MONITORING REPORT

Valdivia Biomass Power Plant

CDM Registration Reference Number: 1787

VERSION 01

Monitoring period:

From: April 01, 2009
To: December 31, 2009

Celulosa Arauco y Constitución S.A.

May, 2010

SUMMARY TABLE

Name of the CDM project activity:	Valdivia biomass power plant
CDM registration reference number:	1787
Starting date of the project activity:	01/02/2002
Starting date of the first crediting period:	01/04/2009[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 April 2009 – 31 December 2009 (both days included)
Total net emission reductions claimed in the monitored period:	**134,247 tCO_2eq**

[1] This is not the date stipulated in the CDM PDD, but the date in which the project activity was registered as a CDM project activity.

1. Project description and current status

Project description

The project activity consists in a 550,000 (ADt/year)[2] 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[3] 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[4]. 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

[2] ADt stands for "Air Dry ton".

[3] 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 and the "Biomass residue" definition provided in page Nº2 of the ACM0006 (Version 05) baseline methodology used for this project activity.

[4] All the wood used to generate pulp and energy (heat and power) comes from exotic plantations of Radiata Pine and Eucalyptus. The forestlands are closely supervised by CONAF and must be managed in a sustainable way by law. For more details, please see Annex 4 of the PDD.

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 proponent 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 promoting 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 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.

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 05)

Applied baseline scenario for the project activity: a combination of baseline scenarios Nº 3 an N° 4[5].

Documentation

The project was validated by DNV and registered in April 01, 2009. 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

[5] The use of more than one baseline scenario of the ACM0006 in a CDM project activity is not allowed on a general basis. However, in this case the Project Proponent presented a request for deviation to the Executive Board in order to apply a combination of baseline scenarios N° 3 and N° 4 of the ACM0006 (Version 05). This request for deviation was approved by the Executive Board in December 13th, 2007. For more details, please see Annex 3 of the PDD.

Implementation and current status

The Valdivia CDM project activity has been completed as described in the registered PDD. It has also operated as described in the registered PDD.

Sustainability, economic and social well-being

The Valdivia 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 have been monitored according to the monitoring plan. The following table below provides information about the monitored data for the project and baseline emission data variables. Note that 2009 values include data from April to December 2009.

Project activity monitored data

ID number.	Data variable.	2009 value	Monitoring systems and procedures
1. $BF_{k,y}$ (and $BF_{T,k,y}$ see comment)	Quantity of biomass residue type k combusted in the project plant during the year y.	Black liquor: 771,995 (tDS). Biomass from forest ops. (sawdust and bark): 101,040 (BDt). From this amount, 21,767 (BDt) corresponds to biomass attributable to the project activity that was brought to the power plant by trucks.	The black liquor flow to the recovery boiler is measured with flow meters, which transmit the on-line data to the DCS of the pulp mill. 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 the emission reductions of the project activity in Arauco Generación S.A. The biomass from forest operations is directly monitored via an on-line weight meter located at the entrance of the power boiler. This instrument transmits the monitored data to the pulp mill 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 the emission reductions of the project activity in Arauco Generación S.A.. Biomass from forest operations that is transported to the power plant by trucks is duly measured (weight and volume) at the entrance of the power plant. This variable is monitored continuously. Comment: $BF_{T,k,y}$ used in equation Nº 4 of the ACM0006 (Version 05) corresponds to the fraction of $BF_{k,y}$ attributable to the project activity that must be brought in trucks from outside of the plant. This biomass type corresponds to biomass from forest operation (sawdust and bark mix).
2. Moisture content of biomass residues.	Moisture content of each biomass residue type k.	Black liquor: This biomass type is directly measured in dry-solid terms (tDs, "tons of dry solids"). Biomass from forest ops.: 62.15% (wet basis). This is an average, since the biomass humidity is reported on a monthly basis for emission reduction calculation purposes.	Water content of black liquor is determined by refract meters installed in the pipes that carry the black liquor to the recovery boiler. Additional humidity measurements are carried out (in parallel to the previous one) consisting in taking black liquor samples and determining the solid content in a laboratory, at the pulp mill site. The Superintendence of Electro Control is responsible for the maintenance and operation of the refract meters. The Superintendence of Liquor is responsible of the black liquor sampling, while the Technical Superintendence is

			responsible for the execution of the solid-content analysis. The biomass from forest operations moisture is monitored and registered by taking daily biomass samples from the feed flow of biomass entering to the power boiler. Humidity content is calculated by evaporating the water of the samples and measuring the weight before and after the water has been evaporated. This process is carried out in dedicated scales. The Superintendence of Liquor is in charge of taking the biomass samples, while the Technical Superintendence is responsible for carrying out the humidity content analysis in a lab inside the pulp mill facility. This variable is monitored continuously.
3. $EF_{CH4,BF}$	CH_4 emission factor for the combustion of biomass residues in the project plant.	30.0 (Kg CH_4/TJ) or 0.00003 (tCH_4/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_4/TJ) or 0.0000306 (tCH_4/GJ). The reasons for which the 1.02 conservativeness factor was chosen in this case can be found in section B.6 of the registered PDD.	The IPCC default factors are applicable for calculating the CH_4 emission from additional biomass from forest operation consumption. This project emission is calculated as per the equations of the baseline scenario N° 3 of the ACM0006 (Version 05). There are no baseline and project emissions associated to black liquor consumption in this case, since its consumption and burning conditions are the same under the baseline and the project scenarios. This was part of the request for deviation presented for the Valdivia project.
4. AVD_y	Average round trip distance (from and to) between biomass fuel supply sites and the project site.	114.8 km on average (round trip). This is an average, since the round trip distances were reported monthly for emission reduction calculation purposes.	The Superintendence of Fiber determines the distance from biomass supply centers to the pulp mill by from information provided by the transportation subcontractors. The average distance in a period of time (i.e. month) is determined by calculating a weighted average distance considering the amount of biomass and the distance from which each supply center provides biomass to the mill. This variable is monitored continuously.
5. N_y	N° of trips per month.	2,241 round trips for the monitored period. Since TL_y and the transported biomass to the plant were monitored, this variable was actually calculated according to equation (4) of the ACM0006 (Version 05). For further details, please refer to the emission reduction calculation section of this Monitoring Report.	The Superintendence of Fiber monitors and records each raw material dispatched to the mill. This information is stored in the mill's information system and the person in charge of reporting this information extracts the number of trucks that arrived to the mill with biomass fuels (biomass from forest operations) and reports this information to the person in charge of calculating the emissions reductions of the project activity in Arauco Generación S.A. This variable is monitored continuously.
6. TL_y	Average truckload of	25.7 (ton/truck).	The Superintendence of Fiber monitors this variable by measuring the truckloads at the project mill's

	the trucks used for the transportation of biomass from forest operations to the pulp mill.	This is an average, since the truck loads are reported monthly for emission reduction calculation purposes.	weighbridges. The value is determined by calculating a weighted average value of the truckloads in tons for the trucks that deliver biomass from forest operations to the pulp mill. This variable is monitored continuously and aggregated monthly.
7. $EF_{km,CO2,y}$	Average CO_2 emission factor for the trucks during year y.	1.269 ($kgCO_2$/km).	The Project Proponent determines the fuel type and the fuel truck performance (km/lts) from the transportation companies. Then, the Project Proponent calculates CO_2 emissions from fuel consumption by multiplying with appropriate net calorific values and CO_2 emission factors. For net calorific values and CO_2 emission factors, the Project Proponent uses reliable national default values or, if not available, (country-specific, if available) IPCC default values. Alternatively, the Project Proponent might use emission factors applicable for the truck types used from the literature in a conservative manner (i.e. the higher end within a plausible range). This variable is monitored at least annually.
8. $EF_{CO2,FF,i}$	CO_2 emission factor for fossil fuel type i.	Diesel: 0.07407 (tCO_2/GJ). Fuel oil: 0.07737 (tCO_2/GJ).	No direct measurements are carried out for this factor, since IPCC default factors are used.
9. $FF_{project\ plant,i,y}$	Quantity of fossil fuel type i combusted in the biomass residue fired power plant during the year y.	406 (ton) of Fuel Oil burned in the recovery boiler. 987 (ton) of Fuel Oil burned in the power boiler.	Fossil fuel consumption in the power and recovery boilers is measured using on-line coriolis mass flow meters and verified against purchases and tank level indicators. In the case of flow meters, the information is registered on-line by the pulp mill's DCS and recorded in databases. The pulp mill operator keeps constant track of the reasons for burning fossil fuels in both boilers (e.g. fossil fuel consumption used to enhance surplus power generation to the grid). The Superintendence of Liquor is responsible for collecting this information and for sending it periodically to the person in charge of calculating the emissions reductions of the project activity in Arauco Generación S.A. Note that in this case, the fossil fuel consumption shown here is the one related to the implementation of the project activity. This is explained in detail in section B.6.1 of the PDD. This variable is monitored continuously.
10. $FF_{project\ site,i,y}$	Quantity of fossil fuel type i combusted at the project site	32 (ton) of diesel.	This fuel amount is determined considering the total fuel consumed for on-site transportation of biomass residues from forest operations (sawdust and bark). The total fuel amount is reported by the front loader operator (or the

	for other purposes that are attributable to the project activity during the year y.		corresponding subcontractor) to the person in charge of reporting this information for the calculation of the project activity emission reductions. This variable is monitored continuously.
11. $EG_{project\ plant,y}$	Net quantity of electricity generated in the project plant during the year y.	478.2 (GWh).	Electric meters that measure the voltage and current continuously monitor the total electric power generation at the mill. This information is stored in the DCS[6] databases of the pulp mill. The Superintendence of Liquor is responsible to process (i.e. integrate) this information and to send it periodically to the person in charge of calculating the emission reductions of the project activity in Arauco Generación S.A. This variable is monitored continuously.
12. $Q_{project\ plant,y}$	Net quantity of heat generated from firing biomass in the project mill.	964,506 (GJ) of heat generated in the power boiler.	High-pressure steam generated at the project plant is measured as well as the total heat to process from the turbogenerator extractions. The process heat that would have been generated by the power boiler in the baseline case scenario is calculated multiplying the fraction of total high-pressure steam (% of tons) generated by the power boiler in the project plant by the total process heat (GJ) obtained from the turbogenerator extractions. This algorithm was part of the request for deviation presented with the Valdivia project activity and was approved by the Executive Board. The Superintendence of Liquor is in charge of monitoring this variable. A mill operator is in charge of aggregating and sending this information to Arauco Generación, where it is used in the emission reduction calculation. This variable is monitored continuously and aggregated monthly.
13. NCV_i	Net calorific value of the fossil fuel type i.	First semester measurements: Diesel: 43.08 (GJ/ton) Fuel Oil: 41.00 (GJ/ton) Second semester measurements: Diesel: 42.98 (GJ/ton) Fuel Oil: 40.87 (GJ/ton)	The Technical Superintendence requests reputed local laboratories to determine the net calorific values of the fossil fuels used in the plant. Alternatively, the Superintendence can evaluate the possibility of carrying out these measurements on site, in the pulp mill laboratory. In all cases, these measurements are carried out according to proper industry standards. In case the above is not feasible, fuel supplier's

[6] DCS stands for Distributed Control System.

			information is used instead, since they normally carry out net calorific measurements of all the fuels they sell. This parameter is part of the specifications of the fuel that is sold to the mill. Monitoring frequency: In case of direct measurements, at least every six months, taking at least three samples for each measurement. In case of other data sources: Review the appropriateness of the data annually.
14. NCV_k	Net calorific value of biomass residue type k.	First semester measurements: Black liquor: 9.77 (GJ/ton) Sawdust & bark mix: 18.61 (GJ/ton) Second semester measurements: Black liquor: 9.46 (GJ/ton) Sawdust & bark mix: 15.97 (GJ/ton)	The Technical Superintendence carries out measurements at reputed local laboratories and according to relevant international standards. Alternatively, the Superintendence can evaluate the possibility of carrying out these measurements on site, in the pulp mill laboratory. Measurements of NCV are all based on dry biomass and are carried out according to proper industry standards. Monitoring frequency: This variable is monitored at least every six months, taking at least three samples for each measurement.
15. $EF_{burning,CH4,k,y}$	CH_4 emission factor for uncontrolled burning of the biomass residue type k during year y.	• Biomass residues from forest operations (sawdust and bark mix from sawmills, pulp mills, etc.): 0.0008742 (tCH_4/GJ) or 874.2 (Kg CH_4/TJ). This value includes the adjustment of a conservativeness factor of 0.94.	According to the registered PDD, the Project Proponent should use the default factor provided in page 42/63 of the baseline methodology. Though the Project Proponent originally intended to use measured values for this variable, an accurate and representative value was not available at the starting date of the project activity. As a result, the Project Proponent had to use the default emission factors provided in the baseline methodology. However, in order to accomplish a higher accuracy in the baseline emission calculations, the Project Proponent conducted a local measurement of this factor in March, 2009 in order to replace the default factors provided in the methodology for more accurate and specific emission factors. Since this clearly departs from the monitoring plan in the PDD, the Project Proponent is presenting the corresponding request for deviation for using measured values instead of the default values. It must be noted, though, that this measurement is consistent with the registered PDD, since in page 87 and under the description of this variable, the Project Proponent explicitly declared its intention to use measured values instead of monitored values in the future.
16. ε_{boiler}	Average net energy efficiency of heat	The 100% default value is used in this case.	Direct measurements are not possible for the proposed project activity.

	generation in the boiler that would generate heat in the absence of the project activity.		
17. --	Quantity of biomass residues of type k that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region.	See table in the leakage section of this Monitoring Report.	Arauco Generación S.A. is responsible for carrying out the necessary research and studies. This variable is monitored annually.
18. --	Quantity of available biomass residues of type k in the region.	See table in the leakage section of this Monitoring Report.	Arauco Generación S.A. is responsible for carrying out the necessary research and studies. This variable is monitored annually.
19. $EC_{PJ,y}$	On-site electricity consumption attributable to the project activity during the year y.	0 (MWh/yr).	Electric meters. The electricity quantity is crosschecked with electricity purchase receipts whenever possible. The Superintendence of Liquor is responsible for monitoring this variable. This variable is monitored continuously and aggregated at least annually.
20. $EF_{grid,y}$	CO_2 emission factor for grid electricity during the year y.	0.6367 (tCO_2/MWh).	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). All the information required for the calculation of this emission factor is provided in the Annex of this Monitoring Report. Arauco Generación 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. This variable is monitored and updated annually, according to the guidance of the ACM0002.
21. EG_y	Electricity supplied to the grid by the	198.2 (GWh).	According to the registered PDD, this variable is determined according to a modified version of equation Nº 14 of the ACM0006 (Version 05). This modification

	project during the year y.		was part of the request for deviation presented with the Valdivia project activity and was approved by the Executive Board. However, in this case the Project Proponent introduced a new modification to equation N° 14 in the calculation of this variable, and is presenting the corresponding request for deviation to the Executive Board.
22. $EF_{OM,y}$	CO_2 Operating Margin emission factor of the grid.	0.8370 (tCO_2/MWh).	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. All the information required for the calculation of this emission factor is provided in the Annex of this Monitoring Report. This variable is monitored annually.
23. $EF_{BM,y}$	CO_2 Build Margin emission factor of the grid.	0.4364 (tCO_2/MWh).	This variable is calculated according to equation N° 9 of the ACM0002 (Version 06). All the information required for the calculation of this emission factor is provided in the Annex of this Monitoring Report. This variable is monitored annually.
24. $F_{i,y}$	Amount of each fossil fuel consumed by each power source / plant.	See tables in the Annex, at the end of this Monitoring Report.	This variable is monitored annually.
25. $COEF_i$	Emission factor coefficient of each fossil fuel type consumed by each power plant / source in the relevant grid.	The data that is used to calculate these coefficients are provided in the Annex, at the end of this Monitoring Report.	This variable is monitored annually.
26. $GEN_{j/k/n,y}$	Electricity generation of each power source / plant j, k or n.	The data that is used to calculate these coefficients are provided in the Annex, at the end of this Monitoring Report.	This variable is monitored annually.
27. --	Identification	Please see the tables for the OM	This variable is monitored annually.

	of power source / plant for the OM.	calculation provided in the Annex, at the end of this Monitoring Report.	
28. --	Identification of power source / plant for the BM.	Please see the tables for the BM calculation provided in the Annex, at the end of this Monitoring Report.	This variable is monitored annually.
29. λ_y	Fraction of time during which low-cost / must-run sources are on the margin.	0.0002283105	This variable is calculated annually, following the indications of the ACM0002.
30. $GEN_{j/k/ll,y}$ IMPORTS	Electricity imports to the project electricity system.	0 (KWh).	This variable is monitored annually.
31. $COEF_{j/k/ll,y}$ IMPORTS	CO_2 emission coefficient of fuels used in connected electricity systems (if imports occur).	Since there are no imports in the SIC, this variable is currently not used in the emission reduction calculation.	This variable is monitored annually.
32. $EF_{CO2,LE}$	CO_2 emission factor of the most carbon intensive fuel used in the country.	Since leakage was 0 during the monitored period, this parameter was not considered in the corresponding emission reduction calculation.	In case of leakage, this variable is monitored annually.

Relevant fixed parameters

ID number.	Data variable.	Additional comments
$\varepsilon_{el,\ other\ plant(s)}$	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.	The reference pulp mill's electric efficiency of 12.09% was established taking into account the following considerations: • The chosen baseline scenario for the Valdivia biomass power plant project activity that states that the reference pulp mill would be self-sufficient in electric and thermal power generation. Therefore, the baseline efficiency of 12.09% was calculated from the baseline pulp mill design energy / mass balances. The baseline scenario applied to the Valdivia CDM project (self-sufficiency in heat and electric power generation) is consistent with the current BAT (Best Available Technology) for non-integrated bleached pulp mills, like the Valdivia pulp mill[7]. • The electric efficiencies of other (modern and recently built) pulp mills in the country. The electric efficiencies of these pulp mills were in the range of 8.0% to 10.5%, therefore the selection of an efficiency of 12.09% (20% higher than the higher end of the range) ensures a conservative baseline. According to the above, the chosen efficiency of 12.09% was deemed conservative and appropriate.
Additional electric power consumption of the project mill	Constant 4.22% of the total energy consumed by the pulp mill in the project scenario.	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). This variable is used to determine the net quantity of electricity generated in the project plant during the year y ($EG_{project\ plant,y}$).
Fuel oil consumption per unit of combusted biomass in the Valdivia mill power boiler	3.43 (kg of fuel oil/m^3st)	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. 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.

[7] 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).

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 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 in 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 in operations of harvesting, pruning and thinning in managed forestlands. Currently this biomass has very little use.

Arauco performed a biomass availability study for 2009, using official bulletins from INFOR[8] as well as other (whenever available) official sources to calculate the biomass supply and demand in the Valdivia power plant influence area[9]. This study is part of the monitoring plan of the Valdivia project activity and was carried out according approach L2 of the baseline methodology. A detailed Excel spreadsheet 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 the Valdivia power plant influence area
(Situation for year 2009)

Biomass residues generation

Biomass from industrial operations	(m^3st/yr)	4,379,824
Biomass from forestry operations	(m^3st/yr)	518,299
Total supply	**(m^3st/yr)**	**4,898,123**

Biomass residues demand

Demand from industrial operations	(m^3st/yr)	1,984,664
Demand from forestry operations (*)	(m^3st/yr)	0
Total demand	**(m^3st/yr)**	**1,984,664**

Sources: Infor official bulletins and studies.
(*) The consumption of biomass from forestry operations in 2009 was nil.

Valdivia power plant surplus index

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

Biomass supply / Biomass demand	**2.47**

[8] INFOR stands for "Instituto Nacional Forestal" or "National Forestry Institute" in English.

[9] The Valdivia project influence area is defined in page 129 of the registered PDD.

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[10].

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.

$$L_y = 0$$

Quality control and assurance

The following table provides information of the quality control and assurance mechanisms implemented for the monitored data in the verified period.

ID number.	Data variable.	Quality control and assurance of the monitored data
1. $BF_{k,y}$ (and $BF_{T,k,y}$ see comment)	Quantity of biomass residue type k combusted in the project plant during the year y.	Both biomass types (black liquor and the biomass from forest operations) and quantities were measured by dedicated meters. All meters (weight meters, weighbridges, etc.) are duly calibrated and maintained according to the manufacturer's specifications and/or according to proper industry standards. Maintenances and calibrations were planned according a specific schedule, which is part of the quality system implemented in the pulp mill. Biomass from forest operations (mix of sawdust and bark) was verified against purchases and stock variations. Black liquor consumption was verified with total pulp production in the pulp mill. Biomass consumption (both types) in the power plant was also verified by an annual energy balance of the power plant.
2. Moisture content of biomass residues.	Moisture content of each biomass residue type k.	Moisture content measurements were continuously carried out for both biomass types. In case of biomass from forest operations, measurements were carried out several times each month. In case of black liquor, the solid content of biomass was continuously measured by on-line meters. These measurements were

[10] Including some prospective CDM biomass projects.

		verified with some laboratory analysis as well. All instruments received periodic maintenance and calibration according to the manufacturer and/or proper industry standards.
3. $EF_{CH4,BF}$	CH_4 emission factor for the combustion of biomass residues in the project plant.	In this case, the Project Proponent is using the default factors provided by the ACM0006 (Version 05). The Project Proponent compared this emission factor with other CH_4 emission factor measurements in other boilers of similar technology (fluidized bed boilers) and found that the actual CH_4 concentration in the boiler flue gases was below of that of clean air. In other words the combustion of this type of biomass in a fluidized bed boiler is so efficient that the combustion process in the boiler actually reduces the CH_4 from the clean air (negative project emissions). According to this, the use of a positive CH_4 emission factor in this case ensures the conservativeness in the calculation of the corresponding project emission.
4. AVD_y	Average round trip distance (from and to) between biomass fuel supply sites and the project site.	Biomass residues from forest operations are mostly brought from known suppliers which have known locations (e.g. road distances to the plant are also known). The Project Proponent verifies the accuracy of distance records using roadmaps.
5. N_y	Nº of trips per month.	The Project Proponent verified the consistency of this variable with the quantity of biomass combusted (e.g. by the relation with previous years).
6. TL_y	Average truckload of the trucks used for the transportation of biomass from forest operations to the pulp mill.	Truckloads of each biomass supplier is known in advance and duly registered by the Procurement department. In addition to this, trucks are weighed at the entrance of the pulp mill. The weighbridges at the pulp mill receive periodic maintenance and calibration according to proper industry standards. It must be noted that in some cases proper maintenance and calibration of weighbridges is also a requirement of the local national authority.
7. $EF_{km,CO2,y}$	Average CO_2 emission factor for the trucks during year y.	The Project Proponent verified the truck performance with data from fuel invoices from trucking companies whenever the information was available and the comparison was possible. In addition, the Project Proponent, cross-checked the monitored data with emission factors referred to in the literature.
8. $EF_{CO2,FF,i}$	CO_2 emission factor for fossil fuel type i.	The Project Proponent used the most updated IPCC default factors to calculate the fossil fuel coefficients.
9. $FF_{project\ plant,i,y}$	Quantity of fossil fuel type i combusted in the biomass residue fired power plant	The Project Proponent performed consistency checks through fossil fuel consumption calculation (purchases plus stock differences) and / or energy balance calculations.

	during the year y.	
10. $FF_{project\ site,i,y}$	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.	The Project Proponent carried out consistency checks based on monthly or annual operational indices (e.g. check whether front loader fossil fuel consumption divided by the operation hours results in a reasonable index, comparable to the ones observed in previous years).
11. $EG_{project\ plant,y}$	Net quantity of electricity generated in the project plant during the year y.	All electricity meters received maintenance and calibration according proper industry standards. The consistency of metered net electricity generation was crosschecked with receipts from electricity sales (whenever available) and historic operational indices of the mill. In addition, the Project Proponent also verified that the total electric power generated was consistent with the energy balance of the biomass power plant.
12. $Q_{project\ plant,y}$	Net quantity of heat generated from firing biomass in the project mill.	All relevant heat meters received maintenance and calibration according to proper industry standards. In addition, the Project Proponent checked the consistency of metered heat flows with a monthly / annual energy balance of the project power plant and with historical operational indices of the mill.
13. NCV_i	Net calorific value of the fossil fuel type i.	The Project Proponent checked the consistency of measurements with similar data of other CDM biomass projects in Chile, with local / national data and with default values by the IPCC. The used values were found to be correct.
14. NCV_k	Net calorific value of biomass residue type k.	The Project Proponent checked the consistency of the measured values with measurements of previous years, similar measurements in other biomass CDM projects, values in the literature and default values by the IPCC. In this case, the measured values were consistent with all the references pointed out above. All NCV were determined on dry biomass.
15. $EF_{burning,CH4,k,y}$	CH_4 emission factor for uncontrolled burning of the biomass residue type k during year y.	As previously mentioned, the Project Proponent used a measured value instead of the default factor provided by the ACM0006 (Version 05). The Project Proponent made sure to carry out the measurements under conditions that led to very conservative and representative CH_4 emission factors. The results were fully consistent with past measurements carried out by the Project Proponent and also with emission factors found in the literature. For more details, please see the measurement report issued by the USDA Forest Service, who was the entity that carried out the measurements.

16. ε_{boiler}	Average net energy efficiency of heat generation in the boiler that would generate heat in the absence of the project activity.	Not applicable in this case.
17. --	Quantity of biomass residues of type k that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region.	The relevant biomass quantities were obtained from multiple official sources and the values were crosschecked, whenever possible.
18. --	Quantity of available biomass residues of type k in the region.	The relevant biomass quantities were obtained from multiple official sources and the values were crosschecked, whenever possible.
19. $EC_{PJ,y}$	On-site electricity consumption attributable to the project activity during the year y.	There was no on-site electricity consumption attributable to the project activity during the monitored period.
20. $EF_{grid,y}$	CO_2 emission factor for grid electricity during the year y.	The Project Proponent applied the procedures in ACM0002. All the information for calculating the grid emission factor came from official sources: CDEC SIC dispatch data and power generators company information.
21. EG_y	Electricity supplied to the grid by the project during the year y.	The Project Proponent verified the accuracy of the electricity supplied by the project activity to the grid with the corresponding receipts of sales. In addition, this value was also checked against the monthly global electricity balance carried out by the CDEC-SIC dispatch Center.
22. $EF_{OM,y}$	CO_2 Operating Margin emission factor of the grid.	The Project Proponent applied the procedures in ACM0002. All the information for calculating the OM grid emission factor came from official sources: CDEC SIC dispatch data and power generators company information. The data and results were found consistent with other official statistics and studies (e.g. IEA studies).
23. $EF_{BM,y}$	CO_2 Build Margin emission factor of the grid.	The Project Proponent applied the procedures in ACM0002. All the information for calculating the BM grid emission factor came from official sources: CDEC SIC dispatch data and power generators company information. The data and results were found consistent with other official statistics and studies (e.g. IEA studies).
24. $F_{i,y}$	Amount of each fossil fuel consumed by each power source / plant.	All the information came from official sources: CDEC SIC dispatch data and power generators company information. The data and results were found consistent with other official statistics and studies (e.g. IEA studies).
25. $COEF_i$	Emission factor coefficient	The Project Proponent used information from official

	of each fossil fuel type consumed by each power plant / source in the relevant grid.	sources: CNE (National Energy Commission), CDEC SIC dispatch data and power generators company information. The data and results were found consistent with other official statistics and studies (e.g. IEA studies, national GHG inventories, etc.).
26. $GEN_{j/k/n,y}$	Electricity generation of each power source / plant j, k or n.	The Project Proponent used official data from the CDEC-SIC dispatch center. The data was found to be consistent with official studies (e.g. IEA, etc.).
27. --	Identification of power source / plant for the OM.	The Project Proponent used official data from the CDEC-SIC dispatch center. The data was found to be consistent with official studies (e.g. IEA, etc.).
28. --	Identification of power source / plant for the BM.	The Project Proponent used official data from the CDEC-SIC dispatch center. In some cases that information was complemented with specific power company information. The data was found to be consistent with official studies (e.g. IEA, etc.).
29. λ_y	Fraction of time during which low-cost / must-run sources are on the margin.	The Project Proponent followed the calculation procedures of the ACM0002.
30. $GEN_{j/k/ll,y}$ IMPORTS	Electricity imports to the project electricity system.	To date, the SIC system is not interconnected with any other transmission system, either of Chile or of any other country.
31. $COEF_{j/k/ll,y}$ IMPORTS	CO_2 emission coefficient of fuels used in connected electricity systems (if imports occur).	To date, the SIC system is not interconnected with any other transmission system, either of Chile or of any other country.
32. $EF_{CO2,LE}$	CO_2 emission factor of the most carbon intensive fuel used in the country.	The Project Proponent 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.

In addition to the above and to ensure the accuracy and reliability of the monitored data, the project proponent developed a dedicated information system. This system is part of the Valdivia biomass power plant ISO-14,001 / OHSAS 18,001 systems.

3. Emission reductions

3.1 Calculation formulas

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

Project Activity Net Emission savings = Baseline Emissions – Project Activity Emissions – 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 (tCO_2/yr).
$BL_{E2,y}$: Baseline emissions from avoided biomass disposal (tCO_2eq/yr).

$P_{E1,y}$: Project emissions from biomass controlled burning in the Power Plant (tCO_2eq/yr).
$P_{E2,y}$: Project emissions from biomass transportation to the biomass Power Plant (tCO_2/yr).
$P_{E3,y}$: Project emissions from biomass transportation within the Power Plant site (tCO_2/yr).
$P_{E4,y}$: Project emissions from fossil fuel consumption in the Power Plant (tCO_2/yr).

L_y : Are the leakage emissions (tCO_2/yr).

3.2 Emission reduction calculation

Please note the following:

1. The baseline and project emissions calculations below may present some minor imprecision due to some decimal rounding.

2. Since the emission reduction calculation for the project activity was done monthly, the calculation below (carried out for the entire monitored period) had to consider weighted averages for some variables.

Baseline emissions

1. Baseline emissions due to electricity displacement

In this case, the Project Proponent is supposed to use a modified version of equation N° 14 of the ACM0006 (Version 05) 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 baseline scenarios N° 3 and N° 4 to this project activity, which was approved by the Executive Board in December 13th, 2007.

In this case, however, the Project Proponent is presenting a new request for deviation in the use of equation N° 14, which leads to a more accurate calculation of the net electricity displaced by the project activity.

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

Data:

(1) Gross electricity generated by the project plant	490.9 (GWh/yr)
(2) Total internal electricity consumption	300.6 (GWh/yr)
(3) Additional power consumption percentage due to the project activity	4.22 (%)
(4) Average net energy efficiency of electricity generation in the baseline plant	12.09%
(5) Quantity of black liquor combusted in the project plant (dry basis)	771,995 (tDS/yr)
(6) Quantity of biomass from forest ops. combusted in the baseline plant (dry basis)	57,720 (BDt/yr)
(7) Net calorific value of black liquor (dry basis) (See note)	9.56 (TJ/000ton)
(8) Net calorific value of biomass from forest operations (dry basis) (See note)	16.85 (TJ/000ton)

Note: Net calorific values of biomass must be monitored twice a year. For simplicity, an average was used here.

Calculations:

(9) Net electricity generated by the project plant	(1)-(2)*(3)	478.2 (GWh/yr)

(10) Electric power generated in the baseline mill	(3)*((5)*(7)+(6)*(8))*(1/3,600)	280.0 (GWh/yr)
(11) Net quantity of increased electricity due to p.a.	**(9)-(10)**	**198.2 (GWh/yr)**

Using the values of the net quantity of increased electricity generation and the CO_2 emission factor of the grid, it is possible to calculate the emission reductions due to displacement of electricity for the year 2009 using equation N° 9 of the ACM0006 (Version 05):

Data:

(1) Combined margin for the SIC grid in 2009	636.7 (tCO_2/GWh)
(2) Electricity displaced by the project activity	198.2 (GWh/yr)

Calculations:

(3) Total grid emission savings	**(1)*(2)**	**126,180 (tCO_2/yr)**

2. Baseline emissions due to 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.

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.

Data:

(1) Total high-pressure steam generated by the recovery boiler	2,718,881 (ton)
(2) Total high-pressure steam generated by the power boiler	530,843 (ton)
(3) Total biomass residues from forest operations combusted in the power boiler.	101,040 (BDt)
(4) Net calorific value of biomass from forest operations (dry basis) (See note).	16.85 (GJ/ton)
(5) Quantity of process heat generated in the cogeneration project plant.	5,914,243 (GJ)
(6) Energy efficiency of the boiler used in the absence of the project activity.	100%

Note: Net calorific values of biomass must be monitored twice a year. For simplicity, an average was used here.

Calculations:

(7) Process heat attributable to the power boiler	[(2)/(1)+(2)]*(5)	964,506 (GJ)
(8) Biomass from forest operations used to generate heat	(7)/((4)*(6))	57,720 (BDt/yr)
(9) Incremental biomass use	**(3)-(8)**	**43,320 (BDt/yr)**

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):

Data:

(1) Additional biomass from forest operations due to the project activity	43,320 (BDt)
(2) Adjusted CH_4 emission factor for uncontrolled burning of biomass (See note)	309 (tCO_2/000ton)

Note: The Project Proponent used an adjustment factor of 0.94 for the measured CH_4 emission factor. The adjustment factor was chosen following the indication of Table N° 6 of the ACM0006 (Version 05). Since the emission factor must consider the NCV of the biomass which is measured twice a year, an average CH_4 emission factor was chosen here for simplicity.

Calculations:

(6) Emissions	**(1)*(2)*(ton/1000 kg)**	**13,372 (tCO_2eq)**

Total baseline emissions

Emission sources	**(tCO_2eq)**
Carbon dioxide emissions due to electricity displacement	126,180
Methane emissions due to uncontrolled biomass burning avoidance	13,372
Total	**139,553**

Project emissions

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).

Data:

(1) Biomass attributable to the project and brought from 3rd parties (dry)	21,767 (BDt)
(2) Biomass average humidity (wet basis)	62.15%
(3) Approximate load for 1 trip	25.7 (ton/truck)
(4) Average round trip between the biomass supply sites and the plant	114.8 (km)
(5) Emission factor for heavy truck transportation (See note)	1.269 (kgCO_2/km)

Note: This parameter was calculated using the Diesel CO_2 emission factor and the monitored performance index of the trucks (2.1 Km/lt), provided by the transportation subcontractors.

Calculations:

(6) Biomass transported (wet)	(1)/[1 – (2)]	57,519 (wet ton)
(7) Number of trips needed for the Plant per year	(6) / (3)	2,241 (trips)
(8) Total distance traveled, considering round trip	(4)*(7)	257,322 (km)
(9) Total emissions	**(5)*(8)*(1ton/1,000kg)**	**324 (tCO_2)**

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

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

Data:

(1) Fuel oil consumption due to power generation reasons	405.9 (ton)
(2) Fuel oil net calorific value (average)	40.98 (GJ/ton)
(3) CO_2 emission factor	0.07737 (tCO_2/GJ)

Calculations:

(4) Total emissions	**(1)*(2)*(3)**	**1,287 (tCO_2)**

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:

(5) Fuel oil used due to operational reasons	896.6 (ton)
(6) Fuel oil consumption due to power generation reasons	90.0 (ton)
(7) Fuel oil net calorific value (average)	40.98 (GJ/ton)
(8) CO_2 emission factor	0.07737 (tCO_2/GJ)

Calculations:

(9) Total emissions	**[(5)+(6)]*(7)*(8)**	**3,123 (tCO_2)**

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 operation (mix of sawdust and bark) that is attributed to the project activity (e.g. generation of additional power).

Data:

(10) Diesel used in the transportation of the biomass residues	32.4 (ton)
(11) Diesel net calorific value (average)	43.0 (GJ/ton)
(12) CO_2 emission factor	0.07407 (tCO_2/GJ)

Calculations:

(13) Total emissions	**(10)*(11)*(12)**	**103 (tCO_2)**

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

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:

Carbon dioxide emissions from on-site consumption of fossil fuels	(tCO_2)
Fossil fuel consumption in the recovery boiler	1,287
Fossil fuel consumption in the power boiler	3,123
Fossil fuel consumption due to on-site biomass from forest operations transportation	103
Fossil fuel consumption due to on-site mechanical preparation of biomass	0
Total emissions	**4,514**

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.

4. Methane emissions from combustion of biomass residues

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

(1) Biomass related to the project activity burned in the power boiler	43,320 (BDt)
(2) Net calorific value of biomass from forest operations (dry basis) (See note).	16.85 (GJ/ton)
(3) Biomass methane emission factor under controlled burning conditions	30.0 ($KgCH_4/TJ$)
(4) Conservativeness factor	1.02
(5) Global Warming Potential of CH_4	21

Note: Net calorific values of biomass must be monitored twice a year. For simplicity, an average was used here.

Calculations:

(6) Total emissions	**(1)*(2)*(1TJ/1,000GJ)*(3)*(4)*(5)*(1 ton/1,000kg)**	**468 (tCO_2eq)**

Total project emissions

Emission sources	**(tCO_2eq)**
Carbon dioxide emissions from biomass residues transportation to the power plant	324
Carbon dioxide emissions from on-site consumption of fossil fuels	4,514
Carbon dioxide emissions from electricity consumption	0
Methane emissions from combustion of biomass residues	468
Total	**5,306**

Net emission reductions for the monitored period

		2009

Baseline emissions	(tCO_2eq)	139,553
Project emissions	(tCO_2eq)	5,306
Leakage	(tCO_2eq)	0
Net emission reductions	**(tCO_2eq)**	**134,247**

<u>Summary of the monthly emission reductions for the monitored period</u>

For the calculation of the net emission reductions of the Valdivia biomass power plant project activity, an Excel spreadsheet with the monitored data and the monthly 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 Valdivia project activity:

<u>Net emission savings per month</u>

		Baseline emissions		Project activity emissions					
	Net emission savings	Grid emissions	Methane emissions	Methane in P.B.	Fossil fuel in P.B.	Fossil fuel in R.B.	Transport onsite	Transport to P. Plant	Leakage
(Months)	(tCO_2eq/yr)	(tCO_2/yr)	(tCO_2eq/yr)	(tCO_2eq/yr)	(tCO_2/yr)	(tCO_2/yr)	(tCO_2/yr)	(tCO_2/yr)	(tCO_2/yr)
Year 2009									
January									
February									
March									
April	**9,076**	9,481	1,190	42	417	1,086	11	40	0
May	**19,687**	18,414	2,078	73	478	166	12	77	0
June	**13,484**	12,355	1,479	52	256	0	11	31	0
July	**18,103**	17,028	1,488	52	308	0	11	42	0
August	**14,271**	13,149	1,588	56	381	0	12	17	0
September	**16,172**	15,537	978	34	273	21	9	6	0
October	**15,562**	14,915	913	32	221	0	8	5	0
November	**14,129**	12,833	1,822	64	411	14	14	24	0
December	**13,763**	12,466	1,836	64	378	0	14	82	0
Total year 2009	**134,247**	**126,180**	**13,372**	**468**	**3,123**	**1,287**	**103**	**324**	**0**
1st verif (April 2009 - Dec 2009)	134,247	126,180	13,372	468	3,123	1,287	103	324	0
Total emissions claimed	134,247	126,180	13,372	468	3,123	1,287	103	324	0

<u>Note:</u> Net emission savings = Baseline emissions - Project activity emissions - Leakage.

According to the project PDD, the estimated emission reductions for the period covered by this monitoring report should have been 66,255 CERs. The monitored emissions are 103% higher than the estimated emissions in the PDD. This difference can be explained by the following reasons:

- A higher grid emission factor for the year 2009 than the one originally estimated in the PDD. The actual grid emission factor for 2009 was 636.7 (tCO_2/GWh), while the estimated grid emission factor for 2009 in the PDD was 461.5 (tCO_2/GWh). The reason for the higher grid emission factor was the replacement of natural gas[11] used for power

[11] Argentina quit sending natural gas in 2004.

generation for more carbon-intensive fossil-fuels, such as coal and diesel. This increased the overall GHG emissions in the SIC grid.

- A higher amount of displaced electricity from the grid. The actual amount of electricity was 198.2 (GWh), while the estimated amount of electricity displaced from the grid in the PDD was 159.6 (GWh). It must be noted however that this difference is due to a methodology deviation that is proposed together with this Monitoring Report, in which the equation used to determine the electricity displaced from the grid considers the biomass in the baseline situation versus the biomass burned under the project situation. This leads to a more realistic and accurate determination of the actual electricity displaced from the grid.

- A higher amount of CH_4 emission in the baseline compared to the baseline emission estimated in the PDD. The actual monitored CH_4 emissions was 13,372 (tCO_2), while the estimated amount of CH_4 emissions estimated in the PDD was 2,878 (tCO_2). This is mainly due to the utilization of a higher measured CH_4 emission factor for uncontrolled burning of biomass (341.6 tCO_2/000ton of dry biomass) instead of the lower default emission factor provided in the methodology (41.4 tCO_2/000ton of dry biomass), which severely underestimates the CH_4 emission when the biomass fuels are burned in the open air. As in the previous case, the Project Proponent is presenting the corresponding request for deviation.

The combined effect of the reasons mentioned above resulted in higher emission reductions than the ones originally estimated in the PDD.

ANNEX

POWER GENERATION IN 2009

POWER PLANT	POWER OUTPUT (MW)	PLANT TYPE	FUEL TYPE	LOW COST / MUST RUN	TOTAL GEN 2009	UNITS SPEC. CONSUMP.	SPECIFIC CONSUMPTION
Los molles	18	Run of the river	Hydro	Yes	48.0	N.C.	0.000
Sauce Andes	1	Run of the river	Hydro	Yes	7.4	N.C.	0.000
Aconcagua	73	Run of the river	Hydro	Yes	409.7	N.C.	0.000
Los Quilos	39	Run of the river	Hydro	Yes	262.7	N.C.	0.000
Florida	28	Run of the river	Hydro	Yes	143.2	N.C.	0.000
Maitenes	29	Run of the river	Hydro	Yes	130.5	N.C.	0.000
Alfalfal	178	Run of the river	Hydro	Yes	893.8	N.C.	0.000
Queltehues	49	Run of the river	Hydro	Yes	343.0	N.C.	0.000
Puntilla	14	Run of the river	Hydro	Yes	149.0	N.C.	0.000
Volcan	63	Run of the river	Hydro	Yes	102.7	N.C.	0.000
Los Morros	4	Run of the river	Hydro	Yes	19.1	N.C.	0.000
Sauzal 50Hz	89	Run of the river	Hydro	Yes	472.4	N.C.	0.000
Sauzal 60Hz	N.A.	Run of the river	Hydro	Yes	0.0	N.C.	0.000
Sauzalito	12	Run of the river	Hydro	Yes	81.9	N.C.	0.000
Currillinque	89	Run of the river	Hydro	Yes	616.7	N.C.	0.000
San Ignacio	37	Run of the river	Hydro	Yes	201.9	N.C.	0.000
Loma Alta	40	Run of the river	Hydro	Yes	271.8	N.C.	0.000
Rucue	178	Run of the river	Hydro	Yes	1,016.9	N.C.	0.000
Pullinque	48	Run of the river	Hydro	Yes	229.0	N.C.	0.000
Pilmaiquén	39	Run of the river	Hydro	Yes	248.9	N.C.	0.000
Capullo	12	Run of the river	Hydro	Yes	64.9	N.C.	0.000
Peuchén	77	Run of the river	Hydro	Yes	269.1	N.C.	0.000
Mampil	49	Run of the river	Hydro	Yes	177.3	N.C.	0.000
Chacabuquito	25	Run of the river	Hydro	Yes	161.1	N.C.	0.000
Antuco	320	Reservoir	Hydro	Yes	1,610.9	N.C.	0.000
Abanico	136	Run of the river	Hydro	Yes	346.4	N.C.	0.000
Isla	68	Run of the river	Hydro	Yes	446.3	N.C.	0.000
Colbún+Mach.	569	Reservoir	Hydro	Yes	2,776.1	N.C.	0.000
Eyzaguirre	2	Run of the river	Hydro	Yes	8.3	N.C.	0.000
Quilleco	70	Run of the river	Hydro	Yes	414.4	N.C.	0.000
El Rincón	0	Run of the river	Hydro	Yes	2.1	N.C.	0.000
Chiburgo	20	Run of the river	Hydro	Yes	82.7	N.C.	0.000
Palmucho	32	Run of the river	Hydro	Yes	244.1	N.C.	0.000
Hornitos	55	Run of the river	Hydro	Yes	269.6	N.C.	0.000
Puclaro	5	Run of the river	Hydro	Yes	41.0	N.C.	0.000
Ojos de agua	9	Run of the river	Hydro	Yes	37.1	N.C.	0.000
Coya	35	Run of the river	Hydro	Yes	91.6	N.C.	0.000
Lircay	19	Run of the river	Hydro	Yes	122.0	N.C.	0.000
EL Manzano	5	Run of the river	Hydro	Yes	26.7	N.C.	0.000
Pehui	1	Run of the river	Hydro	Yes	3.6	N.C.	0.000
Truful Truful	N.A.	Run of the river	Hydro	Yes	0.0	N.C.	0.000
Taltal 2	245	Open cycle	Natural Gas	No	123.3	(m^3-std/KWh)	0.320
Taltal 2 Diesel	120	Open cycle	Diesel	No	83.9	(Kg/KWh)	0.275
Taltal 1	245	Open cycle	Natural Gas	No	116.6	(m^3-std/KWh)	0.320
Taltal 1 Diesel	120	Open cycle	Diesel	No	118.8	(Kg/KWh)	0.275
D. Almagro	24	Open cycle	Diesel	No	24.3	(Kg/KWh)	0.356
Guacolda 1	152	Coal / Steam	Coal / Petcoke	No	1,266.9	(Kg/KWh)	0.403
Guacolda 2	152	Coal / Steam	Coal / Petcoke	No	1,217.0	(Kg/KWh)	0.404
Guacolda 3	135	Coal / Steam	Coal	No	721.7	(Kg/KWh)	0.350
Huasco TV	16	Coal / Steam	Coal	No	0.0	(Kg/KWh)	0.937
Huasco TG	58	Open cycle	Diesel	No	0.6	(Kg/KWh)	0.362
Huasco TG IFO	58	Open cycle	IFO 180	No	22.8	(Kg/KWh)	0.362
L.Verde TG	17	Open cycle	Diesel	No	18.9	(Kg/KWh)	0.253
Los Vientos TG	121	Open cycle	Diesel	No	154.7	(Kg/KWh)	0.265
Nehuenco	368	Combined cycle	Natural Gas	No	111.6	(m^3-std/KWh)	0.204
Nehuenco Diesel	368	Combined cycle	Diesel	No	942.3	(Kg/KWh)	0.161
Nehuenco TG 9B	108	Open cycle	Natural Gas	No	25.0	(m^3-std/KWh)	0.338
Nehuenco TG 9B Diese	108	Open cycle	Diesel	No	17.2	(Kg/KWh)	0.288
Nehuenco II	390	Combined cycle	Natural Gas	No	12.8	(m^3-std/KWh)	0.198
Nehuenco II Diesel	376	Combined cycle	Diesel	No	1,525.8	(Kg/KWh)	0.166
San Isidro	379	Combined cycle	Natural Gas	No	398.6	(m^3-std/KWh)	0.290
San Isidro Diesel	379	Combined cycle	Diesel	No	585.5	(Kg/KWh)	0.169
San Isidro GNL	350	Combined cycle	Natural Gas	No	694.3	(m^3-std/KWh)	0.290
San Isidro II	370	Combined cycle	Natural Gas	No	116.0	(m^3-std/KWh)	0.203
San Isidro II Diesel	370	Combined cycle	Diesel	No	1,415.1	(Kg/KWh)	0.195
San Isidro II GNL	370	Combined cycle	Natural Gas	No	271.2	(m^3-std/KWh)	0.203
Ventanas 1	120	Coal / Steam	Coal	No	883.6	(Kg/KWh)	0.386
Ventanas 2	220	Coal / Steam	Coal	No	1,670.9	(Kg/KWh)	0.372
Nueva Ventanas	240	Coal / Steam	Coal	No	122.6	(Kg/KWh)	0.375
L.Verde	49	Coal / Steam	Coal	No	20.2	(Kg/KWh)	0.714
Nueva Renca	379	Combined cycle	Natural Gas	No	18.6	(m^3-std/KWh)	0.211
Nueva Renca Diesel	379	Combined cycle	Diesel	No	1,257.4	(Kg/KWh)	0.176
Renca	97	Diesel / Steam	Diesel	No	0.3	(Kg/KWh)	0.363
Constitución	9	Biomass / Steam	Biomass	Yes	56.2	N.C.	0.000
Constitución A.	20	Biomass / Steam	Biomass	Yes	49.3	N.C.	0.000
Petropower	75	Petcoke / Steam	Petcoke	Yes	483.0	(Kg/KWh)	0.373
Laja	9	Biomass / Steam	Biomass	Yes	46.3	N.C.	0.000
Bocamina	128	Coal / Steam	Coal	No	919.1	(Kg/KWh)	0.401
Arauco	33	Biomass / Steam	Biomass	Yes	11.0	N.C.	0.000
San Fco. Mostazal	26	Open cycle	Diesel	No	2.2	(Kg/KWh)	0.322
Cholguán	13	Biomass / Steam	Biomass	Yes	76.4	N.C.	0.000
Licantén	6	Biomass / Steam	Biomass	Yes	20.3	N.C.	0.000
Valdivia	61	Biomass / Steam	Biomass	Yes	258.7	N.C.	0.000
Antilhue TG	50	Open cycle	Diesel	No	112.7	(Kg/KWh)	0.589
Horcones TG	24	Open cycle	Natural Gas	No	0.0	(m^3-std/KWh)	0.379
Horcones Diesel	24	Open cycle	Diesel	No	1.5	(Kg/KWh)	0.340
TG_Coronel	46	Open cycle	Natural Gas	No	3.0	(m^3-std/KWh)	0.259
TG_Coronel Diesel	46	Open cycle	Diesel	No	23.5	(Kg/KWh)	0.225
Nueva Aldea	13	Biomass / Steam	Biomass	Yes	103.1	N.C.	0.000
Nueva Aldea 2	10	Open cycle	Diesel	No	0.0	(Kg/KWh)	0.290
Nueva Aldea 3	20	Biomass / Steam	Biomass	Yes	266.7	N.C.	0.000
Candelaria 1	125	Open cycle	Natural Gas	No	21.1	(m^3-std/KWh)	0.329
Candelaria 1 Diesel	125	Open cycle	Diesel	No	68.4	(Kg/KWh)	0.277
Candelaria 2	129	Open cycle	Natural Gas	No	7.3	(m^3-std/KWh)	0.329
Candelaria 2 Diesel	129	Open cycle	Diesel	No	28.9	(Kg/KWh)	0.277
Lebu	2	Diesel engines	Diesel	No	1.8	(Kg/KWh)	0.242
Cañete	3	Diesel engines	Diesel	No	2.8	(Kg/KWh)	0.242
Los Sauces	2	Diesel engines	Diesel	No	4.0	(Kg/KWh)	0.242
Traiguen	N.A.	Diesel engines	Diesel	No	4.0	(Kg/KWh)	0.242
Curacautin	3	Diesel engines	Diesel	No	2.8	(Kg/KWh)	0.220
Ancud	3	Diesel engines	Diesel	No	0.6	(Kg/KWh)	0.242
Collipulli	3	Diesel engines	Diesel	No	2.2	(Kg/KWh)	0.242
Quellon	9	Diesel engines	Diesel	No	1.4	(Kg/KWh)	0.242
Campanario Gas 1	56	Open cycle	Natural Gas	No	0.0	(m^3-std/KWh)	0.319
Campanario Gas 2	56	Open cycle	Natural Gas	No	0.0	(m^3-std/KWh)	0.319
Campanario Gas 3	56	Open cycle	Natural Gas	No	0.0	(m^3-std/KWh)	0.319
Campanario Diesel 1	56	Open cycle	Diesel	No	4.9	(Kg/KWh)	0.261
Campanario Diesel 2	56	Open cycle	Diesel	No	32.6	(Kg/KWh)	0.247
Campanario Diesel 3	56	Open cycle	Diesel	No	66.7	(Kg/KWh)	0.245
Casablanca 1	1	Diesel engines	Diesel	No	1.0	(Kg/KWh)	0.231
Casablanca 2	0	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.278
Las Vegas	2	Diesel engines	Diesel	No	1.5	(Kg/KWh)	0.275
Curauma	2	Diesel engines	Diesel	No	1.6	(Kg/KWh)	0.274
Concon	2	Diesel engines	Diesel	No	1.9	(Kg/KWh)	0.229
FPC + FPC 2	12	Biomass / Steam	Biomass	Yes	77.7	N.C.	0.000
Constitución 1	9	Diesel engines	Diesel	No	0.8	(Kg/KWh)	0.298
Maule	6	Diesel engines	Diesel	No	0.3	(Kg/KWh)	0.282
Monte Patria	9	Diesel engines	Diesel	No	6.4	(Kg/KWh)	0.282
Punitaqui	9	Diesel engines	Diesel	No	7.8	(Kg/KWh)	0.282
Esperanza 1	2	Diesel engines	Diesel	No	1.5	(Kg/KWh)	0.341
Esperanza 2	2	Diesel engines	Diesel	No	0.9	(Kg/KWh)	0.218
Esperanza TG	18	Open cycle	Diesel	No	0.0	(Kg/KWh)	0.226
Degan	34	Diesel engines	Diesel	No	42.4	(Kg/KWh)	0.214
Olivos	2	Open cycle	Diesel	No	51.9	(Kg/KWh)	0.228
Totoral	3	Open cycle	Diesel	No	2.4	(Kg/KWh)	0.228
Quintay	3	Open cycle	Diesel	No	3.0	(Kg/KWh)	0.228
Placilla	3	Open cycle	Diesel	No	2.9	(Kg/KWh)	0.228
Chiloé	9	Diesel engines	Diesel	No	0.7	(Kg/KWh)	0.269
Quellon II	10	Diesel engines	Diesel	No	15.5	(Kg/KWh)	0.222
Colmito	55	Open cycle	Diesel	No	5.2	(Kg/KWh)	0.298
Los pinos	92	Open cycle	Diesel	No	108.4	(Kg/KWh)	0.191
Chuyaca	3	Diesel engines	Diesel	No	2.4	(Kg/KWh)	0.185
Chuyaca 2	18	Diesel engines	Diesel	No	0.1	(Kg/KWh)	0.210
Skretting	3	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.220
Cenizas	17	Diesel engines	Diesel	No	46.9	(Kg/KWh)	0.230
Santa Lidia	136	Open cycle	Diesel	No	9.6	(Kg/KWh)	0.259
Trapén	90	Diesel engines	Diesel	No	47.8	(Kg/KWh)	0.217
Los Espinos	96	Diesel engines	Diesel	No	28.7	(Kg/KWh)	0.221
San Gregorio + Linares	1	Diesel engines	Diesel	No	0.2	(Kg/KWh)	0.210
Biomar	2	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.222
Eagon	2	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.221
Salmofood I	2	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.230
Salmofood II	2	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.220
Teno	50	Diesel engines	Diesel	No	2.1	(Kg/KWh)	0.217
Newen Diesel	15	Open cycle	Diesel	No	0.0	(Kg/KWh)	0.290
Newen Butano	15	Open cycle	Butane Gas	No	2.7	(m^3-std/KWh)	0.455
Newen Propano	15	Open cycle	Propane Gas	No	0.8	(m^3-std/KWh)	0.436
Newen Gas Natural	15	Open cycle	Natural Gas	No	0.9	(m^3-std/KWh)	0.330
Newen Mezcla Butano/	15	Open cycle	Butane/Propane	No	0.0	(m^3-std/KWh)	0.445
Watts	3	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.221
Multiexport I	2	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.221
Multiexport II	2	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.221
Tierra Amarilla	142	Diesel engines	Diesel	No	23.7	(Kg/KWh)	0.239
Quintero	240	Open cycle	Natural Gas	No	7.1	(m^3-std/KWh)	0.340
Quintero GNL	N.A.	Open cycle	Natural Gas	No	15.2	(m^3-std/KWh)	0.340
Louisiana Pacific	3	Diesel engines	Diesel	No	0.0	(Kg/KWh)	0.221
El Peñón	80	Diesel engines	Diesel	No	11.4	(Kg/KWh)	0.217
San Lorenzo de D. De A	60	Diesel engines	Diesel	No	0.6	(Kg/KWh)	0.337
Tapihue	N.A.	Diesel engines	Natural Gas	No	0.8	(m^3-std/KWh)	0.283
Termopacífico	96	Diesel engines	Diesel	No	5.3	(Kg/KWh)	0.225
El Toro	450	Reservoir	Hydro	Yes	1,516.2	N.C.	0.000
Rapel	378	Reservoir	Hydro	Yes	732.4	N.C.	0.000
Canutillar	172	Reservoir	Hydro	Yes	911.4	N.C.	0.000
Cipreses	106	Reservoir	Hydro	Yes	498.7	N.C.	0.000
Pehuenche	566	Reservoir	Hydro	Yes	2,729.9	N.C.	0.000
Pangue	467	Reservoir	Hydro	Yes	2,139.4	N.C.	0.000
Ralco	690	Reservoir	Hydro	Yes	3,128.4	N.C.	0.000
Canela	18	Wind	Wind	Yes	37.4	N.C.	0.000
Canela 2	60	Wind	Wind	Yes	19.4	N.C.	0.000
Lebu (Cristoro)	3	Wind	Wind	Yes	3.2	N.C.	0.000
Totoral (eólica)	46	Wind	Wind	Yes	4.0	N.C.	0.000
Monte Redondo	74	Wind	Wind	Yes	6.1	N.C.	0.000
Total					**41,752**		

OPERATING MARGIN CALCULATION, 2009

		2009
Total emissions from non-low cost / must run power plants	(tCO_2/yr)	13,171,928
Total emissions from low-cost / must-run power plants	(tCO_2/yr)	514,544
Total energy generated in the SIC	(GWh/yr)	41,752
Total energy by non-Low cost / must run power plants	(GWh/yr)	15,733
Total energy by low cost / must run power plants	(GWh/yr)	26,019
Factor λ	(number)	0.0002283105
Operating Margin	**(tCO_2/GWh)**	**837.04**

Note: Low cost / must run units present very low GHG emissions, since they are basically hydro plants and very few biomass plants.

BUILD MARGIN CALCULATION, 2009

	POWER OUTPUT (MW)	PLANT TYPE	FUEL TYPE	START OPERATION	CDM PROYECT	TOTAL GEN IN 2009 (GWh)	(tCO_2/GWh)
Totoral (eólica)	46.00	Wind	Wind	2009	No	4.01	0.00
Monte Redondo	74.00	Wind	Wind	2009	No	6.07	0.00
Quintero GNL	N.A.	Open cycle	Natural Gas	2009	No	15.19	745.46
Canela 2	60.00	Wind	Wind	2009	No	19.40	0.00
Quintero	240.00	Open cycle	Natural Gas	2009	No	7.10	745.46
Tapihue	N.A.	Diesel engines	Natural Gas	2009	No	0.78	620.47
Termopacífico	96.00	Diesel engines	Diesel	2009	No	5.26	760.02
Nueva Ventanas	240.00	Coal / Steam	Coal	2009	No	122.65	1055.10
Truful Truful	N.A.	Run of the river	Hydro	2009	No	0.00	0.00
San Lorenzo de D. De Almagro	60.00	Diesel engines	Diesel	2009	No	0.63	1138.34
San Isidro GNL	350.00	Combined cycle	Natural Gas	2009	No	694.27	636.20
Louisiana Pacific	2.90	Diesel engines	Diesel	2009	No	0.00	747.18
El Peñón	80.00	Diesel engines	Diesel	2009	No	11.43	732.99
Pehui	1.00	Run of the river	Hydro	2009	No	3.63	0.00
San Gregorio + Linares Norte	0.80	Diesel engines	Diesel	2009	No	0.23	709.35
Newen Diesel	15.00	Open cycle	Diesel	2009	No	0.00	979.58
Newen Propano	15.00	Open cycle	Propane Gas	2009	No	0.75	1394.24
Newen Gas Natural	15.00	Open cycle	Natural Gas	2009	No	0.93	723.54
Newen Mezcla Butano/Propano	15.00	Open cycle	Butane/Propane	2009	No	0.00	1423.28
Watts	2.64	Diesel engines	Diesel	2009	Yes	0.00	747.18
Multiexport I	1.60	Diesel engines	Diesel	2009	No	0.00	747.18
Multiexport II	1.60	Diesel engines	Diesel	2009	No	0.00	747.18
Tierra Amarilla	142.00	Diesel engines	Diesel	2009	No	23.65	807.31
Teno	50.00	Diesel engines	Diesel	2009	No	2.08	732.99
Newen Butano	15.00	Open cycle	Butane Gas	2009	No	2.74	1452.33
Lebu (Cristoro)	2.76	Wind	Wind	2009	No	3.15	0.00
Guacolda 3	135.00	Coal / Steam	Coal	2009	No	721.70	984.76
Biomar	2.40	Diesel engines	Diesel	2009	No	0.00	749.55
Eagon	2.40	Diesel engines	Diesel	2009	No	0.00	747.52
Salmofood I	1.60	Diesel engines	Diesel	2009	No	0.00	776.91
Salmofood II	1.60	Diesel engines	Diesel	2009	No	0.02	743.13
Campanario Diesel 2	56.00	Open cycle	Diesel	2009	No	32.58	834.33
Campanario Diesel 3	56.00	Open cycle	Diesel	2009	No	66.71	827.57
Chuyaca 2	17.50	Diesel engines	Diesel	2009	No	0.08	709.35
Trapén	90.00	Diesel engines	Diesel	2009	No	47.80	732.99
Los Espinos	96.00	Diesel engines	Diesel	2009	No	28.65	746.51
EL Manzano	4.70	Run of the river	Hydro	2009	No	26.69	0.00
Santa Lidia	136.00	Open cycle	Diesel	2008	No	9.60	874.86
Chuyaca	2.50	Diesel engines	Diesel	2008	No	2.43	624.23
Cenizas	16.50	Diesel engines	Diesel	2008	No	46.94	776.91
Lircay	19.04	Run of the river	Hydro	2008	Yes	0.00	0.00
Los pinos	92.10	Open cycle	Diesel	2008	No	108.44	644.09
Quellon II	10.00	Diesel engines	Diesel	2008	No	15.48	749.88
Colmito	55.00	Open cycle	Diesel	2008	No	5.20	1006.60
Coya	34.80	Run of the river	Hydro	2008	No	91.61	0.00
Chiloé	9.00	Diesel engines	Diesel	2008	No	0.69	908.64
Ojos de agua	9.00	Run of the river	Hydro	2008	Yes	0.00	0.00
Puclaro	5.20	Run of the river	Hydro	2008	Yes	0.00	0.00
Totoral	3.00	Open cycle	Diesel	2008	No	2.40	771.77
Quintay	3.00	Open cycle	Diesel	2008	No	3.03	771.77
Placilla	3.00	Open cycle	Diesel	2008	No	2.94	771.77
Olivos	1.90	Open cycle	Diesel	2008	No	51.92	769.11
Skretting	2.70	Diesel engines	Diesel	2008	No	0.00	743.13
Palmucho	32.00	Run of the river	Hydro	2007	No	244.10	0.00
Hornitos	55.00	Run of the river	Hydro	2007	Yes	0.00	0.00
Canela	18.20	Wind	Wind	2007	Yes	0.00	0.00
Esperanza TG	17.90	Open cycle	Diesel	2007	No	0.01	763.26
Maule	5.70	Diesel engines	Diesel	2007	No	0.32	952.56
Chiburgo	19.50	Run of the river	Hydro	2007	No	82.72	0.00
Monte Patria	8.60	Diesel engines	Diesel	2007	No	6.41	951.54
Constitución 1	8.60	Diesel engines	Diesel	2007	No	0.77	1005.25
Punitaqui	8.60	Diesel engines	Diesel	2007	No	7.82	951.54
Degan	34.20	Diesel engines	Diesel	2007	No	42.42	721.38
Esperanza 1	1.70	Diesel engines	Diesel	2007	No	1.48	1151.98
Esperanza 2	1.50	Diesel engines	Diesel	2007	No	0.87	737.72
FPC + FPC 2	11.60	Biomass / Steam	Biomass	2007	No	77.66	0.00
Horcones Diesel	24.30	Open cycle	Diesel	2007	No	1.48	1147.42
Nehuenco II Diesel	376.10	Combined cycle	Diesel	2007	No	1525.76	560.81
Quilleco	70.00	Run of the river	Hydro	2007	Yes	0.00	0.00
El Rincón	0.30	Run of the river	Hydro	2007	No	2.15	0.00
San Isidro II	370.00	Combined cycle	Natural Gas	2007	No	115.96	445.09
San Isidro II Diesel	370.00	Combined cycle	Diesel	2007	No	1415.14	657.03
Concon	2.20	Diesel engines	Diesel	2007	No	1.92	774.61
San Isidro II GNL	370.00	Combined cycle	Natural Gas	2007	No	271.23	445.09
Casablanca 1	1.30	Diesel engines	Diesel	2007	No	1.04	781.14
Casablanca 2	0.48	Diesel engines	Diesel	2007	No	0.00	939.18
Las Vegas	2.20	Diesel engines	Diesel	2007	No	1.48	928.91
Curauma	2.40	Diesel engines	Diesel	2007	No	1.65	924.18
Campanario Gas 1	56.00	Open cycle	Natural Gas	2007	No	0.00	699.69
Campanario Diesel 1	56.00	Open cycle	Diesel	2007	No	4.95	881.62
Eyzaguirre	2.10	Run of the river	Hydro	2007	No	8.27	0.00
Los Vientos TG	120.80	Open cycle	Diesel	2007	No	154.70	894.77
Los Sauces	2.40	Diesel engines	Diesel	2007	No	4.05	816.09
Nueva Aldea 3	20.00	Biomass / Steam	Biomass	2006	Yes	0.00	0.00
Nueva Aldea 2	10.00	Open cycle	Diesel	2006	No	0.00	978.90
Candelaria 1	125.30	Open cycle	Natural Gas	2005	No	21.11	721.08
Candelaria 1 Diesel	125.30	Open cycle	Diesel	2005	No	68.42	934.27
TG_Coronel	45.70	Open cycle	Natural Gas	2005	No	3.03	568.48
TG_Coronel Diesel	45.70	Open cycle	Diesel	2005	No	23.45	760.09
Candelaria 2	128.60	Open cycle	Natural Gas	2005	No	7.32	721.08
Candelaria 2 Diesel	128.60	Open cycle	Diesel	2005	No	28.94	934.27
Nueva Aldea	13.00	Biomass / Steam	Biomass	2005	Yes	0.00	0.00
Antilhue TG	50.30	Open cycle	Diesel	2005	No	112.71	1988.20
Horcones TG	24.30	Open cycle	Natural Gas	2004	No	0.01	830.90
Ralco	690.00	Reservoir	Hydro	2004	No	3128.43	0.00

TOTAL GEN. PER YEAR	(GWh / yr)		41,751.7
20% OF GEN. PER YEAR	(GWh / yr)		8,350.3
5 MOST RECENT PLANT GEN	(GWh / yr)		51.8

EMISSION FACTOR 5 PLANTS	(tCO_2/GWh)		320.97
EMISSION FACTOR 20% GEN	(tCO_2/GWh)		436.44

BUILD MARGIN	(tCO_2/GWh)		436.44

Note: Calculation excludes CDM plants (if any), plants that have been moved and retired plants at the calculation date.

COMBINED MARGIN CALCULATION, 2009

OM: Calculated ex post (Option 2, the year in which the emissions occur)
BM: Calculated ex-post (Option 2, updated annually from the date the first emissions occur)

		2009
Operating Margin	(tCO_2/GWh)	837.04
Build Margin	(tCO_2/GWh)	436.44
Combined Margin	**(tCO_2/GWh)**	**636.74**

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	**CELULOSA ARAUCO Y CONSTITUCIÓN S.A.**
Street/P.O.Box:	El Golf 150
Building:	--
City:	Santiago
State/Region:	Región Metropolitana
Postfix/ZIP:	
Country:	Chile
Telephone:	56-2- 462 7000
FAX:	56-2-462 7003
E-Mail:	cpatrickson@arauco.cl
URL:	www.arauco.cl
Represented by:	
Title:	Development Manager of Arauco Generación S.A.
Salutation:	Mr.
Last Name:	Patrickson
Middle Name:	Albert
First Name:	Christian
Department:	Development
Mobile:	56-9158 3483
Direct FAX:	56-2-462 3857
Direct phone:	56-2-462 3795
Personal E-Mail:	cpatrickson@arauco.cl

Organization:	**INVERSIONES CELCO SL**
Street/P.O.Box:	Plaza de Pablo Ruiz Picasso 1
Building:	Edificio Torre Picasso
City:	Madrid
State/Region:	Madrid
Postfix/ZIP:	28020
Country:	Spain
Telephone:	34-915-727488
FAX:	34-915-727450
E-Mail:	gtruffello@arauco.cl
URL:	
Represented by:	Gianfranco Truffello
Title:	Attorney in fact
Salutation:	Mr.
Last Name:	Truffello
Middle Name:	
First Name:	Gianfranco
Department:	

Mobile:	569-96997691
Direct FAX:	562-4617541
Direct phone:	562-4617221
Personal E-Mail:	gtruffello@arauco.cl