Monitoring report form

(Version 05.0)

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

MONITORING REPORT		
Title of the project activity	Nueva Aldea Biomass Power Plant Phase 2	
UNFCCC reference number of the project activity	UNFCCC 0346	
Version number of the monitoring report	2	
Completion date of the monitoring report	28th April, 2015	
Monitoring period number and duration of this monitoring period	Monitoring period 6 (from 01 January 2013 to 31 March 2014) – both days included.	
Project participant(s)	Celulosa Arauco y Constitución S.A.	
Host Party	Chile	
Sectoral scope(s)	Sectoral scope 1 – Energy industries (renewable - / non-renewable sources)	
Selected methodology(ies)	ACM0006 (Version 02) - "Consolidated methodology for grid-connected electricity generation from biomass residues". ACM0002 (Version 04): "Consolidated methodology for grid-connected electricity generation from renewable sources".	
Selected standardized baseline(s)	Not applicable.	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	203,720 (tCO_2/yr)	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	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.	180,618 (tCO_2/yr)

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity is a power greenfield project which involves the installation of a new biomass residue power boiler generation plant at a site where no power generation occurs. This is located inside a forestry complex by Arauco: the Nueva Aldea Complex or the Nueva Aldea Project, owned by Celulosa Arauco y Constitución S.A. (from now on, Arauco), a leading forestry and pulp-producing company in Chile.

The project activity consists in the construction of a new pulp mill with a high electric efficiency to make it a power exporter to the grid basically due to the higher steam production of the recovery boiler and two high-capacity turbo generators of 2x70MW of which 41.7 MW are used to generate surplus power to the grid.

In the absence of the project activity a new biomass power plant would be installed at the same site, but with an electric efficiency lower than that of the project activity power plant. The power plant would only have been able to generate the heat and power required by the pulp mill, but not surplus power to the grid that would have otherwise been generated by grid-connected carbon intensive power plants.

The pulp mill has a definite capacity and can process a certain amount of black liquor (biomass) and is designed to co-fire fossil fuels, which are used to produce energy inside the mill. The project activity increases the energy efficiency of the mill and therefore allows it to generate surplus power to the grid but using the same amount of biomass (black liquor, dry basis) that would be used in the baseline scenario.

Though modern pulp mills are currently designed to be self-sufficient in terms of steam and electric power generation, the Nueva Aldea pulp mill was deliberately designed to generate a considerable amount of surplus power to the grid. Considering the higher cost of building a pulp mill with additional power generation to the grid, the decision of building such power plant relied on the possibility of selling the excess power to the grid and on the benefits of being a CDM project activity.

The project activity assists Chile's sustainable growth by providing electricity to the Nueva Aldea Industrial Complex and to the SIC through biomass power generation, which is a clean and renewable energy source. The Nueva Aldea Phase 2 project participants believe that biomass power generation constitutes a sustainable source of power generation that brings clear advantages to mitigate global warming. Using the available natural resources in a rational way, the Nueva Aldea Phase 2 project activity helps to 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 project is a good example to demonstrate the viability of power 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, making the Nueva Aldea Power Plant Phase 2 quite unique and particular in its type. Although this technological improvement is consistent with the internal policies of efficient energy usage of Arauco, it must be recognized as an initiative that goes beyond the common practice of the pulp industry in Chile.

Relevant dates for the project activity:

Date (DD/MM/YY)	Key events
March 2005	Approval permits to start construction activities
31/08/2006	Commissioning start date
01/04/2007 to 30/09/2007	The 1st monitoring period
01/10/2007 to 30/09/2008	The 2nd monitoring period
01/10/2008 to 31/12/2009	The 3rd monitoring period
01/01/2010 to 31/12/2010	The 4th monitoring period
01/01/2011 to 31/12/2012	The 5th monitoring period
01/01/2013 to 31/03/2014	The 6th monitoring period (this report)

The total net emission reduction claimed in the monitoring period from 01 January 2013 to 31 March 2014 (both days included) is: **180,618 (tCO_2/yr)**

A.2. Location of project activity

The proposed project activity is located in the Nueva Aldea Industrial Complex site. The Nueva Aldea Industrial Project is located near the Nueva Aldea community area, Comuna of Ránquil, in the province of Ñuble. It is 30 km. west of the city of Chillán and 28 km southeast of the city of Coelemu, in the VIII Region (Bío-Bío Region), Chile. The project site is centered at the geographical coordinates 36°39´18" S and 72°28´31" 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)
Chile (host)	Celulosa Arauco y Constitución S.A.	No
United Kingdom of Great Britain and Northern Ireland[1]	Celulosa Arauco y Constitución S.A.	No

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 02): "Consolidated methodology for grid-connected electricity generation from biomass residues".

The project activity also relies on the following methodology:

- ACM0002 (Version 04): "Consolidated methodology for grid-connected electricity generation from renewable sources".

- "Tool for the demonstration and assessment of additionality". (Version 02)

A.5. Crediting period of project activity

Starting date of the first crediting period:	01/04/2007
End date of the first crediting period:	31/03/2014 (this day included)
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

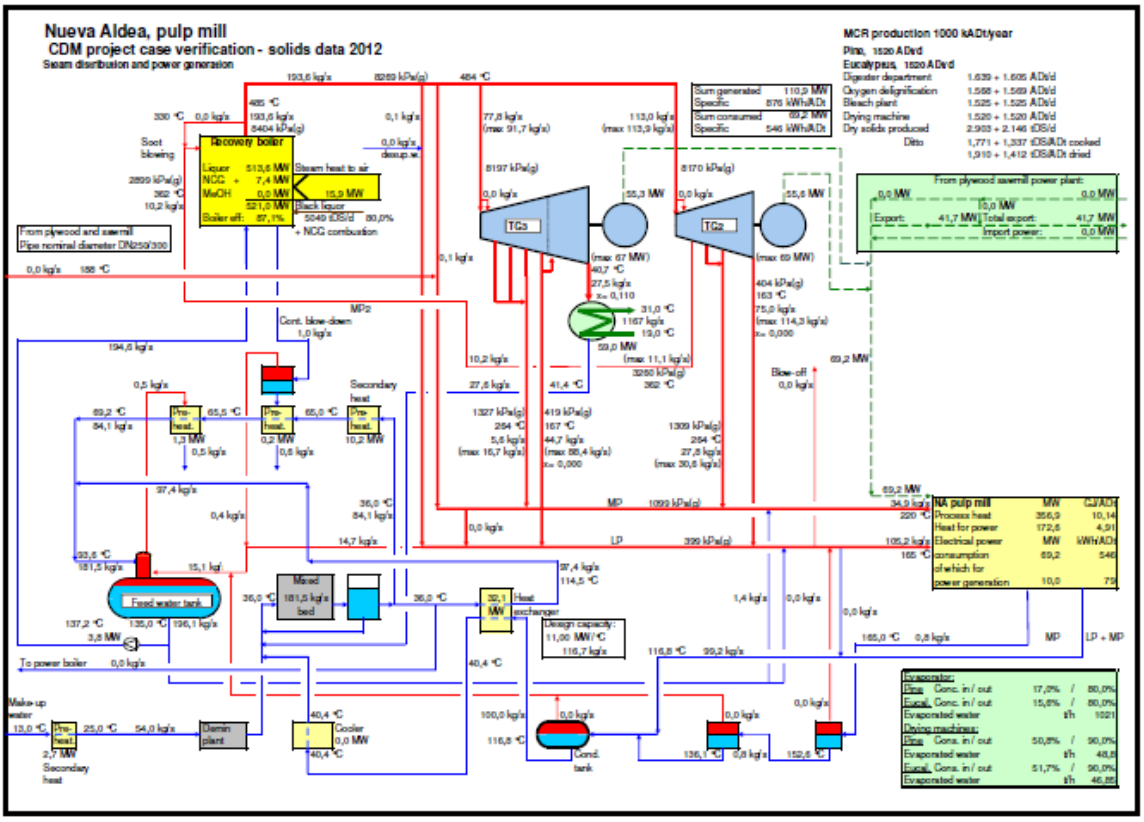
[1] During 2014 Arauco opened two trading accounts under the EU ETS. The accounts were opened in the UK, so Arauco was requested to obtain a LoA (Letter of Approval) through the UK DNA (Environment Agency). For this reason, now Arauco (Celulosa Arauco y Constitución S.A.) appears as a Project Participant under Chile and UK.

	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 consists of a 41.7 MW grid-connected biomass cogeneration[2] power plant located inside a forestry complex by Arauco: the Nueva Aldea Complex or the Nueva Aldea Project (See diagram below)
The power plant, designed to use black liquor (biomass) for steam and electric power generation in a cogeneration power plant, consists of a pulp mill equipped with 2 X 70 MW gross generation capacity, of which 41.7 MW are destined to generate surplus power to the grid.



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 this case black liquor, in a boiler to generate steam, which is then expanded through a turbine. 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 to recover heat from flue gases to preheat combustion air, and a deaerator to remove dissolved oxygen from water before it enters the boiler.

[2] Steam and power generation.

Steam turbines are designed as either “backpressure” or “condensing” turbines. CHP applications typically employ backpressure turbines. In this case, the project activity consists of one condensing-extraction turbine and one backpressure turbine. In the case of the condensing-extraction turbine, the steam expands to a pressure that is still substantially above ambient pressure. It leaves the turbine still as steam and is sent to satisfy industrial heating needs, where it condenses back to water. Additionally, the portion of 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 a backpressure turbine. The non-extracted steam is converted back to liquid water in a condenser that utilizes water from a cooling tower as coolant.

The project activity has been completed as planned and described in the Project Design Document (PDD). The starting date of the project activity was 01/04/2007 and it has operated as described in the CDM PDD:

Description of plant operation during the 6th period (Jan 01, 2013 – March 31, 2014)

The Project Participant presents information about the operation of the project activity occurred during these monitoring periods i.e. shutdown/stoppages due to the regular maintenance program and also irregular stoppages. Note that no events or situations occurred during the monitoring period have impacted the applicability of the methodology.

2013	Out of service day	Re-start of operations	Number of hours	Comments
Recovery boiler	30/09/2013	13/10/2013	308	Programmed shutdown and problems with wastewater outlet
	18/10/2013	28/10/2013	231	Boiler tube failure
	02/11/2013	08/11/2013	139	Boiler tube failure
Turbo generator (TG2)	30/09/2013	13/10/2013	318	Programmed shutdown and problems with wastewater outlet
	18/10/2013	29/10/2013	267	Boiler tube failure
	02/11/2013	08/11/2013	156	Boiler tube failure
Turbo generator (TG3)	30/09/2013	30/10/2013	728	Programmed shutdown, problems with wastewater outlet, and boiler problems
	02/11/2013	09/11/2013	173	Boiler tube failure
	04/12/2013	14/12/2013	240	Steam seal and shaft bearing maintenance

01 Jan – 31 March 2014	Out of service day	Re-start of operations	Number of hours	Comments
--	**--**	**--**	**--**	**--**

Instrument replacements:

TAG	Date	Old serial number	New serial number
552-FT-382	08/10/2013	000402556/X002	242051359/X001

Although this black liquor flowmeter was providing correct readings, problems with detector insulations and a worn-out liner were found during a mill programmed stoppage. Therefore, the decision was made to change it.

B.2. Post registration changes

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

None

B.2.2. Corrections

None

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

Two revisions were performed to the monitoring plan; both have been approved by the EB. Each of them is described as follows:

The first revision performed to the monitoring plan was approved by the EB in 10/10/2008. In this case, the monitoring plan was revised due to the project participant determined the net electricity displaced from the grid, by directly measuring the surplus of electric power delivered to the grid by the new biomass power plant, instead of using equation 13 of the ACM0006 (Version 02).

Although the approach described above was accepted and the project activity was successfully registered, in order to follow the guidelines or rules of the CDM, during the first verification the DOE submitted a revised monitoring plan to follow the equation 13. The revised monitoring plan was approved and used by the Project Participants.

The second revision performed to the monitoring plan was approved by the EB in 05/04/2012. In this case, the monitoring plan was revised in order to increase its completeness according to the methodology ACM0006 (Version 02).

Consequently of applying the revised (approved) monitoring plan, the net quantity of increased electricity generation, as a result of the project activity (incremental to the baseline generation), is determined using the net terms of equation 13 of ACM0006 (Version 02) instead of using gross terms of this equation.

The net quantity of electricity generated in the project plant is the result of the measurements of gross quantity of electricity generated by the project minus total auxiliary electricity consumption required for power plant operation. The net energy efficiency of electricity generation in the reference plant is used instead of gross energy efficiency of electricity of the reference plant. This value will remain fixed during the crediting period in accordance to the methodology ACM0006 (Version 02).

Considering the above the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity whilst ensuring the conservativeness of the emission reduction calculations. Therefore, the revised monitoring plan was approved and was used by the Project Participants.

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

No changes to the project design of the registered project activity have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period

The original starting date established in the registered PDD was 1st August, 2006. Due to some technical problems during the start-up operation, the Project Participant requested a delay of 8 months for the starting date. Therefore, the starting date of the first crediting period was 1st April, 2007.

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

None

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

Not applicable.

SECTION C. Description of monitoring system

The Project Participant (Arauco) has implemented monitoring procedures according to the methodology chosen for this project activity. This methodology accounts for emission reductions in an accurate and conservative manner.

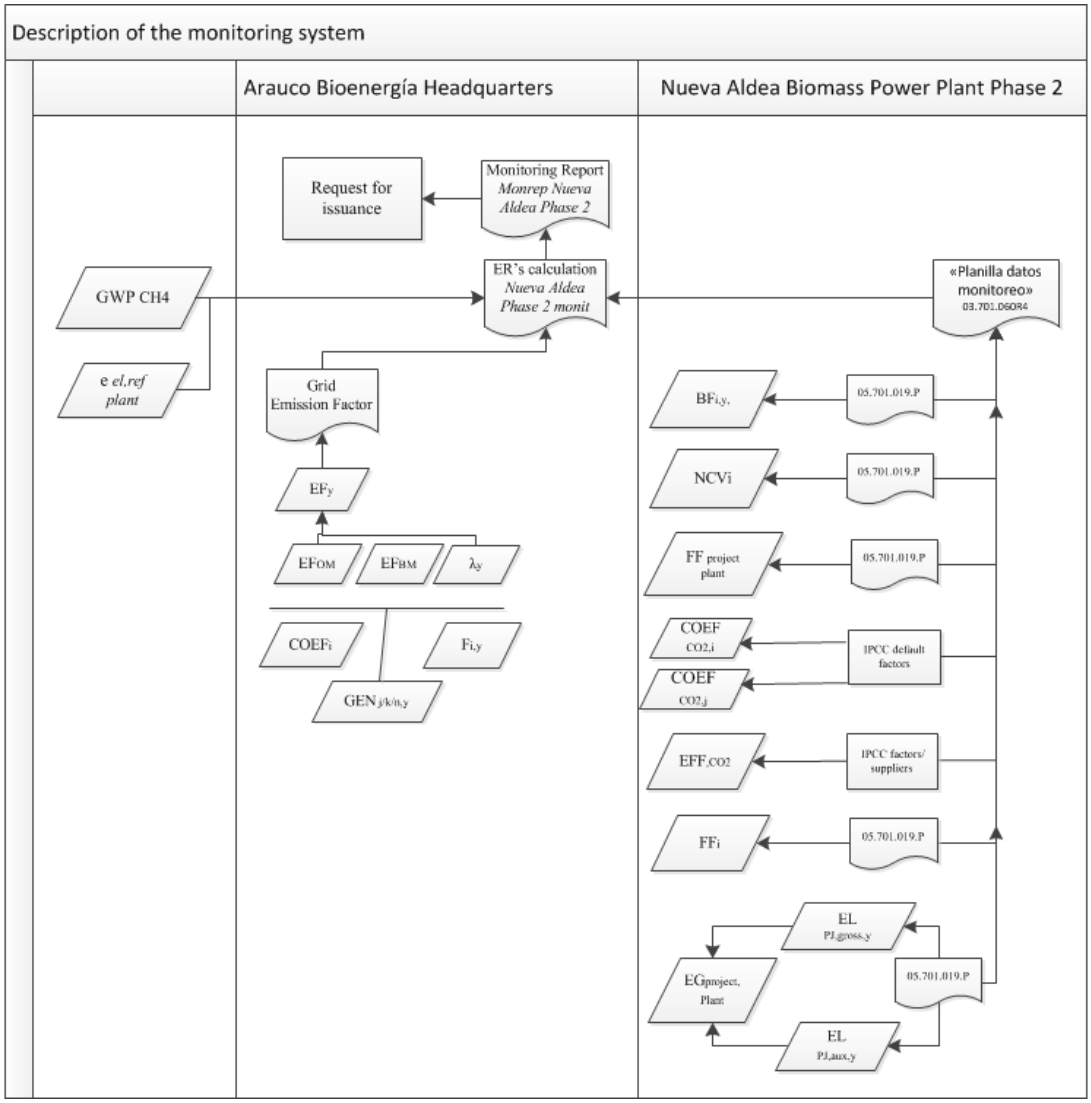
The Project Participant counts with on-site personnel (at the project activity site), who are in charge of gathering and registering all the information as per required in the monitoring plan. Such duties are incorporated to the personnel's everyday activities to ensure continuity and high-quality standards.

The monitoring parameters i.e. the quantity of biomass used, fossil fuel consumption and net quantity of electricity generated data, as can be seen from diagram below, are continuously monitored and collected by the Data Control System (DCS) and downloaded by the IP system automatically to an Excel spread sheet. Then, data collected are recorded daily and aggregated monthly as per required by the monitoring procedure.

The collected information is partially processed, validated and stored on-site by personnel. Then information is sent periodically i.e. monthly to Arauco Bioenergía S.A.(ex-Arauco Generación S.A.) in Santiago for further and final processing (table formats, reports, etc.).

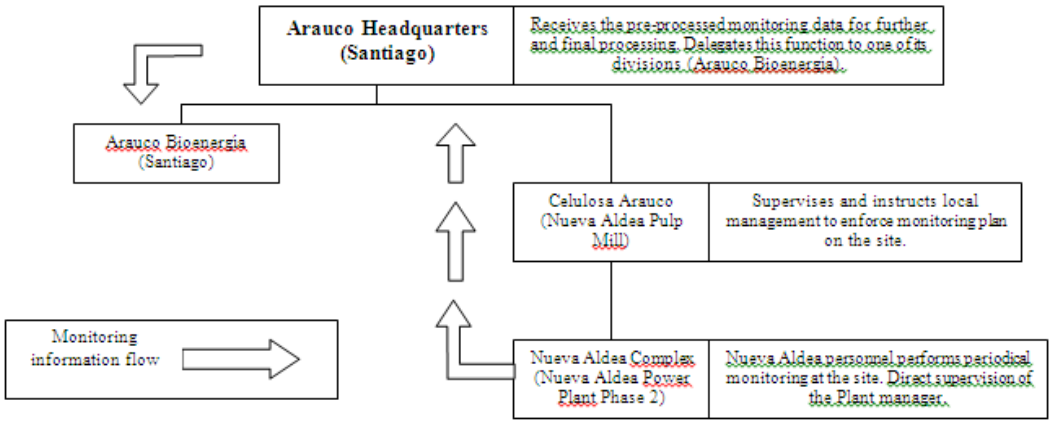
With the information at this level, the Project Participant is then in condition to verify the emission reduction of the Nueva Aldea Power Plant Phase 2 periodically i.e. once every year.

The diagram of the monitoring system used in this project activity is presented as follows:



Note that the procedure # 05.701.019 corresponds to the monitoring procedure of CDM parameters used in the emission reduction calculations

The flow chart that shows the monitoring information flow implemented by Arauco Bioenergia S.A. for this project activity is presented as follows:

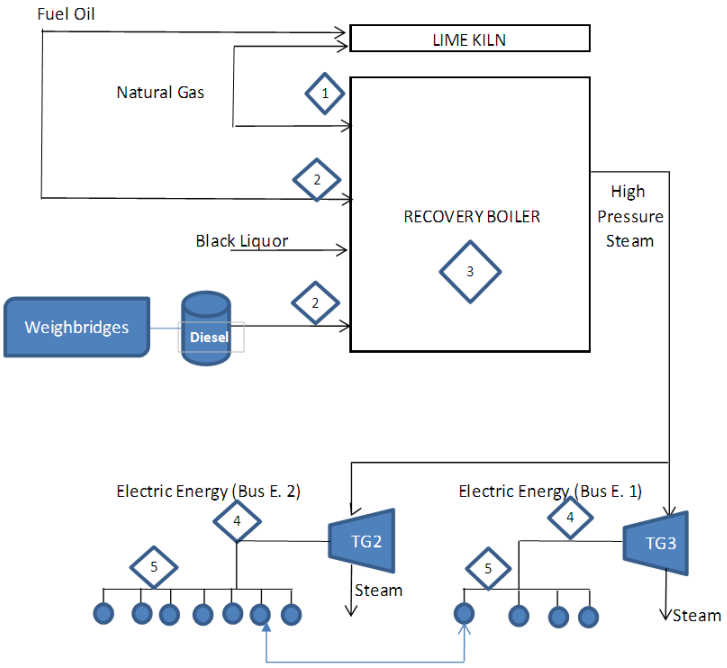


Relevant monitoring points and instruments of the monitoring plan:

Basically, the fuels (mainly black liquor) are combusted in the recovery boiler, where high pressure steam is produced and then transported to the turbines (TG2 and TG3). The turbines generate electricity (part of it goes to supply the pulp mill processes, and part goes to the grid) and steam (used internally, for pulp production).

The amount of fuels consumed in the recovery boiler and the electricity generated by the turbines are directly measured by the instruments that can be seen at the diagram and table below. The instruments are calibrated according to the specification of the manufacturer or proper industry standards and all the calibration certificates are saved electronically by the Project Participant.

The relevant monitoring points, including the instruments used to measure the variables that are part of the monitoring plan are shown as follows:



Item	Instrument
1	Natural Gas Meter (Start-up Burners) Natural Gas Meter (Load Burners)
2	Diesel Meter (Start-up Burners) Return Diesel Meter (Start-up Burners) Diesel Meter (Load Burners) Return Diesel Meter (Load Burners)
3	Black Liquor Flow Meter (Nozzle) 1-3 Black Liquor Flow Meter (Nozzle) 4-7 Black Liquor Flow Meter (Nozzle) 8-10 Black Liquor Flow Meter (Nozzle) 11-14 Refractometer Refractometer Black Liquor Temperature Transmitter
4	Energy Meter Switchgear 1-2 (Bus E.1) gross electric generation Energy Meter Switchgear 2-5 (Bus E.2) gross electric generation
5	Energy Meter Switchgear 5-1 Energy Meter Switchgear 5-2A Energy Meter Switchgear 5-2B Auxiliary consumption Energy Meter Switchgear 6-1 Energy Meter Switchgear 6-2A

Note: See Line diagram for detailed information.

Note that Diesel meters are also used for measuring Fuel Oil. There is a control logic that records diesel consumption separately from fuel oil consumption.

ITEM	INSTRUMENT	VARIABLE	TAG N°	MEASURED ERROR GREATER THAN ADMISSIBLE ERROR (YES/NO)	ADJUSTMENT MADE (YES / NO)
1	Natural Gas Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-471	NO	NO
	Natural Gas Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-483	NO	NO
2	Diesel/Fuel Oil Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-663	NO	NO
	Return Diesel/Fuel Oil Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-668	NO	NO
	Diesel/Fuel Oil Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-671	NO	NO
	Return Diesel/Fuel Oil Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-674	NO	NO
3	Black liquor flow transmitter (nozzles 1 - 3)	$BF_{i,y}$	552-FT-378	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 4 - 7)	$BF_{i,y}$	552-FT-380	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 8 - 10)	$BF_{i,y}$	552-FT-382	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 11 - 14)	$BF_{i,y}$	552-FT-384	CALIBR NOT REQ	NO
	Refractometer	$BF_{i,y}$	552-DT-370-A	NO	YES
	Refractometer	$BF_{i,y}$	552-DT-370-B	NO	YES
	Temperature transmitter	$BF_{i,y}$	552-TI-365	NO	NO
4	Energy meter switchgear 1-2	$EG_{projectplant,y}$ / $EL_{PJ,gross,y}$	568-PML-12	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 2-5	$EG_{projectplant,y}$ / $EL_{PJ,gross,y}$	568-PML-25	NOT INSPECTED	NOT APPLICABLE
5	Energy meter switchgear 5-1	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-51	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 5-2A	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-52A	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 5-2B	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-52B	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 6-1	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-61	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 6-2A	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-62A	NOT INSPECTED	NOT APPLICABLE

SECTION D. Data and parameters

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

Data / Parameter:	$\varepsilon_{el,\ other\ plant(s)}$
Unit:	(%)

Description:	Average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass fired in the project plant in the absence of the project activity.
Source of data:	The reference pulp mill's updated electric efficiency of 10.779% was calculated taking into account the following considerations: This is the reference plant electric efficiency, calculated using data from the (updated) energy/mass balance, which at the same time uses actual performance data of the mill. The energy/mass balance is performed by KSH consulting. The chosen baseline scenario for the Nueva Aldea Phase 2 project activity that states that the reference pulp mill would be self-sufficient in electric and thermal power generation. This baseline scenario is consistent with the current BAT (Best Available Technology) for non-integrated bleached pulp mills, such as the Nueva Aldea Phase 2 pulp mill. The net electricity that would have been generated in the reference plant was determined by considering the gross electricity generated by the reference plant minus the corresponding auxiliary consumption. The corresponding values were obtained from the energy/mass balance of the reference plant.
Value(s) applied):	10.779%
Purpose of data:	Baseline emissions calculations.
Additional comment:	---

D.2. Data and parameters monitored

Data / Parameter:	$BF_{i,y}$
Unit:	(tDS (tonnes dry solids))
Description:	Quantity of biomass type i used as fuel in the project plant during the year y in a volume or mass unit.
Measured/ Calculated / Default:	Measured
Source of data:	This variable was directly monitored using dedicated flow meters. The direct measurement of the % of dry solids and the temperature of the liquid biomass flow allow determining the flow of dry solids to the recovery boiler.
Value(s) of monitored parameter:	2013: 1,559,101 tDS 01 Jan 2014 – 31 March 2014: 414,557 tDS Total: 1,973,657 tDS

Monitoring equipment:	552-FT-378 Type: Black Liquor Flow Meter (Nozzle) (1-3). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000450891/X010 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 16/06/2006 552-FT-380 Type: Black Liquor Flow Meter (Nozzle) (4-7.). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000402556/X003 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 19/08/2005 552-FT-382 Type: Black Liquor Flow Meter (Nozzle) (8-10). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000402556/X002 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 22/08/2005 *Replaced on 08/10/2013 by:* 552-FT-382 Type: Black Liquor Flow Meter (Nozzle) (8-10). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 242051359/X001 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 14/08/2013 552-FT-384 Type: Black Liquor Flow Meter (Nozzle) (11-14). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000402556/X004 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 19/08/2005 552-DT-370-A Type: Refractometer K-Patents PR-01-S Accuracy class: +/- 0.1%DS Serial number: 2005B16-6232 Calibration frequency: 2 years Calibration dates: 24/08/2012 Date of last calibration: 03/10/2013 Validity: 02/10/2015 552-DT-370-B Type: Refractometer K-Patents PR-01-S Accuracy class: +/- 0.1%DS Serial number: 2005B17-6233 Calibration frequency: 2 years Calibration dates: 24/08/2012 Date of last calibration: 03/10/2013

<table>
<tr><td></td><td>Validity: 02/10/2015

552-TI-365
Type: Black Liquor Temperature Transmitter Rosemount 3144PD1A1NAB4C4Q4
Accuracy class: +/- 0.1°C
Serial number: 494356
Calibration frequency: 5 years
Calibration dates: 14/08/2012
Date of last calibration: 03/10/2013
Validity: 02/10/2018</td></tr>
<tr><td>Measuring/
Reading/
Recording frequency:</td><td>The measurement is done continuously (each five seconds), online and fully integrated with the Data Control System (DCS) of the pulp mill. Data of biomass consumption is aggregated and recorded monthly for emission reduction calculation.</td></tr>
<tr><td>Calculation method
(if applicable):</td><td>Not applicable</td></tr>
<tr><td>QA/QC procedures:</td><td>All instruments received proper maintenance and calibration according to manufacturer's specification.

In addition, the amount of black liquor burnt was cross checked against the difference obtained between the total measurements of black liquor flows to the recovery boiler and measurements of the returned flows of black liquor not burnt in the boiler.

A comparison of the measurement with its cross-checking value is shown in the table below. Based on the results, black liquor flow measurements were deemed consistent.

<table>
<tr><th>Black liquor flow (tDS)</th><th>Black liquor flow check (tDS)</th><th>% Difference</th></tr>
<tr><td>1,973,657</td><td>1,992,282</td><td>0.9%</td></tr>
</table>

Also, the Project Participant performed the energy / mass balance of the biomass power plant that considered the biomass (black liquor in tDS) burned in the recovery boiler, the heat and the electric power generation during the monitored period. The efficiency obtained for the recovery boiler was 63.7% (2013) and 64.0% (Jan-March 2014), which is consistent when compared with the value of 62.1% informed by the manufacturer.</td></tr>
<tr><td>Purpose of data:</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comment:</td><td>---</td></tr>
</table>

Data / Parameter:	NCV_i
Unit:	(GJ/ tDS (tonnes dry solids))
Description:	Net calorific value of biomass type i per mass or volume of biomass.
Measured/ Calculated / Default:	Measured.
Source of data:	This variable was measured in a specialized and reputed laboratory, according to proper industry standards. Measurement is performed on dry basis
Value(s) of monitored parameter:	2013: 10.53 (GJ/tDS) 01 Jan 2014 – 31 March 2014: 9.55 (GJ/tDS)

<table>
<tr><td>Monitoring equipment:</td><td>Not applicable</td></tr>
<tr><td>Measuring/
Reading/
Recording frequency:</td><td>Annually</td></tr>
<tr><td>Calculation method
(if applicable):</td><td>According to ACM0006 (Version 2) and to the approved revised monitoring plan, measurement of NCV must be taken once a year. The annual values, which were measured in a specialized and reputed laboratory, are considered representative for the whole monitoring period because raw material composition (i.e. wood from pine and eucalyptus) used to make pulp, from which the black liquor is generated, remained stable along both monitoring periods.

As shown in the following table, pulp from pine and eucalyptus was produced in approximately equal amounts:

<table>
<tr><td rowspan="2">Period</td><td>Share of pulp mill Production from Pine.</td><td>Share of pulp mill Production from Eucalyptus.</td><td>Total Pulp mill Production</td></tr>
<tr><td>(% of ADT)</td><td>(% of ADT)</td><td>(ADT/yr)</td></tr>
<tr><td>2013</td><td>47%</td><td>53%</td><td>936,938</td></tr>
<tr><td>Jan-March 2014</td><td>48%</td><td>52%</td><td>256,448</td></tr>
</table>
Note that ADT stands for “Air dry tons” used of pulp pricing.</td></tr>
<tr><td>QA/QC procedures:</td><td>The measured net calorific value of the biomass (black liquor) was consistent with the net calorific values found for Sulphite Lyes (black liquor) in Table 1.2, Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

<table>
<tr><th>Source</th><th>NCV (GJ / tDS)</th><th>NCV (MWh / tDS)</th></tr>
<tr><td>Applied value Jan-Mar 2014</td><td>9.55</td><td>2.65</td></tr>
<tr><td>Applied value 2013</td><td>10.53</td><td>2.92</td></tr>
<tr><td rowspan="2">Default values IPCC 2006, Chapter 1, Volume 2.</td><td>Average:11.8</td><td>Average:3.2</td></tr>
<tr><td>Range [5.9– 23.0]</td><td>Range [1.64-6.39]</td></tr>
<tr><td>Historical value 2012</td><td>10.70</td><td>2.97</td></tr>
<tr><td>Historical value 2011</td><td>10.70</td><td>2.97</td></tr>
<tr><td>Historical value 2010</td><td>10.29</td><td>2.86</td></tr>
<tr><td>Historical value 2009</td><td>10.35</td><td>2.87</td></tr>
<tr><td>Historical value 2008</td><td>9.78</td><td>2.72</td></tr>
<tr><td>Historical value 2007</td><td>9.37</td><td>2.60</td></tr>
</table></td></tr>
<tr><td>Purpose of data:</td><td>Baseline emission calculations</td></tr>
<tr><td>Additional comment:</td><td>---</td></tr>
</table>

Data / Parameter:	$FF_{project\ plant,i,y}$
Unit:	Diesel: (ton) Fuel Oil: (ton) Natural Gas: (ton)
Description:	On-site fossil fuel consumption of fuel type i for co-firing in the project plant.
Measured/ Calculated / Default:	Measured.

Source of data:	Fossil fuel consumption reported contemplates the total amount of fossil fuels co-fired in the project activity but does not consider the fuel consumed under start-up periods, since the latter amount would have been used with or without (baseline scenario) the implementation of the project activity. The Project Participant would like to note that start-up conditions are defined in terms of pulp production. Below 4,000 (ADt/day) (air-dry tons per day) the mill is defined under start-up situation, and above this level the pulp mill is defined under "normal operation". Considering this, all fossil fuel consumed under normal operation previously described, was contemplated in the project emission calculations. This resulted to be a more conservative approach since under normal operation not all fossil fuel consumed necessarily was used for power surplus generation to the grid. Part of it was used for operational reasons.
Value(s) of monitored parameter:	Diesel: 2013: 0 (ton) Jan-March 2014: 0 (ton) Total: 0 (ton) Fuel Oil: 2013: 1,116 (ton) Jan-March 2014: 539 (ton) Total: 1,655 (ton) Natural Gas: 2013: 0 (ton) Jan-March 2014: 0 (ton) Total: 0 (ton) The Project Participant would like to note that because Argentina no longer exports natural gas to Chile, the plant was forced to switch from natural gas to Fuel Oil. Natural gas is currently unavailable at the mill location. Diesel meters are also used for measuring Fuel Oil flows. There is a control logic that allows diesel consumption records to be kept separately from fuel oil consumption records.

Monitoring equipment:	552-FT-663 Type: Diesel Meter (Start-up Burners) ENDRESS & HAUSER Promass 83 F DN25 / 1” Accuracy class: +/- 0.1% Serial number: 75044102000 Calibration frequency: 5 years Date of penultimate calibration: 09/06/2005 Date of last calibration: 31/03/2010 Validity: 30/03/2015 552-FT-668 Type: Return Diesel Meter (Start-up Burners) ENDRESS & HAUSER Promass 83 F DN15 / ½” Accuracy class: +/- 0.1% Serial number: 75043E02000 Calibration frequency: 5 years Date of penultimate calibration: 08/06/2005 Date of last calibration: 30/03/2010 Validity: 29/03/2015 552-FT-671 Type: Diesel Meter (Load Burners) ENDRESS & HAUSER Promass 83 F DN25 / 1” Accuracy class: +/- 0.1% Serial number: 75044202000 Calibration frequency: 5 years Date of penultimate calibration: 09/06/2005 Date of last calibration: 31/03/2010 Validity: 30/03/2015 552-FT-674 Type: Return Diesel Meter (Load Burners) ENDRESS & HAUSER Promass 83 F DN15 / ½” Accuracy class: +/- 0.1% Serial number: 75043F02000 Calibration frequency: 5 years Date of penultimate calibration: 08/06/2005 Date of last calibration: 30/03/2010 Validity: 29/03/2015 552-FT-471 Type: Natural Gas Meter (Start-up Burners) ENDRESS & HAUSER Promass 83 F DN100 / 4” Accuracy class: +/- 0.5% Serial number: 75044302000 Calibration frequency: 5 years Date of penultimate calibration: 07/06/2005 Date of last calibration: 01/04/2010 Validity: 31/03/2015 552-FT-483 Type: Natural Gas Meter (Load Burners) ENDRESS & HAUSER Promass 83 F DN100 / 4” Accuracy class: +/- 0.5% Serial number: 75044402000 Calibration frequency: 5 years Date of penultimate calibration: 07/06/2005 Date of last calibration: 31/03/2010

<table>
<tr><td></td><td>Validity: 30/03/2015</td></tr>
<tr><td>Measuring/
Reading/
Recording frequency:</td><td>The measurement of fossil fuels is online and fully integrated with the Data Control System (DCS) of the pulp mill. Data are recorded monthly in the emission reduction sheet.</td></tr>
<tr><td>Calculation method
(if applicable):</td><td>Not applicable</td></tr>
<tr><td>QA/QC procedures:</td><td>Fuel meters received periodic maintenance and calibration as instructed by the equipment manufacturer and according to proper industry standards.

According to methodology, the consistency of metered fuel consumption shall be checked with purchase receipts, whenever possible and available.

Fuel oil measurements under normal operation were cross-checked with purchase receipts, inventory changes and lime kiln consumption for the whole monitoring period.

Recovery boiler consumption = Initial inventory + purchases – final inventory – lime kiln consumption.

<table>
<tr><td>Initial inventory</td><td>Purchases</td><td>Final inventory</td><td>Lime kiln consumption</td><td>Cross-checking value</td><td>Measured consumption in recovery boiler</td><td>Difference</td></tr>
<tr><td>ton</td><td>ton</td><td>ton</td><td>ton</td><td>ton</td><td>ton</td><td>%</td></tr>
<tr><td>426</td><td>48,372</td><td>987</td><td>46,040</td><td>1,772</td><td>1,655</td><td>7%</td></tr>
</table>

<table>
<tr><td>Diesel purchase receipts (ton/y)</td><td>Diesel consumption in the recovery boiler (ton/y)</td><td>% Difference</td></tr>
<tr><td>0</td><td>0</td><td>n/a</td></tr>
</table>

<table>
<tr><td>Gas supplier meter reading (ton/y)</td><td>Recovery boiler consumption (ton/y)</td><td>%Difference</td></tr>
<tr><td>0</td><td>0</td><td>n/a</td></tr>
</table>
</td></tr>
<tr><td>Purpose of data:</td><td>Project emissions.</td></tr>
<tr><td>Additional comment:</td><td>---</td></tr>
</table>

Data / Parameter:	$EG_{project\ plant,y}$
Unit:	(Mwh)
Description:	Net quantity of electricity generated in the project plant during the year y.
Measured/ Calculated / Default:	Calculated
Source of data:	– Nueva Aldea Phase 2 power plant on line direct measurements of the gross electric power generated in the power plant. Measurements are continuously stored in the DCS database system (See note below). – Nueva Aldea Phase 2 power plant on line direct measurements of the total auxiliary electricity consumption. Measurements are continuously stored in the DCS database system of the power plant (See note below). Note: The gross quantity of electricity generation and total auxiliary electricity consumption are named using the nomenclature defined in the ACM0006 (Version 12.0.1). (For additional information see the revised monitoring plan, page 11).
Value(s) of monitored parameter:	2013: 668,348 (Mwh) Jan – March 2014: 193,498 (Mwh)

	Total: 861,846 (Mwh)
Monitoring equipment:	– Gross quantity of electricity generated in the project plant: Refer to monitoring equipment presented in the table for parameter $EL_{PJ,gross,y}$ – Total auxiliary electricity consumption: Refer to the monitoring equipment presented in the table for $EL_{PJ,aux,y}$
Measuring/ Reading/ Recording frequency:	The gross electricity generated and total auxiliary electricity consumption of the project plant was continuously measured using dedicated energy meters. Measurements obtained were recorded in the DCS database system every two minutes and aggregated and registered monthly for the emission calculation of the monitored period.
Calculation method (if applicable):	In accordance with criteria used in a more recent version of the ACM0006 baseline methodology and following the indications of the revised monitoring plan the net quantity of electricity generated was determined from the difference between the monitored amount of gross electricity generated and the monitored amount of total auxiliary electricity consumption, as shown below: $EG_{project\ plant} = EL_{PJ,gross,y} – EL_{PJ,aux,y}$ where: $EL_{PJ,gross,y}$: Parameter obtained from on-site measurement using proper and dedicated electricity meters. $EL_{PJ,aux,y}$: Parameter obtained from on-site measurement using proper and dedicated electricity meters. Note that parameter $EL_{PJ,aux,y}$ includes the electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. pumps, fans, instrumentation and control, etc.)

<table>
<tr><td>QA/QC procedures:</td><td>According to methodology ACM0006 (version 2), the consistency of metered net electricity generation was cross-checked using an efficiency index (electricity generation divided by the quantity of biomass fired).

As can be seen in the following table, the value obtained for 2013 was 0.48 Mwh/tDS. This is consistent with values obtained in previous years except for 2011 and 2012 when turbogenerator 3 was out of service for several months.

<table>
<tr><td></td><td>Real</td><td>Theoretical</td></tr>
<tr><td>Index</td><td>(MWh/tDS)</td><td>(MWh/tDS)</td></tr>
<tr><td>Jan-March 2014</td><td>0.52</td><td>0.51</td></tr>
<tr><td>2013</td><td>0.48</td><td>0.51</td></tr>
<tr><td>2012</td><td>0.40</td><td>0.51</td></tr>
<tr><td>2011</td><td>0.45</td><td>0.51</td></tr>
<tr><td>2010</td><td>0,50</td><td>0,51</td></tr>
<tr><td>2009</td><td>0,49</td><td>0,51</td></tr>
<tr><td>2008</td><td>0,51</td><td>0,51</td></tr>
</table>

The theoretical index is based on the generation of 61.4 MW by the first turbine (TG2) and 31.9 MW by the second turbine (TG3).

All electricity meters received periodic maintenance and calibration as instructed by the equipment manufacturer and according to proper industry standards.</td></tr>
<tr><td>Purpose of data:</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comment:</td><td>---</td></tr>
</table>

Data / Parameter:	$EL_{PJ,gross,y}$
Unit:	(MWh)
Description:	Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year.
Measured/ Calculated / Default:	Measured.
Source of data:	Nueva Aldea Phase 2 power plant on-line direct measurements of the gross electricity generated in Nueva Aldea Phase 2 biomass power plant. Measurements were continuously stored in the DCS database system.
Value(s) of monitored parameter:	2013: 755,609 (Mwh) Jan-March 2014: 216,132 (Mwh) Total: 971,741 (Mwh)

Monitoring equipment:	568-PML-12 Type: Energy Meter Switchgear (1-2) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A449-11 Calibration frequency: 7 years Date of first calibration: 25/08/2011 Validity: 24/08/2018 568-PML-25 Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1001A347-11 Calibration frequency: 7 years Date of first calibration: 22/01/2010 Validity: 21/01/2017
Measuring/ Reading/ Recording frequency:	The gross electricity generated by the Nueva Aldea Phase 2 biomass power plant was 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 calculation of the monitored period.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	All electricity meters received periodic maintenance and calibration as per instructed by the equipment manufacturer and according to proper industry standards.
Purpose of data:	Baseline emissions calculations.
Additional comment:	---

Data / Parameter:	$EL_{PJ,aux,y}$
Unit:	(Mwh)
Description:	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh).
Measured/ Calculated / Default:	Measured.
Source of data:	Nueva Aldea Phase 2 power plant on-line direct measurements of the total auxiliary electricity consumption in Nueva Aldea Phase 2 biomass power plant. Measurements were continuously stored in the DCS database system.
Value(s) of monitored parameter:	2013: 87,261 (Mwh) Jan-Mar 2014: 22,635 (Mwh) Total: 109,896 (Mwh)

Monitoring equipment:	568-PML-51 Type: Energy Meter Switchgear (5-1) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A602-11 Calibration frequency: 7 years Date of first calibration: 01/09/2011 Validity: 31/08/2018 568-PML-52A Type: Energy Meter Switchgear (5-2A) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A463-11 Calibration frequency: 7 years Date of first calibration: 27/08/2011 Validity: 26/08/2018 568-PML-52B Type: Energy Meter Switchgear (5-2B) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A470-11 Calibration frequency: 7 years Date of first calibration: 27/08/2011 Validity: 26/08/2018 568-PML-61 Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A595-11 Calibration frequency: 7 years Date of first calibration: 01/09/2011 Validity: 31/08/2018 568-PML-62A Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A462-11 Calibration frequency: 7 years Date of first calibration: 26/08/2011 Validity: 25/08/2018
Measuring/ Reading/ Recording frequency:	The total auxiliary electricity consumption of the Nueva Aldea Phase 2 biomass power plant was 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 calculation of the monitored period.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	All electricity meters received periodic maintenance and calibration as per instructed by the equipment manufacturer and according to proper industry standards.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	EF_y
Unit:	(tCO_2/GWh)
Description:	CO_2 emission factor of the grid.

Measured/ Calculated / Default:	Calculated.
Source of data:	– CDEC SIC Dispatch Centre reports. – Ministry of Energy reports. – 2006 IPCC lower limit default carbon content values.
Value(s) of monitored parameter:	2013: 0.766 (tCO_2/MWh) 2014: 0.676 (tCO_2/MWh)
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Calculated as a weighted sum of the OM and BM emission factors, according to equation 10 of the ACM0002 (Version 4). All the information required for the calculation of this emission factor is presented in section E.1 of this report.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$EF_{OM,y}$
Unit:	(tCO_2/MWh)
Description:	CO_2 Operating Margin emission factor of the grid
Measured/ Calculated / Default:	Calculated.
Source of data:	– CDEC SIC Dispatch Centre reports. – Ministry of Energy reports. – 2006 IPCC lower limit default carbon content values.
Value(s) of monitored parameter:	2013: 0.731 (tCO_2/MWh) 2014: 0.715 (tCO_2/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 04). The justification for the chosen OM calculation method is presented in detail in page 47 of the registered PDD. All the information required for the calculation of this emission factor is presented in section E.1 of this report.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$EF_{BM,y}$
Unit:	(tCO_2/MWh)
Description:	CO_2 Build Margin emission factor of the grid.
Measured/ Calculated / Default:	Calculated.
Source of data:	– CDEC SIC Dispatch Centre reports. – Ministry of Energy reports. – 2006 IPCC lower limit default carbon content values.
Value(s) of monitored parameter:	2013: 0.801 (tCO_2/MWh) 2014: 0.637 (tCO_2/MWh)
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	This variable is calculated using equation N° 9 of the ACM0002 (Version 04). In this case, the BM is calculated for each year (ex-post). All the information required for the calculation of this emission factor is presented in section E.1 of this report.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$F_{i,y}$
Unit:	For Liquid Natural Gas (LNG) (MMm^3 – std/yr) For Natural Gas (MMm^3 – std/yr) For Diesel (000' ton/yr) For IFO 180 (000' ton/yr) For Coal (000' ton/yr) For Petcoke (000' ton/yr) Note that the amount fossil fuel consumed by each power source is presented in units of thousand tons per year (000 ton/yr) for the grid emission factor calculation considering that the CO_2 emission coefficient of each fuel type i ($COEF_i$) is expressed in units of tons of CO_2 per thousand tons (tCO_2/000ton).
Description:	Amount of each fossil fuel consumed by each power source / plant.
Measured/ Calculated / Default:	Measured.
Source of data:	– CDEC SIC Dispatch Centre reports. – Ministry of Energy reports.
Value(s) of monitored parameter:	Refer to the emission factor calculation Excel sheet.
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually.

Calculation method (if applicable):	Not applicable.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$COEF_{CO2,i}$
Unit:	(tCO_2/000ton)
Description:	CO_2 emission factor of fossil fuel type i used in the project plant.
Measured/ Calculated / Default:	This coefficient is calculated based on net calorific value and the CO_2 emission factor of fuel type i, as shown below.
Source of data:	– Fossil fuel net calorific value: upper limit of the 95 percent confidence interval, 2006 IPCC Guidelines for National Greenhouse gas Inventories, Volume 2,Table 1-2. – Fossil fuel carbon content: upper limit of the 95 percent confidence interval, 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: 3,239 (tCO_2/000ton) Fuel Oil: 3,287 (tCO_2/000ton) Natural Gas: 2,938 (tCO_2/000ton)
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	These emission factors were determined in accordance to Option B of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" using IPCC values for net calorific value ($NCV_{i,y}$) and the CO_2 emission factor of each fossil fuel i. ($EF_{CO2,i,y}$). $COEF_{CO2,Diesel}$(tCO_2/000ton) = $NCV_{Diesel,y}$ [TJ/000ton] *$EF_{CO2,\ Diesel,y}$ [tCO_2/TJ] $COEF_{CO2,FO}$(tCO_2/000ton) = $NCV_{FO,y}$ [TJ/000ton] *$EF_{CO2,\ FO,y}$ [tCO_2/TJ] $COEF_{CO2,Natural\ gas}$(tCO_2/000ton)= $NCV_{Natural\ gas,y}$ [TJ/000ton] *$EF_{CO2,\ Natural\ gas,y}$ [tCO_2/TJ]. Where: The emission factor for each fossil fuel i is determined using IPCC values as follows: $EF_{CO2,i,y}$ (tCO_2/TJ) = [Carbon content of fossil i (tC/GJ)* Fraction of carbon oxidized * CO_2 / C conversion factor [tCO_2/tC].] (1,000GJ/1TJ).
QA/QC procedures:	Not applicable, since IPCC values are used.
Purpose of data:	Project emissions.
Additional comment:	---

Data / Parameter:	$COEF_i$
Unit:	(tCO_2/000ton) except Nat. Gas (tCO_2/MMm^3)
Description:	CO_2 emission coefficient of each fuel type i consumed by the electric power generators in the relevant grid.
Measured/ Calculated / Default:	Calculated.
Source of data:	This factor was calculated using 2006 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:	Coal: 2,581 (tCO_2/000ton) Pet coke: 2,306 (tCO_2/000ton) Diesel: 3,145 (tCO_2/000ton) Nat. Gas: 1,909 (tCO_2/MMm^3) IFO 180: 3,155 (tCO_2/000ton) Butane Gas: 2,807 (tCO_2/000ton) Propane Gas: 2,807 (tCO_2/000ton) Liquid Natural Gas: 1,909 (tCO_2/MMm^3)
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	$COEF_{CO2,i}$ (tCO_2/000ton)= NCV_i (TJ/000ton)*Carbon content of fuel type i (tC/TJ)* CO_2 / C conversion factor (tCO_2/tC). Note that the Project Participant presents local measurements of Net calorific values in terajoules per thousand tons (TJ/000tons) to cross-check measurements with IPCC values published in units of (TJ/Gg) equivalent to (TJ/000tons). This explains why the Project Participant expresses parameter $COEF_{CO2,i}$ in tons of CO_2 per thousand tons of fossil fuel (tCO_2/000ton), as shown in the equation above.
QA/QC procedures:	Local NCVs were duly compared with IPCC default values at the lower limit of the 95% confidence interval. Local values were found consistent. Carbon content and % of carbon oxidized were taken from the IPCC.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$GEN_{j/k/n,y}$
Unit:	(MWh/yr) Refer to the emission factor calculation.
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 Center.
Value(s) of monitored parameter:	Refer to the 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 calculated this emission coefficient from official and publicly available data from the CDEC-SIC Dispatch Center.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	---
Unit:	Text
Description:	Identification of power source / plant for the OM calculation.
Measured/ Calculated / Default:	Determined based on official data
Source of data:	This information was directly obtained by the CDEC-SIC Dispatch Center.
Value(s) of monitored parameter:	Refer to the 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:	---

Data / Parameter:	---
Unit:	Text
Description:	Identification of power source / plant for the BM calculation.
Measured/ Calculated / Default:	Determined based on official data.
Source of data:	This information was directly obtained by the CDEC-SIC Dispatch Center.
Value(s) of monitored parameter:	Refer to the 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:	---

Data / Parameter:	λ_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 Center.
Value(s) of monitored parameter:	λ_{2013} = 0.000000000 λ_{2014} = 0.000000000
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	As per the corresponding methodology (ACM0002) (Version 04)
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:	$GEN_{j/k/ll,y\ IMPORTS}$
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 Center.
Value(s) of monitored parameter:	Does not apply since there is no interconnection with other transmission systems.
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 any other country.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$COEF_{i,j,y\ IMPORTS}$
Unit:	(tCO_2/ton) or (tCO_2/m^3)
Description:	CO_2 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 Center.
Value(s) of monitored parameter:	Does not apply since there is no interconnection with other transmission systems. Since there are no imports in the SIC this variable is currently not used in the emission reduction calculation. The data used for baseline emission calculations is 0 (tCO_2/ton) or 0 (tCO_2/m^3).
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable.
Purpose of data:	Baseline 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 emission reduction calculation spread sheet.

The net quantity of increased electricity generation is calculated using equation N° 13 of the ACM0006 (Version 02).

$$EG_y = EG_{project\ plant,y} - \varepsilon_{el,other\ plant(s)} \cdot \sum B F_{i,y} \cdot NCV_i$$

Where:

EG_y: is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh.

$EG_{project\ plant,y}$: is the net quantity of electricity generated in the project plant during the year y in MWh.

$\varepsilon_{el,other\ plant(s)}$: is the average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass fired in the project plant in the absence of the project activity, expressed in MWhel/MWh biomass

$BF_{i,y}$: is the quantity of biomass type i used as fuel in the project plant during the year y in a volume or mass unit, and

NCV_i: is the net calorific value of the biomass type i in MWh per mass or volume of biomass

The total emission reduction due to displacement of electricity is calculated using equation N° 8 of the ACM0006 (Version 02):

$$ER_{electricity,y} = EG_y \cdot EF_{electricity,y}$$

where:

$ER_{electricity,y}$: Emission reductions due to displacement of electricity during the year y in of tCO_2

EG_y: is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh,

$EF_{electricity,y}$: is the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tCO_2/MWh.

The corresponding calculations for the monitored period are presented below.

Data:

	Units	2013	Jan-Mar 2014
(1) CO_2 emission factor of the grid.	(tCO_2/MWh)	0.766	0.676
(2) Net quantity of electricity generated in the project plant.	(MWh)	668,348	193,498
(3) Average net efficiency of electricity generation in the reference plant.	(%)	10.779	10.779
(4) Quantity of biomass type black liquor used as fuel in the project plant.	(tDS)	1,559,101	414,557
(5) Net calorific value of biomass type black liquor	(GJ/tDS)	10.53	9.55

Calculations:

		2013	Jan-Mar 2014
(6) Electric power displaced from the grid.	(2) –(3)*[(4)*(5)]*(1 MWh)/(3.6 GJ)	176,779	74,956
(7) Total grid emission savings.	(1)*(6)	135,392 (tCO_2)	50,667 (tCO_2)

Total baseline emissions	**(tCO_2)**	**135,392**	**50,667**

Determination of the emission factor of the grid electricity generation:

The parameter EF should be determined as the combined margin CO_2 emission factor for the grid to which the project activity is connected in year y, calculated according to the ACM0002 (version 04). This calculation is presented below:

a) Operating Margin calculation:

In this case the OM emission factor is calculated using the simple/adjusted method equation N°4 of the ACM0002 (Version 04). The Project Participant used ex-post data to calculate this parameter, i.e. the coefficient was calculated the year in which project emissions occurred.

The Project Participant used data from 2013 and 2014 to determine each year's lambda factor that expresses the percentage of time when low-cost/must-run sources were on the margin for that year:

$$\lambda_y = \lambda_{2013} = 0.00000$$

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

The rest of the parameters used to calculate the EF_{grid} for 2013 and 2014 were obtained from the CDEC-SIC dispatch centre (official and public information). The calculation is as follows:

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

$$\sum_{i,j} F_{i,j,2013} \cdot COEF_{i,j} = 20{,}521{,}322\ (tCO_2/y)$$

$$\sum_{i,j} F_{i,j,2014} \cdot COEF_{i,j} = 17{,}121{,}276\ (tCO_2/y)$$

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

$$\sum_{j} GEN_{j,2013} = 28{,}082{,}135\ (Mwh/y)$$

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

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

For 2013:

$$\sum_{i,k} F_{i,k} . COEF_{i,k} = 428{,}411\ (tCO_2/y)$$

For 2014:

$$\sum_{i,k} F_{i,k} . COEF_{i,k} = 548{,}476\ (tCO_2/y)$$

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

$$\sum_{k} GEN_{k,2013} = 22{,}803{,}478\ (Mwh/y)$$

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

Replacing the above values in the equation used to calculate the EF for 2013 and 2014, the corresponding operating margins result:

$$EF_{OM,2013} = (1 - 0.00000) . \frac{20{,}521{,}322}{28{,}082{,}135} (tCO_2/Mwh) + 0.00000 . \frac{428{,}411}{22{,}803{,}478} (tCO_2/Mwh)$$

$$EF_{OM,2013} = EF_{OM,simple\ adjusted,2013} = 0.731(tCO_2/Mwh)$$

$$EF_{OM,2014} = (1 - 0.00000).\frac{17,121,276}{23,957,647}(tCO_2/Mwh) + 0.00000.\frac{548,476}{28,328,214}(tCO_2/Mwh)$$

$$EF_{OM,2014} = EF_{OM,simple\ adjusted,2014} = 0.715\ (tCO_2/Mwh)$$

b) Build Margin calculation:

According to 2013 and 2014 SIC data, the group of plants that accounts for the largest generation are the ones responsible for the 20% of the total generation of that year. These plants are considered to calculate the Build Margins for 2013 and 2014 respectively.

$$EF_{BM,2013} = 0.801(tCO_2/Mwh)$$

$$EF_{BM,2014} = 0.637(tCO_2/Mwh)$$

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

Having obtained the Operating Margins $EF_{OM,y}$ and the Build Margins $EF_{BM,y}$, for 2013 and 2014, and assuming the default value of 0.5 for weighing factor W_{OM} and 0.5 for W_{BM}, it is possible to calculate $EF_{grid,CM,y}$ for each year.

$EF_{electricity,2013}$ =0.5 x 0.731 + 0.5 x 0.801 = 0.766 *(tCO_2/MWh)*

$EF_{electricity,2014}$ =0.5 x 0.715 + 0.5 x 0.637 = 0. 676 *(tCO_2/MWh)*

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

The only project emission corresponds to the consumption of some fossil fuel in the recovery boiler, which is attributable to additional power generation to the grid. This is calculated using equation N° 6 of the ACM0006 (Version 02):

$$PEFF_y = \sum FF_{project\ plant,i,y} \cdot COEF_{CO2,i}$$

The corresponding calculation is shown below:

Data:

	Units	2013	Jan-Mar 2014
(1) On-site fossil fuel consumption of type diesel for co-firing in the project plant.	(ton)	0	0
(2) On-site fossil fuel consumption of type natural gas for co-firing in the project plant.	(ton)	0	0
(3) On-site fossil fuel consumption of type fuel oil for co-firing in the project plant.	(ton)	1,116	539
(4) Diesel emission factor	(tCO_2/000ton)	3,239	3,239
(5) Natural gas emission factor	(tCO_2/000ton)	2,938	2,938
(6) Fuel Oil emission factor	(tCO_2/000ton)	3,287	3,287

Calculations:

	Calculation procedure	2013	Jan-Mar 2014
(8) Diesel emissions.	(1)*(1/1,000)*(4)	0 (tCO_2)	0 (tCO_2)
(9) Nat. gas emissions.	[(2)*1,000/(7)]*(1/1,000,000)*(5)	0 (tCO_2)	0 (tCO_2)
(10) Fuel Oil emissions.	(3)*(1/1,000)*(6)	3,669 (tCO_2)	1,772 (tCO_2)
Total fossil fuel emissions.	(8)+(9)+(10)	3,669 (tCO_2)	1,772 (tCO_2)

Total project emissions.	**(tCO_2)**	**3,669**	**1,772**

E.3. Calculation of leakage

As described in section E.2 of the registered PDD, no leakage is anticipated from the implementation of the project activity.

$$L_y = 0$$

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_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	GHG emission reductions or net GHG removals by sinks (t CO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	186,059	5,440	0	Not applicable.	180,618	180,618

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_2e)	203,720	180,618

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

Achieved emission reductions are 11.3% lower than the ex-ante estimated value. This can be mainly attributed to 14.2% less net increased electricity generation (EG_y) as calculated by equation 13 of ACM0006 (Version 02).

$$EG_y = EG_{project\ plant,y} - \varepsilon_{el,other\ plant(s)} \cdot \quad BF_{i,y} \cdot NCV_i$$

Finally, the ex-ante emission reduction estimation does not consider fossil fuel consumption in the recovery boiler, whereas in reality, there is a small amount of fossil fuel consumed for surplus power generation which results in higher project emissions.

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

Project participant and/or responsible person/ entity	☒ Project participant ☒ Responsible person/ entity for completing the CDM-MR-FORM
Organization name	Arauco Celulosa y Constitución S.A.
Street/P.O. Box	El Golf 150, piso 7
Building	---
City	Las Condes, Santiago
State/Region	Región Metropolitana
Postcode	---
Country	Chile
Telephone	+56 2 2462-3888
Fax	---
E-mail	Christian.rodriguez@arauco.cl
Website	www.arauco.cl
Contact person	Christian Rodríguez
Title	Head of Climate Change
Salutation	Mr.
Last name	Rodríguez
Middle name	Arnoldo
First name	Christian
Department	Arauco Bioenergía – Development Area
Mobile	---
Direct fax	---
Direct tel.	---

Document information

Version	*Date*	*Description*
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (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.

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