07407	0.07407

Calculations:

		Units	2015 01Jan to 31Dec	2016 01Jan to 31March
<b>(13) Total emissions</b>	<b>(10)*(11)*(12)</b>	<b>(tCO<sub>2</sub>)</b>	<b>179.6</b>	<b>44.0</b>

- Fossil fuel consumption due to on-site biomass residues from forest operations preparation: Since there was no mechanical preparation of biomass residues (sawdust and bark) during the monitored period, this emission source was zero.

According to the calculations above, the carbon dioxide emissions from on-site consumption of fossil fuels attributable to the implementation of the project activity can be summarized in the table below:

	2015 01Jan to 31Dec	2016 01Jan to 31March
<b>Carbon dioxide emissions from on-site consumption of fossil fuels</b>	<b>(tCO<sub>2</sub>)</b>	<b>(tCO<sub>2</sub>)</b>
Fossil fuel consumption in the recovery boiler	6,956	2,442
Fossil fuel consumption in the power boiler	10,473	2,344
Fossil fuel consumption due to on-site biomass from forest operations transportation	180	44
Fossil fuel consumption due to on-site biomass from forest operations preparation	0	0
<b>Total emissions</b>	<b>17,609</b>	<b>4,830</b>

3. Carbon dioxide emissions from electricity consumption

This emission source is calculated using equation N° 7 of the ACM0006 (Version 05). However, during the monitored period, there was no electricity consumption associated to the project activity, therefore the total emissions related to this source is zero.

$$PE_{EC,y} = 0$$

4. Methane emissions from combustion of biomass residues

This emission source is calculated using equation N° 8 of the ACM0006 (Version 05).

$$PE_{Biomass,CH_4,y} = EF_{CH_4,BF} * \sum BF_{k,y} * NCV_k$$

Where:

$BF_{k,y}$  : Quantity of biomass residue type k combusted in the project plant during the year y (tons of dry matter or liter).

$NCV_k$  : Net calorific value of the biomass residue type k (GJ/ton of dry matter or GJ/liter).

$EF_{CH_4,BF}$  : CH<sub>4</sub> emission factor for the combustion of biomass residues in the project plant

(tCH<sub>4</sub>/GJ).

Since the project activity implies additional biomass from forest operations consumption in the power boiler, the only source of methane emissions attributed to the project activity is the one related to this additional consumption under controlled burning conditions.

Data:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
(1) Biomass related to the project activity burned in the power boiler.	(BDt)	101,690	27,554
(2) Net calorific value of biomass from forest operations (dry basis).	(GJ/ton)	18.16	18.15
(3) Biomass methane emission factor under controlled burning conditions	(KgCH <sub>4</sub> /TJ)	30.0	30.0
(4) Conservativeness factor	---	1.02	1.02
(5) Global Warming Potential of CH <sub>4</sub>	---	25	25

The Project Participant would like to note that net calorific values of biomass must be monitored twice a year. For simplicity, an average was used here.

Calculations:

	Units	2015 01Jan to 31Dec	2016 01Jan to 31March
<b>(6) Total emissions</b>	(1)*(2)*(1TJ/1,000GJ)*(3)*(4)*(5) *(1 ton/1,000kg)	<b>1,413</b>	<b>382</b>

Total project emissions:

	2015 01Jan to 31Dec	2016 01Jan to 31March
<b>Emission sources</b>	(tCO <sub>2</sub> eq)	(tCO <sub>2</sub> eq)
Carbon dioxide emissions from biomass residues transportation to the power plant	679.2	294.6
Carbon dioxide emissions from on-site consumption of fossil fuels.	17,609.4	4,830.2
Carbon dioxide emissions from electricity consumption	0.0	0.0
Methane emissions from combustion of biomass residues	1,413.0	382.5
<b>TOTAL PROJECT EMISSIONS</b>	<b>19,701.6</b>	<b>5,507.3</b>

### E.3. Calculation of leakage

Since the project activity contemplates the utilization of additional biomass from forest operations (sawdust and bark), it is required to assess if the project displaced the current use of biomass as a fuel. If the project actually drove current users of biomass to resort to more carbon-intensive fuels, the emission related to that fuel must be deducted from the project's emission reductions.

There are two sources of biomass that can be used in the Valdivia biomass power plant:

1. Biomass from industrial operations, consisting basically of biomass generated by local sawmills. Currently, part of this biomass is used by the same sawmills for heat generation purposes, however, a considerable surplus still remains.
2. Biomass from forestry operations, consisting basically of harvesting, pruning and thinning operations in managed forestlands. Currently this biomass has very little use.

Arauco performed a biomass availability study for 2015, using official bulletins from INFOR<sup>4</sup> as well as other (whenever available) official sources to calculate the biomass supply and demand in the Valdivia power plant influence area<sup>5</sup>. This study is part of the monitoring plan of the Valdivia project activity and was carried out according to approach L2 of the baseline methodology. A detailed Excel spread sheet with the monitored data and the calculation of the forest biomass supply/demand situation was provided to the DOE to establish the quality and validity of the data sources and the accuracy of the calculated numbers. The following table summarizes the results of this study:

**Supply / Demand situation in Valdivia power plant influence area**

(Estimation for year 2014)

**Biomass residues generation**

Biomass from industrial operations	(m <sup>3</sup> st/yr)	4.387.570
Biomass from forestry operations	(m <sup>3</sup> st/yr)	2.390.204

**Biomass residues demand**

Demand from industrial operations	(m <sup>3</sup> st/yr)	2.586.078
-----------------------------------	------------------------	-----------

**Sources:** Infor official bulletins and studies.

\* Demand from forestry operations not available for year 2014

**Valdivia power plant surplus index**

(estimation for year 2014)

This index was calculated using criteria "L2" of the ACM0006

<b>Industrial Biomass residues supply / Industrial Biomass residues consumption</b>	1,6966
<b>Biomass residues supply / Biomass residues consumption*</b>	2,6209

\* The Biomass residues supply considered the biomass residues from industrial and forestry operations

According to the table above, it is clear that the quantity of available biomass in the influence area of the project activity is greater than the 25% threshold established in option L2 of the consolidated baseline methodology. These results are consistent with the fact that in the last years the existing biomass power plants in the area/region continue to function without restriction and that new biomass based projects are being considered in the area<sup>6</sup>.

From the above analysis, it is possible to conclude that the Valdivia biomass power plant has not caused a biomass supply shortage in its influence area, and therefore has not caused other biomass consumers to switch from biomass fuels to fossil fuel sources. For these reasons, the associated leakage to the Valdivia project activity is considered to be zero.

$$L_y = 0$$

<sup>4</sup> INFOR stands for "Instituto Nacional Forestal" or "National Forestry Institute" in English.

<sup>5</sup> The Valdivia project influence area is defined in page 129 of the registered PDD.

<sup>6</sup> Including some prospective CDM biomass projects.



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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (t CO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
<b>Total</b>	183,992	25,209	0	Not applicable.	158,782	158,782

Notes:

The baseline emissions informed corresponds to the sum of the monitored amount of 145,916 tCO<sub>2</sub> from 01Jan to 31Dec, 2015 and the Monitored amount of 38,075 from 01Jan to 31March, 2016.

The project emission informed corresponds to the sum of the monitored amount of 19,701.6 tCO<sub>2</sub> from 01Jan to 31Dec, 2015 and the Monitored amount of 5,507.3 tCO<sub>2</sub> from 01Jan to 31March, 2016.

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

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO <sub>2</sub> e)	169.435	158,782

**E.6. Remarks on difference from estimated value in registered PDD**Monitored period (01Jan to 31Dec, 2015)

According to the PDD, the estimated emission reductions for 2015 should have been 135,548 CERs. However, the monitored emission reductions results in 126,215 CERs, 6.8% % lower than the estimated in the PDD.

Monitored period (01Jan to March, 2016)

According to the PDD, the estimated emission reduction for 2016 should have been 135,548 CERs. The monitored emission reductions for the first quarter of 2016 results in 32,568 CERs, 3.8% lower than the estimated emission reductions of 33,887 (135,548/4) CERs, equivalent to the first quarter of 2016.

-----

## Appendix 1. Contact information of project participants and responsible persons/ entities

<b>Project participant and/or responsible person/ entity</b>	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
<b>Organization name</b>	Arauco Celulosa y Constitución S.A.
<b>Street/P.O. Box</b>	Av. El Golf 150, piso 7, Las Condes
<b>Building</b>	---
<b>City</b>	Santiago
<b>State/Region</b>	Región Metropolitana
<b>Postcode</b>	---
<b>Country</b>	Chile
<b>Telephone</b>	+59 2 2462-3888
<b>Fax</b>	----
<b>E-mail</b>	<a href="mailto:Christian.rodriguez@arauco.cl">Christian.rodriguez@arauco.cl</a>
<b>Website</b>	<a href="http://www.arauco.cl">www.arauco.cl</a>
<b>Contact person</b>	Christian Rodríguez
<b>Title</b>	Head of Climate Change
<b>Salutation</b>	Mr.
<b>Last name</b>	Rodríguez
<b>Middle name</b>	Arnoldo
<b>First name</b>	Christian
<b>Department</b>	Arauco Bioenergía – Development Area
<b>Mobile</b>	----
<b>Direct fax</b>	----
<b>Direct tel.</b>	+59 2 2462-3888
<b>Personal e-mail</b>	----

- - - - -

### Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		