

MONITORING REPORT

Nueva Aldea Biomass Power Plant Phase 2

CDM Registration Reference Number: 346

VERSION 01

Monitoring period:

From: October 01, 2007

To: September 30, 2008



Celulosa Arauco y Constitución S.A.

October, 2008

SUMMARY TABLE

Name of the CDM project activity:	Nueva Aldea Biomass Power Plant Phase 2
CDM registration reference number:	346
Starting date of the project activity:	01/07/2004
Starting date of the first crediting period:	01/04/2007 ¹
Length of the first crediting period:	Seven (7) years.
Maximum length of the crediting period:	3 x Seven (7) years
Period covered by the current monitoring report:	01 October 2007 – 30 September 2008 (both days included)
Total net emission reductions claimed in the monitored period:	149,624 tCO₂eq

¹ The original starting date established in the registered PDD was 01/08/2006. Due to some technical problems during the start-up operation, the project proponent requested a delay of the starting date of the first crediting period of 8 months.

1. Project description and current status

Project description

The proposed project activity consists in a new 37 MW grid-connected biomass cogeneration power plant located inside a forestry complex by Arauco: the Nueva Aldea Complex or the Nueva Aldea Project. The power plant consists in a new pulp mill equipped with 2 X 70 MW gross generation capacity, of which 37 MW will be destined to generate surplus power to the grid.

The project activity is designed to use black liquor² (biomass) for steam and electric power generation in a cogeneration power plant located inside a new bleached pulp mill site. The project activity is presented by Celulosa Arauco y Constitución S.A. (from now on, Arauco), a leading forestry and pulp-producing company in the world.

The Nueva Aldea Industrial Complex is built in two phases.

Phase 1, that consists in the construction of:

- A sawmill.
- A plywood mill.
- A log processing mill.
- A biomass cogeneration power plant.

Phase 2 that consists in the construction of:

- A new 856,000 tons per year of bleached kraft pulp mill.

Phase 1 of the Nueva Aldea Project also contemplates a new CDM project activity, which consists of a new 30 MW biomass cogeneration power plant. Due to differences in the way the baseline methodology is applied to the project activity in the two Phases and for better clarity reasons, the Nueva Aldea biomass Power Plant Phase 1 is presented separately in another PDD, therefore a description of this project is not done in this PDD.

Phase 2 of the Nueva Aldea Project contemplates the construction of a pulp mill, which will add approximately 37 MW to the power surplus of 13 MW generated by the Nueva Aldea biomass power plant in Phase 1. 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 electric power to the grid. Considering the higher cost of building a pulp mill with excess electric power capacity, the decision of building such Power Plant relied on the possibility of not relying on the SIC for electric power, on selling

² Black liquor is an organic by-product of the pulp production Kraft cycle and falls under the category of *biomass residue*, according to the “Clarifications of definitions of biomass and consideration of changes in carbon pools due to a CDM project activity”, Annex 8, of 20th Executive Board meeting report.

excess power to the grid, on supplying electric power to other mills within the Arauco Group and on the potential benefits from being a CDM project activity.

The proposed project activity will assist 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 activity 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 proposed 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, 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.

Baseline methodology

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

"Consolidated baseline methodology for grid-connected electricity generation from biomass residues", ACM0006. (Version 02)

Applied baseline scenario for the project activity: N° 4.

Documentation

The project was validated by DNV and registered in June 02, 2006. The Project Design Document, validation report, request for registration and registration approval are available on the UNFCCC website: <http://cdm.unfccc.int/Projects/registered.html>

Implementation and current status

The project activity has been completed as planned and described in the Project Design Document (PDD). The only change has been made in the starting date of the first crediting period of the project activity, due to some technical problems during the start-up process.

Sustainability, economic and social well-being

The Nueva Aldea Phase 2 biomass Power Plant reduces carbon emissions by replacing fossil fuel-based electricity generation. The project promotes sustainable development by:

- Fostering the diversification of electricity generation towards renewable energy sources in the country.
- Using clean, efficient and top of the line technology to generate power, thus, conserving natural resources and the environment.
- Becoming a benchmark of an efficient and renewable energy generation project in the country. This encourages the development of modern and more efficient generation of electricity and thermal energy throughout the country using renewable biomass sources.

2. Monitored parameters

All parameters needed to make the emission reduction calculations according to the monitoring plan are described in the PDD, section D.2. This section provides additional explanatory information about the monitored data.

The following table provides information about the monitored data for the baseline and project emission data variables:

Project activity monitored data

ID number.	Data variable.	Additional comments
1. $BF_{i,y}$	Quantity of biomass type i used as fuel in the project plant during the year y in a volume or mass unit.	<p>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.</p> <p>It must be noted that this variable was not included in the original monitoring plan presented in the PDD, since the PDD did not use equation 13 of the ACM0006 (Version 02) to calculate the net quantity of increased electricity generation resulting from the implementation of the project activity. Since the project proponent decided to use equation 13 instead of deviating from the methodology, this variable is now included in the monitoring plan of the Nueva Aldea Phase 2 project activity.³</p>
2. NCV_i	Net calorific value of biomass type i per mass or volume of biomass.	<p>This variable was measured in a specialized laboratory in Finland. The measurement was carried out according to proper industry standards.</p> <p>It must be noted that this variable was not included in the original monitoring plan presented in the PDD, since the PDD did not use equation 13 of the ACM0006 (Version 02) to calculate the net quantity of increased electricity generation resulting from the implementation of the project activity. Since the project proponent decided to use equation 13 instead of deviating from the methodology, this variable is now included in the monitoring plan of the Nueva Aldea Phase 2 project activity.</p>
3. $COEF_{CO_2,i}$	CO_2 emission factor of the fossil fuel type i used in the project plant.	The project proponent used IPCC default factors for these coefficients.
4. $FF_{project\ plant,i,y}$	On-site fossil fuel consumption of fuel type i for co-firing in the project plant.	<p>Total quantities of fossil fuel per type used in the recovery boiler were constantly monitored at the Power Plant. Emissions from fossil fuel quantities associated to additional power generation were considered project emissions and deducted from the baseline emissions of the project activity. The fossil fuel associated with additional power generation was determined following the indications of section E.1. (pages 44 and 45) of the registered PDD.</p> <p>Though this variable was not considered in the original monitoring</p>

³ A revised monitoring plan has been submitted in order to incorporate the new variables from now on.

		<p>plan, it was added to the new monitoring plan. During the monitored period, whenever fossil fuels were used in the recovery boiler, the corresponding CO₂ emission factors were duly monitored / calculated. The project emissions related to this source were calculated using IPCC default values (Carbon content and fraction of carbon oxidized) and local national data (Net calorific values of the corresponding fossil fuels).</p>
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Baseline monitored data

ID number.	Data variable.	Additional comments
5. $EG_{\text{project plant},y}$	Net quantity of electricity generated in the project plant during the year y.	<p>This variable was monitored using electric meters that are standard in the electric power industry in Chile.</p> <p>It must be noted that this variable was not included in the original monitoring plan presented in the PDD, since the PDD did not use equation 13 of the ACM0006 (Version 02) to calculate the net quantity of increased electricity generation resulting from the implementation of the project activity. Since the project proponent decided to use equation 13 instead of deviating from the methodology, this variable is now included in the monitoring plan of the Nueva Aldea Phase 2 project activity.</p>
6. EF_y	CO ₂ emission factor of the grid.	Calculated as the average (equal weights of 50% for each) between the OM and BM SIC grid emission factors.
7. $EF_{\text{OM},y}$	CO ₂ Operating Margin emission factor of the grid.	This factor was calculated according to the chosen baseline methodology (which indicates to follow the ACM0002 methodology). For this coefficient and according to the PDD, the Simple Adjusted OM factor was used. For the 2008 coefficient, the information was available only until September 2008.
8. $EF_{\text{BM},y}$	CO ₂ Build Margin emission factor of the grid.	This factor was calculated according to the chosen baseline methodology (which indicates to follow the ACM0002 methodology). In this case, the BM was calculated for each year (ex-post) and in each case, the weighted average of the emission coefficients of the most recent power plants responsible for 20% of the total power generation each year was used. For the 2008 coefficient, the information was available only until September 2008.
9. $F_{i,y}$	Amount of each fossil fuel consumed by each power source / plant.	This information was directly obtained by the CDEC-SIC Dispatch Center or directly from the electric power companies themselves.
10. COEF_i	CO ₂ emission coefficient of each fuel type i consumed by the electric power generators in the relevant grid.	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).
11. $\text{GEN}_{j/k/n,y}$	Electricity generation of each power source / plant j/k or n.	This information was directly obtained by the CDEC-SIC Dispatch Center. For the 2008 generation, the information was available only until September 2008.
12.	Identification of power source / plant for the OM calculation.	This information was directly obtained by the CDEC-SIC Dispatch Center.
13.	Identification of power source / plant for the BM calculation.	This information was directly obtained by the CDEC-SIC Dispatch Center.
14. λ_y	Fraction of time during which low-cost / must-run sources are on the margin.	This factor was calculated from information directly obtained from the CDEC-SIC Dispatch Center. For the 2008 coefficient, the information was available only until September 2008.
15.a $\text{GEN}_{j/k/ll,y}$ IMPORTS	Electricity imports to the project electricity system.	This information was directly obtained by the CDEC-SIC Dispatch Center. There are no imports / exports to the project activity electricity system.

15.b COEF _{ijy} IMPORTS	CO ₂ emission coefficient of fuels used in connected electricity systems (if imports occur).	See 12.a above.
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Fixed parameters

ID number.	Data variable.	Additional comments
$\epsilon_{el, \text{ other plant(s)}}$	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.	<p>The reference pulp mill's electric efficiency of 12.31% was calculated taking into account the following considerations:</p> <ul style="list-style-type: none"> 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 mill⁴. The electric efficiencies of other (modern and recently built) pulp mills in Chile and in the region. The electric efficiencies of these pulp mills were in the range of 8.0% to 10.5%. <p>According to the above, the chosen efficiency of 12.31% was deemed conservative and appropriate.</p> <p>It must be noted that this parameter was not included in the original monitoring plan presented in the PDD, since the PDD did not use equation 13 of the ACM0006 (Version 02) to calculate the net quantity of increased electricity generation resulting from the implementation of the project activity. Since the project proponent decided to use equation 13 instead of deviating from the methodology, this parameter is now used in the emission reduction calculation of the Nueva Aldea Phase 2 CDM project activity.</p>

⁴ Please see table 2.46 of the BREF document (the "European IPPC Bureau. 2001. Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques in the Pulp and Paper Industry, Seville, Spain, p 111.". The link: <http://eippcb.jrc.ec.europa.eu/pages/FActivities.htm>).

Summary of the main monitored data

According to the monitoring plan outlined above, the following table shows a summary of the main monitored data of the project activity during the monitored period.

Summary of main monitored data per year

		2007	2008
Operating Margin	(tCO ₂ /GWh)	809.0	864.4
Build Margin	(tCO ₂ /GWh)	570.5	505.0
Combined Margin	(tCO ₂ /GWh)	689.8	684.7
Net energy displaced from the grid	(GWh/yr)	50.9	174.9
Fossil fuel consumed in Recovery Boiler			
Diesel	(Lt/yr)	626,904	1,106,660
Fuel Oil	(ton/yr)	0.00	0.00
LPG	(Lt/yr)	0.00	0.00
Natural Gas	(m ³ /yr)	133,252	102,003

Note: Year 2007 considers monitored data from October to December and year 2008, from January to September.

Some differences between the monitored data and the one used to calculate the net emission reductions in the registered PDD are due to the following reasons:

1. The replacement of natural gas for diesel in fossil fuel power plant⁵ and a lower share of hydro power generation in the SIC grid during 2007 and 2008 compared to the year in which the Nueva Aldea Phase 2 PDD was written.

⁵ Natural gas from Argentina for electric power generation in Chile was virtually unavailable in 2007 and 2008.

Leakage

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

$$L_y = 0$$

Quality assurance

Quality control and quality assurance mechanisms for the monitored data were implemented as mentioned in the registered PDD. The following table provides additional information in the same format as the one used in the PDD.

Data	Uncertainty level	QA/QC procedures implemented during the monitored period.
1.	Low	Biomass flows were crosschecked considering two different biomass flow measurements to the recovery boiler. In addition, the project proponent performed a consistency check consisting in the calculation of a production index that considered the tons of dry solids (black liquor in tDS) burned in the recovery boiler per pulp production (in ADt). This index is appropriate, since the amount of pulp produced is directly related to the amount of black liquor generated and burned in the recovery boiler.
2.	Low	The measured net calorific value of the biomass (black liquor) was consistent with the values of 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.
3.	Low	IPCC default factors were used in this case.
4.	Low	Fuel meters received periodic maintenance, calibration and the consistency of metered fuel consumption was checked with purchase dispatch bills.
5.	Low	Electricity meters received periodic maintenance and calibration as per instructed by the equipment manufacturer and according proper industry standards. Total power generation takes place in two turbogenerator units at the Nueva Aldea pulp mill. To check the generation of the first unit, a power balance in the corresponding bus was carried out. To check the generation of the second unit, an operation index that considers the total energy generated, the efficiency of the turbogenerator and the total steam that goes through the turbogenerator was calculated.
6, 7, 8, 9, 10, 11, 12, 13, 14, 15a, 15b	Low	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator. However, the project proponent calculated this emission coefficient from official and publicly available data from the CDEC-SIC dispatch center.

The project proponent developed a dedicated information system designed to guarantee the quality of the information related to the Nueva Aldea Phase 2 project activity. This system will be part of the Nueva Aldea Phase 2 ISO-14,001 / OHSAS 18,001 systems, which is currently under implementation.

3. Emission reductions

Calculation formulas

As presented in the PDD and according to the baseline methodology, the net emission reduction calculation formula for the Nueva Aldea Phase 2 project is:

$$\text{Project Activity Net Emission savings} = \text{Baseline Emissions} - \text{Project Activity Emissions} - \text{Leakage}$$

or

$$PNE_y = BL_{E,y} - EM_{P,y} - L_y$$

or

$$PNE_y = (BL_{E1,y} + BL_{E2,y}) - (P_{E1,y} + P_{E2,y} + P_{E3,y} + P_{E4,y}) - L_y$$

Where:

$BL_{E1,y}$: Baseline emissions from grid electricity displacement (tCO₂/yr).

$BL_{E2,y}$: Baseline emissions from avoided biomass disposal (tCO₂eq/yr).

$P_{E1,y}$: Project emissions from biomass controlled burning in the Power Plant (tCO₂eq/yr).

$P_{E2,y}$: Project emissions from biomass transportation to the biomass Power Plant (tCO₂/yr).

$P_{E3,y}$: Project emissions from biomass transportation within the Power Plant site (tCO₂/yr).

$P_{E4,y}$: Project emissions from fossil fuel consumption in the Power Plant (tCO₂/yr).

L_y : Are the leakage emissions (tCO₂/yr).

In case of the Nueva Aldea Phase 2 project activity, the only terms of the equation above that apply are $BL_{E1,y}$ and $P_{E4,y}$, so the net emission reductions of the project can be calculated as:

$$PNE_y = BL_{E1,y} - P_{E4,y}$$

The following section of the monitoring report evaluates each part of this equation and calculates the net emission reductions of the Nueva Aldea Phase 2 project activity on a monthly basis.

Emission reductions for the monitored period

For the calculation of the net emission reductions of the Nueva Aldea Phase 2 project activity, an Excel spreadsheet with the monitored data and the monthly / yearly calculation of the net emission reductions was provided to the DOE for the verification of the calculated numbers. For informative purposes, this monitoring report provides a table that shows the monthly net emission reduction of the Nueva Aldea Phase 2 project activity:

Net emission savings per month

Year (Months)	Net emission savings (tCO ₂ eq/yr)	Baseline emissions	Project Emissions
		Grid emissions (tCO ₂ /yr)	Fossil fuel in R.B. (tCO ₂ /yr)
Year 2007			
October	11,366	12,918	1,552
November	7,941	8,335	394
December	13,887	13,887	0
Total year 2007	33,194	35,141	1,946
Year 2008			
January	11,672	11,961	289
February	9,917	10,015	98
March	13,300	13,334	34
April	14,689	16,018	1,329
May	13,439	14,477	1,039
June	13,499	13,499	0
July	12,215	12,615	400
August	14,752	14,752	0
September	12,947	13,099	152
October	0	0	0
November	0	0	0
December	0	0	0
Total year 2008	116,430	119,770	3,340

2nd verif (Oct 07- Sept 08)	149,624	154,910	5,286
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Total emissions claimed	149,624	154,910	5,286
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Note: Net emission savings = Baseline emissions - Project activity emissions.

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