Project Description (PD)

NOBRECEL Biomass energy project

Developed under the Voluntary Carbon Standard

Date: 19 November 2007

Version: 01

Voluntary Carbon Standard
PROJECT DESCRIPTION (PD)

CONTENTS

EXECUTIVE SUMMARY

The NOBRECEL Biomass energy project developed by Nobrecel S/A Celulose e Papel is a co-generation project using biomass residues as fuel in Pindamonhangaba city, Brazil.

The project activity consists of renewable energy generation by installing a new biomass boiler and a new turbine. This new cogeneration plant replaces fuel-oil-fired boilers and reduces the electricity consumption from the grid. The new boiler has an installed capacity of 60 tonnes of steam per hour at 450ºC and 45bar and will burn only wood biomass residues. The turbine will have the capacity to generate 8 MW of electricity.

The new equipment will allow the project developer to produce steam only from biomass residues. These biomass residues will be either a by-product from the project developer core business or obtained from third parties (located near the project developer). The residues will be burned in the new biomass boiler to produce high-pressure steam. As the production process of the project developer only demands low-pressure steam, a turbine will be installed complementarily to the boiler in order to generate electricity from the high pressure steam. This electrical energy will be used in the production process, as well as in other day-to-day activities, displacing grid-generated electricity.

The proposed project activity will replace four boilers used for heat generation and displace both fossil fuel fired heat generation and grid electricity consumption. Two of the boilers to be replaced use biomass as fuel, and the other two use fuel oil. Replacement of the fuel oil fired boilers will result in emission reductions by displacing the use of fossil fuels for steam production, by displacing the use of electricity from the S-SE-CO Brazilian interconnected grid and by avoiding dumping biomass residues or leaving it to decay.

The project uses approved methodology ACM0006 (“Consolidated baseline methodology for grid-connected electricity generation from biomass residues”), Version 06, Valid from 10 Aug 07 onwards. From this methodology, the Scenario 16 is selected as the most appropriate baseline scenario. There is a minor deviation from this scenario further discussed in Annex 3.

The proposed project activity is additional according to investment analysis and common practice analysis performed. It is in compliance with all applicable laws and regulations. Local and international stakeholders consultation were performed.

The starting date of the crediting period is 01 January 2002. This project is forecasted to reduce a total of **802 335** tCO_2e in its first period.

SECTION A. General description of project activity

A.1 Title of the project activity:

NOBRECEL Biomass energy project

A.2. Description of the project activity:

The NOBRECEL Biomass energy project (hereafter, the "Project") developed by Nobrecel S/A Celulose e Papel (hereafter referred to as the "Project Developer") is a co-generation project using biomass residues as fuel in Pindamonhangaba city, Brazil, hereafter referred to as the "Host Country".

For any purposes, in this document the term "project activity" means the voluntary emission reductions project in under the Voluntary Carbon System (VCS) rules.

The project activity consists of renewable energy generation by installing a new biomass boiler and a new turbine. This new cogeneration plant replaces fuel-oil-fired boilers and reduces the electricity consumption from the grid. The new boiler has an installed capacity of 60 tonnes of steam per hour at 450ºC and 45bar and will burn only wood biomass residues. The turbine will have the capacity to generate 8 MW of electricity.

In the past, Nobrecel owned and operated 5 boilers which were used for steam generation: two of these boilers were burning fuel oil, two burning biomass residues, and a fifth boiler burning recovered black liquor (a net-emissions free by-product of the cellulose production process) and fuel oil. The four boilers (two fuel oil, two biomass) produced steam but were not responsible for electricity generation because they produced only low-pressure steam. Only the black liquor boiler generated both heat and electricity.

The black liquor recovery boiler (CRQ or "Caldeira de Recuperação Química") is a plant close to the project activity that is not included in the project activity and the project activity will not affect the operation of this boiler.

Given the difficulties of accessing capital in the host country and the GHG emission reductions that can be achieved by the project activities, the Project Developer considers that the carbon credits revenues (direct and indirect benefits) will help the project activity viability.

The project is also helping the Host Country fulfil its goal of promoting sustainable development. Specifically, the project:

- Contributes to local environmental sustainability since it will decrease use of fossil fuels and replace the use with an alternative renewable source.
- Contributes towards better working conditions as contact with fuel oil can be dangerous to the employees, and increases employment opportunities in the area where the project is located;
- Contributes towards better revenue distribution since the use of a renewable fuel decreases dependence on fossil fuels;
- Contributes to technological and capacity development;
- This type of project can stimulate further innovative initiatives inside the Brazilian energy sector;
- Contributes to regional integration and connection with other sectors, such as engineering and civil construction.

A.3. Project participants:

1 - Nobrecel S/A Celulose e Papel (Private Entity – Project Developer)

2 - EcoSecurities Group Plc (Private Entity – Carbon Advisor)

Further information regarding contact details can be found in Annex I.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Country:

Brazil

A.4.1.2. Region/State/Province etc.:

Southeast region, São Paulo State.

A.4.1.3. City/Town/Community etc:

Pindamonhangaba city.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity:

Rodovia Vereador Abel Fabrício Dias, s/nº, Km 155, Distrito de Moreira César, Caixa Postal 1, Zipcode 2400-970, in the municipality of Pindamonhangaba, São Paulo State.
GPS location: 22º 54’ 07.7” S, 45º 23’35.3” W.

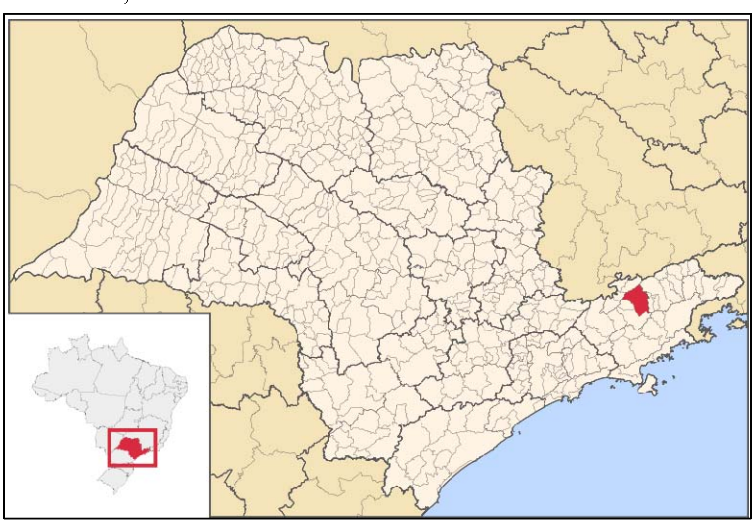

Figure: Physical location of Pindamonhangaba city (red), in São Paulo state, Southeastern Brazil.

A.4.2. Category(ies) of project activity:

According to Annex A of the Kyoto Protocol, this project fits in Sectoral Scope 01 (Energy industries – renewable/non-renewable sources). In addition, according to the project categories defined under VCS version 1 eligible under VCU verification criteria, this project fits into Category 1. Renewable Energy

A.4.3. Technology to be employed by the project activity:

The project activity consists of installation of new equipment that will allow the project developer to produce steam only from biomass residues. These biomass residues will be either a by-product from the project developer core business or bought from third parties (located near the project site). The residues will be burned in the new biomass boiler to produce high-pressure steam. As the production process of the project developer only demands low-pressure steam, a turbine will be installed complementarily to the boiler in order to generate electricity from the high pressure steam. This electrical energy will be used in the production process, as well as in other day-to-day activities, displacing grid-generated electricity.

The new equipment included in the Project activity consists of the installation of:

1. A new biomass boiler with capacity of 60 tonnes of steam/hour; manufactured by Equipalcool, model 60-v-2-s;
2. 1 Turbine manufactured by TGM and 1 generator WEG with an installed capacity of 8 MW;

This boiler was designed to be fuelled with biomass residues only. It is not expected that any fossil fuel will be used as auxiliary fuel or start up fuel. The lifetime of the old boilers was estimated according to the Brazilian Regulatory Norm number 13[1]. Inspections were carried out to evaluate the actual condition of the boilers and was verified that, after undergoing minor repairs, the equipment had a remaining lifetime of greater than 30 years.

All the equipment and maintenance labour is done by Brazilians. The technology and know-how being promoted by this project is environmentally safe and sound, and will further promote such activities in the future.

A.4.4 Estimated amount of emission reductions over the crediting period:

Table - estimated emissions reductions from the project

Years	Annual estimation of emission reductions over the chosen crediting period*
2002	40 523
2003	44 950
2004	52 104
2005	79 034
2006	85 697
2007	86 144
2008	95 098
2009	100 810
2010	106 325

[1] From Portuguese, Norma Regulamentadora nº13, from the Brazilian Labour and Employment Ministry. A full version of the text can be found at http://www.mte.gov.br/legislacao/normas_regulamentadoras/nr_01.asp

2011	111 650
Total estimated reductions (tonnes of CO_2)	802 335
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2)	80 233

A.4.5. Public funding and grants of the project activity:

The project will not receive any public funding for its financing or development.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the baseline and monitoring methodology applied to the project activity:

The project uses approved methodology ACM0006 ("Consolidated baseline methodology for grid-connected electricity generation from biomass residues"), Version 06, Valid from 10 Aug 07 onwards.

For spatial extent of the project electricity system, including issues related to the calculation of the build margin (BM) and operating margin (OM), ACM0006 refers to ACM0002 ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources"), Version 06, Valid from 19 May 06 onwards.

For methane avoidance component, ACM0006 refers to the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site", EB 35 Meeting Report, Annex 10, Version 2.

For demonstration of additionality, ACM0006 refers to the "Tool for the demonstration and assessment of additionality", EB 36 Version 4.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity consists of a grid-connected and biomass residue fired electricity generation project activity. The applicable scenario for the project activity and baseline will be described in section B.4. The project activity includes:

- **Power capacity expansion projects:** The installation of a new biomass power generation unit, which is operated next to existing power generation capacity fired with the same type of biomass residue as in the project plant.

The project activity is based on the operation of a power generation unit located in an agro-industrial plant generating the biomass residues (by-products of pulp and paper production) and supplied by biomass residues coming from a nearby area. All biomass residues used in the project have the following properties:

- The biomass residues used either are a by-product from the Project Developer's own forestry activities or wood residues from different industrial activities in the region (sawmills, wood packs, etc);
- No other biomass types other than the biomass residues described above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired, but it is not expected, although this will be monitored);
- The implementation of this project will not result in an increase of the processing capacity of raw input or in other substantial changes in the pulp and paper process;
- The biomass used by the project facility will not be stored for more than one year, and thus no significant anaerobic reactions will occur;
- No significant energy quantities, except from transportation of the biomass, are required to prepare the biomass residues for fuel combustion.

The project activity meets all the conditions above and is therefore applicable to the methodology.

B.3. Description of the sources and gases included in the project boundary

The project boundary is assessed above in terms of the emission sources and spatial extent.
Emission sources: This refers to the geographical site where power expansion facilities could be located. For the Baseline, these include:

- CO_2 emissions from fossil fuel fired power plants connected to the electricity system;
- CO_2 emissions from fossil fuel based heat generation that is displaced through the project activity;
- CH_4 avoidance emissions due to avoiding the dumping and leaving to decay of biomass.

For the Project activity, the boundary includes CO_2 emission from fossil fuel used for biomass transportation and CH_4 emissions from combustion of biomass residues for electricity and heat generation.

Spatial extent: The spatial extent of the project boundary includes:

- The new biomass co-generation plant
- All power plants connected physically to the grid electricity system that the Project power plant is also connected (S-SE-CO system)
- The trucks and the roads within 150km radius used for transportation of biomass residues to the project site
- The site where the biomass residues would have been left for decay or dumped.

The project activity fulfils all the methodology requirements and applicability conditions, classified as *Power Capacity Expansion Project*.

Table: Sources and gases included in the project boundary

	Source	Gas	Included	Justification/Explanation
Baseline	Grid electricity generation	CO_2	**Yes**	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Heat Generation	CO_2	**Yes**	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	**Yes**	It was decided to include this emission source since baseline cases B1 and B2 are used.
		N_2O	No	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources.
Project Activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO_2	**Yes**	Important emission source. Electricity consumption due to mechanical treatment of the biomass residues and fuel oil consumed at the project site.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass residues	CO_2	**Yes**	Important emission source.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source

				is assumed to be very small.
	Combustion of biomass residues for electricity and / or heat generation.	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	**Yes**	Emission source included because of inclusion of CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario.
		N_2O	No	Excluded for simplification. This emission source is assumed to be small.
	Storage of biomass residues	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.
		N_2O	No	Excluded for simplification. This emissions source is assumed to be very small.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

Step I. Identification of alternatives to the project activity consistent with mandatory laws and regulations

The identification of baseline scenarios considered the plausible alternatives for **power generation** (P), **biomass destination** (B) and **heat production** (H) were analized according to methodology ACM0006.

Table: Alternative Scenarios - POWER

POWER	~~P1~~	Unlikely	*The project activity not undertaken as a project activity.* Faces financial barriers as described in B.5 and B.4.
	~~P2~~	Unlikely	*The proposed project activity, fired with the same type of biomass residues but with a lower efficiency of electrical generation.* All companies in Brazil work with similar electricity generation efficiency and it is not a possible baseline scenario. Hence, the Project will be even more expensive then P1 - which already faces financial barriers - with more trucks being contracted to bring a larger amount of biomass.
	~~P3~~	Unlikely	*The generation of power in an existing plant, on-site or nearby the project site, using only fossil fuels.* As this scenario has higher baseline emissions compared to the possible scenario P4, this scenario is conservatively not a plausible alternative.
	P4	**Plausible**	*The generation of power in existing and/or new grid-connected power plants.* There is no significant barrier to purchase electricity from the Brazilian S-SE-CO Grid. This is the lowest cost scenario.
	~~P5~~	Unlikely	*The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-)fired in the project activity, and implementation of the project activity, not undertaken as a project activity, at the end of the lifetime of the existing plant.* The boilers being replaced by the cogeneration unit produced only low pressure steam and thus have no electricity generation capacity.

	P6	Unlikely	*The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-)fired in the project activity and, at the end of the lifetime of the existing plant, replacement of that plant by a similar new plant.* The boilers being replaced by the cogeneration unit produced only low pressure steam and thus have no electricity generation capacity.

Table: Alternative Scenarios - HEAT

HEAT	H1	Unlikely	*The project activity not undertaken as a project activity.* There are financial barriers faced, as described in B.5.
	H2	Unlikely	*The proposed project activity, fired with the same type of biomass residues but with a different efficiency of heat generation.* All companies in Brazil work with similar heat generation efficiency and it is not a possible baseline scenario. Hence, high efficient boilers has a very high investment involved and low efficient boilers has high biomass transportation costs involved (it will be even more expensive then H1, with more trucks being contracted to bring a bigger amount of biomass).
	H3	Unlikely	*The generation of heat in an existing cogeneration plant, on-site or nearby the project site, using only fossil fuels.* There is no fossil fuel fired cogeneration unit nearby the plant that can supply the amount of steam needed by Nobrecel.
	H4	**Plausible**	*The generation of heat in boilers using the same type of biomass residues.* The heat generation prior to the project activity was partly in boilers using biomass residues.
	H5	Unlikely	*The continuation of heat generation in an existing cogeneration plant, fired with the same type of biomass residues as in the project activity, and implementation of the project activity, not undertaken as a project activity, at the end of the lifetime of the existing plant.* The boilers replaced by the cogeneration unit did not have electricity generation capacity. They only generated low pressure steam and therefore could not act as cogeneration plants.
	H6	**Plausible**	*The generation of heat in boilers using fossil fuels.* The heat generation prior to the project activity was partly in boilers using fossil fuel.
	H7	Unlikely	*The use of heat from external sources.* There are no viable external sources of heat.
	H8	Unlikely	*Other heat generation technologies.* Other technologies are not feasible because of the complexity of operational needs or they are costly.

Table: Alternative Scenarios – BIOMASS RESIDUES

BIOMASS	B1	**Plausible**	*The biomass residues are dumped or left to decay under mainly aerobic conditions.* As Nobrecel uses several types of different wood biomass residues, some of them could be dumped or left to decay under mainly aerobic conditions.
	B2	**Plausible**	*The biomass residues are dumped or left to decay under clearly anaerobic conditions.* As Nobrecel uses several types of different biomass residues, some of them could be left to decay under clearly anaerobic conditions.
	B3	Unlikely	*The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.*

			Uncontrolled burning of biomass is forbidden in São Paulo State (Decree number 8468/1976, from São Paulo State).
	B4	**Plausible**	*The biomass residues are used for heat and/or electricity generation at the project site.* Nobrecel already generates part of its heat with part of the biomass residues that will be used in the proposed project activity.
	B5	Unlikely	*The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants.* There is no nearby biomass fired power generator and all power generated near Pindamonhangaba city is from fossil fuels. Furthermore, the biomass availability research performed by Nobrecel shows that there is a potential surplus of biomass exceeding Nobrecel's consumption. Further explanation below.
	B6	Unlikely	*The biomass residues are used for heat generation in other existing or new boilers at other sites.* The Biomass Availability Research performed by Nobrecel demonstrates that there is a surplus of biomass residues that will exceed Nobrecel's consumption. Further explanation below is presented below.
	B7	Unlikely	*The biomass residues are used for other energy purposes.* The biomass residues used in the proposed project activity has never been used to generate biofuels or other energy purposes.
	B8	Unlikely	*The biomass residues are used for non-energy purposes.* Nobrecel uses biomass in its pulp and paper process, but no biomass residues can be used due to the low quality of the residues.

For the purpose of defining the baseline, the continuation of business as usual, the use of other less intensive fossil fuel and the project activity not undertaken as a project will now be compared with the Project Activity. Steps 2 and 3 from the Tool for the demonstration and assessment of additionality were applied for to exclude non credible and realistic scenarios.

Step II. Investment analysis

Sub-step IIa. Determine appropriate analysis method

As the project has other financial benefits other than emission reductions related income, the simple cost analysis was not used. Therefore option IIb was chosen: investment comparison analysis.

Sub-step IIb. – Option II. Apply investment comparison analysis

The project activity generates heat and electricity generation for pulp and paper production. The company needs these two resources to continue operation the mill. As a stand-alone project, it does not make economic sense, thus, the NPV will be used as the indicator. The financial analysis was done using a discount rate of 20%[2] (similar to interest rates of the period before the implementation of the project activity, i.e. before 2001).

Continuation of activities - given the non requirement of investment, this option does not present financial and investment barriers. A financial analysis considering only the investment costs was elaborated and compared with project activity not undertaken as a project activity.

Project not undertaken as a VER project activity - represents the whole strategy of Nobrecel for project activities that were undertaken at the same time. Specifically, it is represented by the construction of a new co-generation plant, new equipment and improvements in the CRQ boiler given that it represents a corporate strategy for the company (important to emphasize that the last component is not considered in this PD). This scenario faces specific financial/economic barriers due to the fact that the capital costs

[2] SELIC rate (Source: Banco Central do Brasil, http://www.bcb.gov.br/

related to investments are very high. The capital costs involved in the project pose a barrier, especially considering the high interest rates prevalent in developing countries. It is worth noting that there are no direct subsides or promotional support for the implementation of independent renewable energy plants. The financial barrier is demonstrated through a financial analysis, which the results are presented in table below. Please refer to section B.5. for more information.

Table: Financial analysis result considering the investments and benefits.

NPV analysis	Unit	Values
Discount rate	%	20.00[3]
Project not undertaken as a project activity	1000 R$	**(9 877)**

The analysis evaluated investments necessary to implement the project. The assumptions of financial analysis were:

Both Scenarios:
- The fuel and operation cost prices were constant along the years.
- A 21 year time frame was used (up to 2022).
- No taxes were taken into account.
- The equipment in both scenarios presents a remaining lifetime longer than the entire renewable crediting period of 10 years.

Continuation of activities:
- No revenue is earned.
- No extra costs are necessary
- No investment is necessary.

Heat costs proportional to fuel mix and fuel prices in the year before project activity

Project not as a project activity:
- The only revenue was the reduction in electricity cost.
- The heat costs were different given the different fuel mix used.
- The investments were made over the time.

According to the analysis above, the project not as a project activity does not represent a realistic and credible scenario, given the higher costs for heat and electricity production.

Step III. Barrier Analysis

With respect to the **technical/technological** barrier:

- In the case of continuation of the baseline, there are no technical/technological issues as this represents a continuation of current practices and does not involve any new technology or innovation. Indeed, in this scenario there are no technical/technological implications as the scenario calls for continued use of electricity from the grid.
- In the case of project not undertaken as a project activity, there are no significant technical/technological barriers. All the technologies involved in this scenario are available in the market, and have been used effectively in the Host Country.

With respect to the **economical** barrier:

- The continuation of current practices presents no particular obstacles. The company would not need new financing, would not need to perform big investments and would not need to change its energy

[3] SELIC rate (Source: Banco Central do Brasil, http://www.bcb.gov.br/

supply process. The continued operation of existing facilities and actual practices presents no real barriers.

- The economical situation of Nobrecel since 1998 is not good[4]. They have a growing liquid debt (as shown in the graphic below), what makes difficult for the company to get loans and financing for their projects. The financing institutions would only accept to finance their projects if they pay an extremely high interest rate, making any kind of financing not viable and all projects inside the company that need a big investment must be carried on with own resources. Therefore, to perform a fuel switch from their production process energy supply was very risky and demanded huge efforts from the company. The opinion from Dun & Bradstreet regarding the general credit appraisal of the company is "LIMITED as per the analysis of the significant credit items, indicating a significant risk factor", corroborating what is stated in this barrier. Moreover, in 2000 (one year before the implementation of the project) the project developer had an indebtedness degree of 1200% when compared to their net worth (as shown in the graphic below). Therefore, the construction of a new co-generation plant with own capital represents a big risk for the company, posing a barrier for the development of the project.

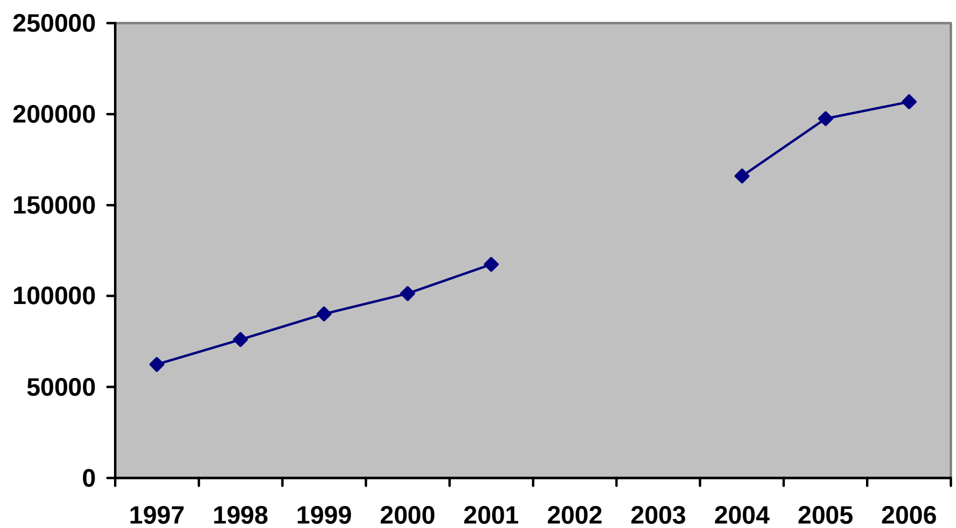

Figure – Liquid debt of Nobrecel S/A Celulose e Papel from 1997 to 2006, with the exception of 2002 and 2003 (no data could be evaluated and, thus is not presented).

[4] The economical situation of the project developer was evaluated from 1997 to 2001 with data provided by Nobrecel and from 2004 to 2006 with data provided in a report made by Dun & Bradstreet.

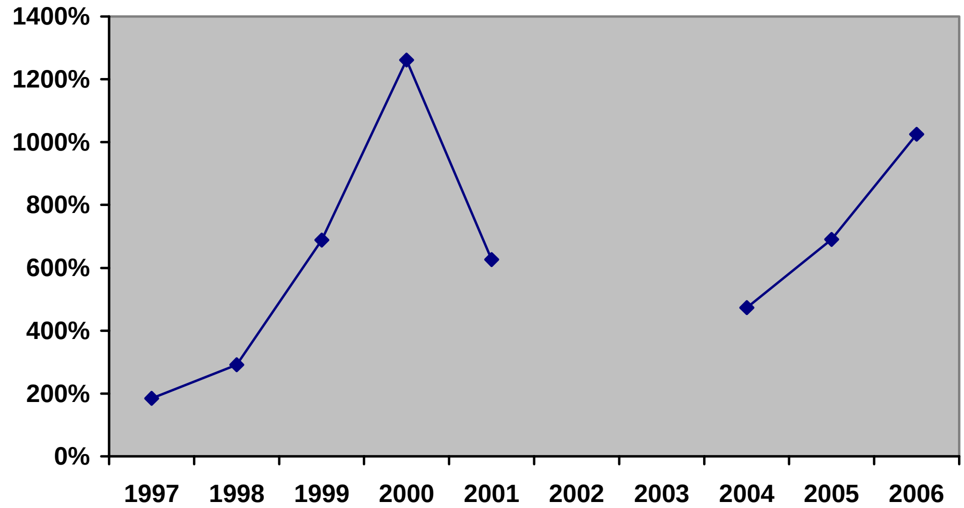

Figure – Indebtedness degree of Nobrecel S/A Celulose e Papel when compared to the net worth, from 1997 to 2006, with the exception of 2002 and 2003 (no data could be evaluated and, thus is not presented).

With respect to the analysis of **prevailing business practice**:

- The continuation of current practices presents no particular obstacles. This practice has been used effectively in the past with good results, and the continued operation of existing facilities and actual practices presents no real barriers.
- The construction of a new co-generation plant represents a deviation from the company's core business (pulp and paper production). Even with large increases in demand, new plants are generally not planned as they imply significant changes and adaptations in the production process and in the employees' activities (e.g., safety measures). It is worth noting that the consumption of biomass residues as fuel represents a barrier. To make this scenario possible a new, expensive, and complex process must be initiated, given that the residues are composed of materials of different types, with significant size differences and calorific content. New equipment shreds and homogenizes the wood residues mixture, prior to using it as a fuel. Moreover, a complex logistic process must be implemented to ensure a non-stop supply of wood residues to the new equipment. As a result, such changes require management capacity and input, and have high economic costs. An indicator of this barrier is the fact that there are no others biomass residues consumers in the region, the Project Developer is the only significant biomass residues consumer.

The use of other fossil fuel such as natural gas was considered as a possible scenario but not feasible since it is more expensive than fuel oil and other reasons described below. Nobrecel didn't have the expertise necessary to operate natural gas plants. Moreover, national and sectoral trends were analyzed. According to the Brazilian Energy Balance 2003, during the years 2000, 2001 and 2002 there was no significant increase in natural gas consumption, or decrease in fuel oil consumption in the sector. The accentuated fuel oil consumption decrease happened during the 1990s (from 466 tep[5] in 1996 to 146 tep 1999), but during 2000-2002 there was no significant decrease (changing only from 110 to 106 tep). The increase of

[5] Tep is a representation used in Brazil of fuel consumption, and means Equivalent Petroleum Tonnes (from Portuguese "Toneladas Equivalentes de Petróleo").

natural gas consumption presents a similar pattern. It demonstrates that the most advantageous fuel switches already took place during the nineties (from 2.7% in 1990 to 5.1% in 2000), leaving only plants where natural gas was not available or was not viable.

Pindamonhangaba was one of first cities in the region to receive a natural gas supply, with natural gas being available since 1998[6]. Given the high prices of natural gas, and the consequent non-viability of a fuel switch, the switch was not considered as a possible scenario. The Pindamonhangaba city is located very near Via Dutra highway, one of the best roads in Brazil, which reduces significantly the transportation costs, lowering the price of fuel oil or biomass. The picture below presents the price fluctuation of fuel oil and natural gas in Pindamonhangaba (prices for Aços Villares, a company located approximately 10 km from Nobrecel). There are two natural gas fired thermoelectric plants near Nobrecel, but neither is from the pulp and paper production industrial sector, showing that this type of fuel is indeed not viable to this industry (see table below).

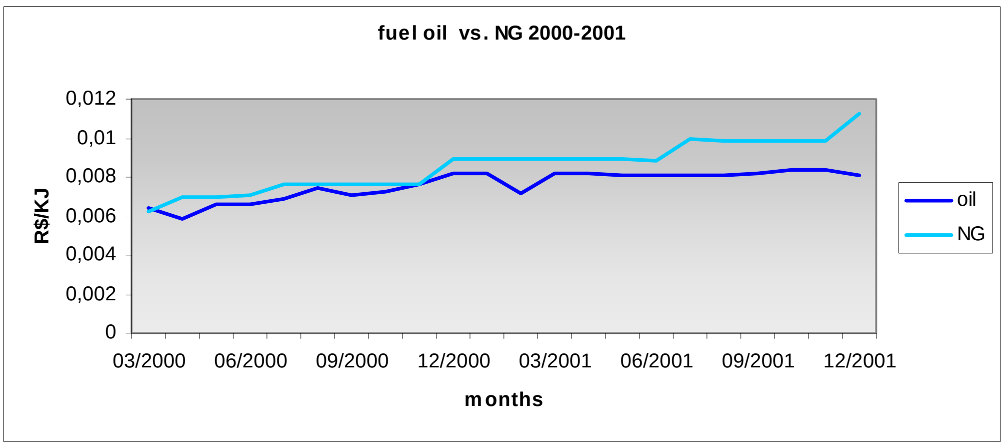

Figure: Fuel and natural gas prices during period 2000 and 2001, prior to decision making[7].

The use of the biomass in other power generator units (including cogeneration units) or heat generation units were also not considered as a possible baseline scenario. There are no nearby plants using biomass registered in ANEEL website, therefore there is no company able to use the biomass residues as fuel to generate power. The only nearby thermoelectric units registered are listed below:

Table: List of thermoelectric plants registered in ANEEL in the Nobrecel region.

Plant Name	Owner	Municipality	Fuel	Fuel Class
Basf Guaratinguetá	100% to Basf S/A	Guaratinguetá – SP	Diesel	Fossil
Refinaria Henrique Lages (REVAP)	100% to Petróleo Brasileiro S/A.	São José dos Campos - SP	Refinery Gas	Fossil
Casa de Geradores de Energia Elétrica F-242	100% to Empresa Brasileira de Aeronáutica S/A	São José dos Campos - SP	Natural Gas	Fossil
Sams Club São José dos Campos	100% to Wal Mart Brasil Ltda	São José dos Campos - SP	Diesel	Fossil
Aeroporto de São José dos Campos	100% to Empresa Brasileira de Infra-Estrutura Aeroportuária	São José dos Campos - SP	Diesel	Fossil
Crylor	100% to Radicifibras Indústria e Comércio Ltda	São José dos Campos - SP	Natural Gas	Fossil

[6] http://www.pindamonhangaba.sp.gov.br/expansaoIndustrial.asp

[7] Prices paid by Aços Villares.

Source: Aneel (www.aneel.gov.br) - Banco de Informações de Geração (BIG)

Furthermore, the Biomass Availability Study (Estudo de disponibilidade de biomassa), conducted by Nobrecel, estimated that there is a surplus of 330 000 tonnes of biomass residues available in the region, and Nobrecel will burn around 90 000 in its boilers, leaving a surplus of 240 000 tonnes. Therefore, it proves that even if other companies decide to consume biomass, there will be an excess of biomass residues that would be dumped in the near future.

Considering these analyses:

The most plausible scenario for power generation is P4 (the generation of power in existing and/or new grid-connected power plants).

The plausible scenarios for heat production were a combination of scenarios H4 (the generation of heat in boilers using the same type of biomass residues) and H6 (the generation of heat in boilers using fossil fuels).

The plausible scenarios for biomass were a combination of B1 (the biomass residues are dumped or left to decay under mainly aerobic conditions, i.e. biomass residues dumped in fields with less than 5 meters deep) and B2 (The biomass residues are dumped or left to decay under clearly anaerobic conditions, i.e. biomass residues dumped in landfills with more than 5 meters deep), and B4 (The biomass residues are used for heat and/or electricity generation at the project site).

After the possible scenarios were chosen, aspects from these scenarios were analyzed. Only the most probable scenarios will remain in the subsequent analysis, always keeping conservativeness in mind. The other scenarios were not realistic in this particular project mostly because they were neither inside the range of the company expertise on dealing with electricity and steam nor feasible in a near future. In section B.5 there is a detailed explanation of a realistic and credible baseline scenario detailing barriers and the financial analysis regarding for the business as usual and carbon revenue inclusive scenarios.

As the project uses several kinds of biomass residues, with different sources and destinations, in order to correctly evaluate the most plausible biomass baseline they must be addressed individually. The types of residues are: Eucalyptus logs (from reforested areas), dry wood chips (wood residues), crude wood chips (wood residues from sawmills), industrial wood residues (pallets or civil work residues), sawmill wood residues (wood residues from sawmills that uses eucalyptus and pinus from reforesting) and process residues (sieve residues, thin process residues or wood chips). These types of residues are likely to be dumped and degraded clearly in an anaerobic way (B2), while forest wood residues (barks and trees residues) are residues that are likely to be left to decay in an aerobic way (B1). However, all residues are wood residues for methodological issues. Moreover, other kind of biomass residues can be burnt in the boiler, in the future. Therefore, this possibility is included in this PD, however not accounted in calculations. Below is a table individualizing the types of wood residues and the baseline scenarios established for each wood residue.

Table: Biomass in Baseline

Type of wood residue		Scenario B1	Scenario B2	Scenario B4
Portuguese	English			
Toretes de Eucalipto	Eucalyptus logs			X
Cavaco Seco	Dry wood chips		X	
Cavaco Verde	Crude wood chips		X	
Resíduos industriais de	Industrial wood residues		X	

Madeira				
Resíduos florestais de Madeira	Forest wood residues	X		
Descarte do Processo	Process residues		X	
Resíduos de Serrarias	Sawmill wood residues		X	
Outros	Others	X	X	

Scenario B1 – Dumped or left to decay in unclear anaerobic condition.
Scenario B2 – Dumped or left to decay in clearly anaerobic condition.
Scenario B4 – Already used for heat generation at the project site.
Others – comprises other kind of biomass residues that can be available in the region in the future.

The emission reduction formulae and calculations are described in detail in section B.6.3. For the grid emission factor, the "ex-ante" option is chosen. The project activity will use the data from the three years of 2004-2006, fixing the value of 0.2823 t CO_2e/MWh for the first crediting period. Details of the calculation are presented in annex 3.

For demonstration and assessment of additionality, the project developers used the "Tool for the demonstration and assessment of additionality" as agreed by the CDM Executive Board and available on the UNFCCC website.

Considering the most plausible scenarios for power, heat and biomass identified above, scenario 16 would be the most plausible baseline scenario for the project activity. However, the project activity slightly deviates from the description of the situation provided in Version 6 of ACM0006. The scope of the deviation and the proposed solution are provided in Annex 3.

There is no leakage as a result of the project, as the Project Developer is the only significant consumer of biomass residues in the region and there is an abundant of surplus in the region. In addition, there are in the region an intense activity in forestry and sawmill sectors, and many large industries that generate wood residue (pallets, wood packs, etc). The option for leakage demonstration was L_2 option, where it is demonstrated that the quantity of available biomass in the region is at least 25% larger than the quantity of biomass that is utilized, including the project plant (a supply-demand study was prepared by the Project Developer and is available to the validator).

Table: Key information and data used to determine the baseline scenario.

Variable	Unit	Data Source
Electricity generation by 8 MW turbine	MWh	Project developer
Project Plant Consumption	MWh	Project developer
Chopper/Cruncher operation	MWh	Project developer
Total net electricity generated	MWh	Project developer
Grid Emission Factor	tCO2e/MWh	Calculated based on ONS data
Steam production by biomass boiler	MWh	Project developer
Steam produced by CRQ	MWh	Project developer
NCV fuel oil	Kcal/Kg	BEN 2005
Nobrecel biomass consumption	Tonnes	Project developer
Third parties biomass consumption	Tonnes	Project developer

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

As described above, it can be demonstrated that the most realistic and credible baseline scenario is represented by "the continuation of activities previous to project activity implementation (BAU)".

Baseline Description:

Purchase of all electricity from grid, heat generation in 5 boilers (CRQ, 2 biomass and 2 fuel oil boilers), small amount of biomass used on site for heat purposes (about 25,000 tonnes) and biomass dumped or left to decay (more than 95,000 tonnes).

The additionality demonstration was done using the "Tool for the demonstration and assessment of additionality". However, as the project started in 2001, a Step 0 was provided, according to a previous version of this same tool. This tool for assessing additionality follows a step-based approach. Explanation on how additionality for the proposed project activity is proven following the tool for additionality follows.

Step 0. Preliminary screening based on the starting date of the project activity

This project started in year 2000, before COP 7 and Marrakech Accords, as a prompt start project. It was pre-validated by SGS (contract signed on 28th September 2000) and received a preliminary approval letter from the Brazilian government (before Brazilian Resolution no. 01) on 6th September, 2001. Both documents were available prior to the start of the project activity.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

- The continuation of previous practices (BAU) – Scenario 1
- Consider the project not as a project activity – Scenario 2
- Consider the use of Natural Gas as energy source – Scenario 3

Please refer to section B.4. for further details.

The project activity presents more than one plausible scenario, thus it passes through this step.

Sub-step 1b. Enforcement of applicable laws and regulations:

The alternatives comply with all mandatory Brazilian legal and regulatory requirements. Therefore, the project passes through this step.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

Given that the project activity presents other minimal economic benefits (fuel and electricity costs savings), but it is not enough to cover all the investments costs (hence the use of IRR analysis is not the most appropriate option), the method used is for comparisons of the two plausible scenarios is the NPV analysis. The most appropriate analysis is the Option II - Apply investment comparison analysis "Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g., levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision-making context".

The benchmark used represents the Brazilian Special Settlement and Custody System (SELIC) rate, which is expressed in annual terms and is the Central Bank of Brazil's lending rate. This is the discount rate stipulated by the Brazilian DNA as it is the most conservative discount rate in the host country, given that it represents the lowest risk return in Brazil (risk free tax). As seen in the Tool for the demonstration and assessment of additionality, benchmarks can be derived from government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert.

The average SELIC rate was chosen in a conservative matter considering the last three years before the starting year of the project activity (1998, 1999 and 2000) and the previous six months before the starting date of the project activity (November 2001). In the previous three years the average SELIC tax was 24,36%, while in the previous six months the average SELIC tax was 18.23% (http://www.bcb.gov.br/?SELICDIA). As the graphic below shows, in the six months before the implementation of the project this benchmark had a clear trend of increase.

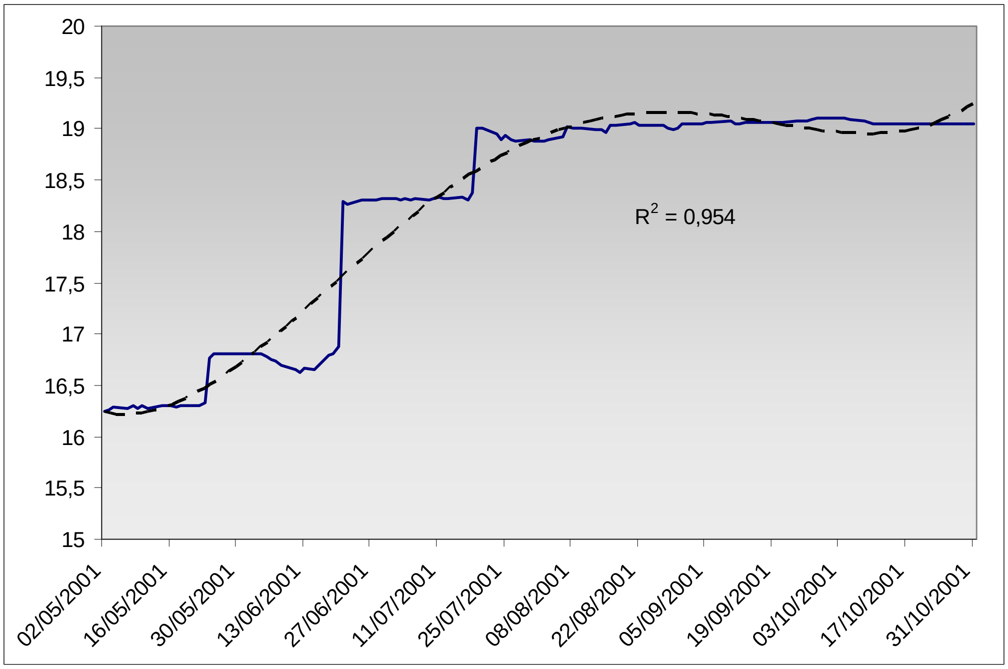

Figure – Trend of the SELIC tax (dash line) in the previous six months before the starting date of the project activity. The continuous line represents the absolute values (real variation) of SELIC tax.

The SELIC Rate has been very volatile, as stated in the paragraph above. The average SELIC rate chosen to this project activity 20% p.a.

Companies usually expect to have returns be significantly higher (premiums) than the SELIC rate to proceed with an investment. As the discount rate used – 20% – is not increased to reflect associated risks, the 20% benchmark is more conservative than what is suggested by the Additionality Tool.

The capital costs involved in the project pose a barrier, especially considering the above mentioned. It is worth noting that there are no direct subsidies or promotional support for the implementation of independent renewable energy plants. The financial barrier is demonstrated through a financial analysis, the results of which are presented below. The financial analysis is considering the investments related to the project activity, and revenues related to non purchase of fuel oil. As it can be seen, the costs of implementing the project without carbon are greater than the costs of maintaining current practices (business as usual) i.e. the baseline scenario. The carbon revenues increase the returns of the project to an acceptable level compared to the baseline.

Sub-step 2b. – Option II. Apply investment comparison analysis

The results of investment comparison analysis are detailed in Step II of baseline definition analysis (described in section B.4), and the project activity was not the most attractive scenario, hence it passes through this step.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

Option II was used and the Scenario 1, considered as the baseline scenario was the most attractive course of action, consequently it passes through this step.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

A sensitive analysis considering the increase of investment costs, decrease of operation and maintenance costs, increase of fuel oil savings and decrease of discount rate was completed. The assumptions used were the same as presented in section B.4. Even with a 10% change in these variables, the Project not undertaken as a project activity continues to be the most unlikely scenario, since the NPV is still higher when compared to business as usual scenario. The results are presented in the table below:

Table: Sensitivity analysis from the Project not undertaken as project activity.

Variable		(1000R$)
Initial Investment decrease of	10%	(9 085)
O&M decrease of	10%	(8 507)
Fuel Oil saving increse of	10%	(9 583)
Discount rate decrease of	10%	(10 074)

Based on the results of the sensitivity analysis it is clearly demonstrated that the project activity is not the most attractive course of action, even when key parameters are adjusted. None of the three situations demonstrated above presented a result attractive enough to justify the risks of investing upfront costs on new activities, consequently, the project passes through this step, and forward to step 4.

Step 4. Common Practice Analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity

In the region nearby to the project, there are no other industries of the same sector and size. Approximately 120 and 170 km away are the two only other established pulp and paper companies respectively: VCP (Votoratim Celulose e Papel) with a production capacity of 3,000 tons of pulp and paper per day and Suzano Papel e Celulose with a production capacity of 2,500 tons of pulp and paper per day. Nobrecel is a small company when compared to these two companies, with production capacity of 250 tons of pulp and paper per day (at least 10 times smaller than these two other plants); therefore, these are not of similar scale. The barriers faced by these companies are different from the Project Developer, but even these other pulp and paper companies do not have an energy matrix based on biomass residues. Considering that the Project Developer is the only large biomass residue consumer in the region, the project activity can not be considered as a common practice. Furthermore, companies in the region from other sectors use fuel oil as main fuel. The business as usual of using fuel oil is further demonstrated through the necessity of Aços Villares, located in the same region, needing carbon credits revenues to stop using fuel oil as their main energy source and start using biomass residues.

Sub-step 4b: Discuss any similar options that are occurring

Not applicable (see sub-step 4a).

Conclusion

The emission reductions revenue expected for the Project has been key in encouraging the project developer to undertake the project activity. The impact of approval and registration of the Project as a project activity will bring numerous benefits to the project developer, the cellulose and paper industry and the Host Country.

Table: Financial Analysis Results

Data	Unit	NPV
NPV without credits	1000 R$	(9 877)
Carbon NPV	1000 R$	**4.175**

For the project developer, revenue from carbon credits represents extra income that will contribute with the improvement of its cash flow, while reducing its fuel-related costs and increasing the overall thermal efficiency. It will also improve the image of the company as an environmentally and socially responsible company, and alleviate the commercial, investment and institutional hurdles shown previously.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The Methodology ACM0006 version 6 is applicable to the proposed project activity, as it is applicable to grid-connected electricity generation from biomass residues activities, where the baseline scenario is the use of electricity generated from the grid, the burning of fuel oil to produce steam and the dumping of or leaving to decay of biomass residues and the project activities include situations such as:
a) Generation of electricity from boilers' steam to be consumed internally, therefore the energy supplied by the grid will be replaced by renewable energy;
b) Two fuel oil fired boilers and two biomass fired boilers will be replaced by one biomass fired boiler, therefore there will be no more consumption of fuel oil to produce steam;
c) The surplus of biomass residues that would be dumped or left for decay in the region will be controllably burned, therefore reducing the amount of residues to be dumped and the amount of organic matter that will suffer anaerobic digestion in piles.

Emission reductions are claimed for displacing energy generation from other sources (i.e. the grid), for stop consuming fuel oil in boilers to produce steam and for avoiding biomass residues anaerobic decomposition. After careful analysis regarding all scenarios, Scenario 16 was chosen. This choice was based in the following aspects:

- The project activity involves the installation of a new biomass residue fired cogeneration unit (biomass boiler);
- The new unit (biomass fired boiler) is operated next to an existing biomass residue fired power generation unit (black liquor boiler);
- The existing unit is fired with biomass residues (black liquor);
- The power generated by the project plant would, in the absence of the project activity, be generated mostly in power plants in the grid (the power generated by the new power unit would in the absence of the project activity be purchased from the grid);
- The biomass residues would in the absence of the project activity partly be used for heat generation in boilers at the project site and partly be dumped or left to decay or burnt in an uncontrolled manner without utilizing it for energy purposes (prior to the project implementation biomass residues were used in boilers for heat generation and the project activity involves the use of additional biomass residue quantities that would in the absence of the project activity be dumped, left to decay or burnt in an uncontrolled manner);
- The heat generated by the project plant would in the absence of the project activity be generated in on-site boilers fired partly with the biomass residues that are used in the project plant and partly with fossil fuels (prior to the implementation of the project activity heat has been generated in boilers using both fossil fuels and biomass residues).

ACM0002 ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources"), Version 06 was applied for electricity displaced.

Project emissions:
In this project, project emissions were calculated as recommended by methodology ACM0006. Project emissions are emissions from the transport biomass residues, electricity consumption to mechanically process biomass residues, use of fossil fuel onsite (tractor) and the combustion of biomass residues (methane emissions).

For processing the biomass, Nobrecel uses a chopper to reduce the biomass residues into the size they are supposed to have to be burnt in the boiler. The electricity consumed by this device will be accounted as project emissions.

To determine project emissions due to biomass residues transportation, the "option 1" is used: Emissions are calculated on the basis of distance and the average truck load. To determine project emissions due to methane emissions occurred in the combustion of biomass residues, the emission factor default values for wood waste were chosen.

There is a very small amount of project emissions from a tractor that Nobrecel uses to push the biomass residues to the conveyor belt ($FF_{project\ site,i,y}$). The calculation of these emissions is shown in section B.6.3.

Baseline emissions:
In the baseline, there are five boilers producing steam. Four of them will be replaced by the biomass boiler to produce steam and electricity. Two of the replaced boilers consume fuel oil and two of them consume biomass. The requested fuel change will be account only for the amount of fuel oil that will be replaced. Calculations exclude the amount of biomass residues formerly consumed by the two replaced boilers.

Another component of the baseline is the replacement of the use of grid electricity by electricity generated in the project activity. All electricity consumed by the plant comes from the grid. The CO_2 emission factor for the grid is calculated and used to estimate the baseline emissions from this component.

For the last component of the project, baseline biomass residues scenarios are the residues are landfilled or left to decay aerobically or anaerobically. In the project scenario, there is controlled burning of the biomass residues. In order to be as conservative as possible, possible types of biomass burned in the boiler were identified and their possible uses were explored. Only the biomass residues most likely to be landfilled are considered when requesting credits for this component. The project participants are aware of concerns regarding methane avoidance and are committed with conservativeness in this matter. The guidelines established by the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site* will be followed in this project.

Leakage emissions:

The methodology states that the main source of leakage is diversion of biomass residues from other uses to the project plant as a result of the project activity. The option for leakage demonstration was L_2 option, where it's demonstrated that the quantity of available biomass in the region is at least 25% larger than the quantity of biomass that is utilized, including the project plant (A supply-demand study was prepared by project developer, and will be available to the validator, using a 125 km radius). However, the quality of the wood residues burnt will be monitored and, if necessary, accounted as leakage as stated by the methodology. If, due to lack of available data for that period, the option L_2 can not be applied, option L_3 will be used to calculate leakage.

L_2: Demonstrate that there is an abundant surplus of the biomass residue in the region of the project activity which is not utilized. For this purpose, demonstrate that the quantity of available biomass residue of type *k* in the region is at least 25% larger than the quantity of biomass residues of type *k* that are utilized (e.g. for energy generation or as feedstock), including the project plant.

L_3: Demonstrate that suppliers of the type of biomass residue in the region of the project activity are not able to sell all of their biomass residues. For this purpose, project participants shall demonstrate that the ultimate supplier of the biomass residue (who supplies the project) and a representative sample of suppliers of the same type of biomass residue in the region had a surplus of biomass residues (e.g. at the end of the period during which biomass residues are sold), which they could not sell and which is not utilized.

Emission reductions:
According to the Methodology the greenhouse gas emission reductions achieved by the project activity during a given year "y" (ER_y) shall be estimated as follows:

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$

where:

ER_y = Emissions reductions of the project activity during the year y (tCO_2/yr)
$ER_{electricity,y}$ = Emission reductions due to displacement of electricity during the year y (tCO_2/yr)
$ER_{heat,y}$ = Emission reductions due to displacement of heat during the year y (tCO_2/yr)
$BE_{biomass,y}$ = Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y (tCO_2e/yr)
PE_y = Project emissions during the year y (tCO_2/yr)
L_y = Leakage emissions during the year y (tCO_2/yr)

All equations applied to obtain the emission reduction from the project activity are listed in Section B.6.3.

ACM0006 states that the Operating Margin and the Build Margin for the grid to which the project is connected shall be calculated according to the procedures described in ACM0002. Thus, ACM0002 ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources"), Version 06 was used to obtain the resultant grid Carbon Emission Factor.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$EG_{historic,3yr}$
Data unit:	MWh
Description:	Net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant
Source of data used:	Project developer
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	The boilers replaced by the project activity were not capable of producing electricity because they produced only low pressure steam.
Any comment:	

Data / Parameter:	$Q_{historic,3yr}$
Data unit:	GJ
Description:	Net quantity of heat generated during the most recent three years in all cogeneration plants at the project site, generated from firing the same type(s) of

	biomass residues as in the project plant
Source of data used:	Project developer
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	There were no cogeneration plants at the project site firing the same types of biomass residues as in the project plant.
Any comment:	

Data / Parameter:	$Q_{biomass,historic,3yr}$
Data unit:	MWh
Description:	Net quantity of heat generated during the most recent three years in all boilers at the project site, generated from firing the same type(s) of biomass residues as in the project plant
Source of data used:	Project developer
Value applied:	85 467
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data monitored by flow meter and registered by “Ecoeficiencia” Sector
Any comment:	

Data / Parameter:	**φ**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	UNFCCC
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.
Any comment:	From the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually	Unmanaged solid waste disposal sites.

applied :	
Any comment:	From the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	2006 IPCC
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.
Any comment:	From the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*

Data / Parameter:	**DOC_f**
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	2006 IPCC
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	From the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006
Value applied:	0.8 for **unmanaged deep solid waste disposal sites**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.
Any comment:	From the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*

Data / Parameter:	**DOC_j**
Data unit:	% dry waste
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*

Source of data used:	IPCC 2006
Value applied:	50
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value reflects waste type wood and wood products
Any comment:	

Data / Parameter:	**k_j**
Data unit:	-
Description:	Decay rate for the waste type *j*
Source of data used:	2006 IPCC
Value applied:	0.035
Justification of the choice of data or description of measurement methods and procedures actually applied :	The region that the project activity takes place is a region with MAT higher then 20ºC and with MAP higher than 1000 mm. Information on this matter can be found in Annex 3.
Any comment:	From the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*

Data / Parameter:	**$EF_{CH4,BF}$**
Data unit:	Kg/TJ
Description:	CH_4 emission factor for the combustion of biomass residues in the project plant
Source of data used:	Project developer
Value applied:	41.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	A conservative factor is applied, as specified in the baseline methodology. IPCC default was selected
Any comment:	

Data / Parameter:	**$EF_{km,CO2,y}$**
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for the trucks during the year *y*
Source of data used:	1996 IPCC guidelines (not available in 2006 guidelines)
Value applied:	0.00053
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value was used, based on the estimated emission factor for European diesel heavy duty vehicles.
Any comment:	

Data / Parameter:	**NCV_k**

Data unit:	GJ/ton
Description:	Net calorific value of biomass residue type *k*
Source of data used:	Project Developer
Value applied:	14.65
Justification of the choice of data or description of measurement methods and procedures actually applied :	The project developer has estimations of calorific value of each subtype of wood residue. As a conservative approach, the highest value, among the values available, was used. It represents 3500 kcal/kg, relared to the subtype "Industrial wood residue".
Any comment:	

Data / Parameter:	$NCV_{Fuel\ oil}$
Data unit:	GJ/ton
Description:	Net calorific value of the fuel oil co-fired
Source of data used:	Brazilian Energetic Balance
Value applied:	40.1514
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value
Any comment:	

Data / Parameter:	$EF_{burning,CH4,k,y}$
Data unit:	tCH_4/t biomass
Description:	CH_4 emission factor for uncontrolled burning of the biomass residue type *k* during the year *y*
Source of data used:	Methodology ACM0006
Value applied:	0.001971
Justification of the choice of data or description of measurement methods and procedures actually applied :	Following the methodology.
Any comment:	

Data / Parameter:	$EF_{grid,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor for grid electricity during the year *y*
Source of data used:	All information can be found in Annex 3
Value applied:	0.2823
Justification of the choice of data or description of measurement methods and procedures actually applied :	All information can be found in Annex 3.

Any comment:	

Data / Parameter:	ε_{boiler}
Data unit:	%
Description:	Average net energy efficiency of heat generation in the boiler that would generate heat in the absence of the project activity
Source of data used:	Project developer
Value applied:	85%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value from references. Annually will be checked if the reference value changes.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Project emissions

$$PE_y = PET_y + PEFF_y + GWP_{CH4} \cdot PE_{Biomass,CH4,y}$$

where:

PET_y = CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2/yr)

$PEFF_y$ = CO_2 emissions from onsite combustion of fossil fuels (tCO_2e/yr)

GWP_{CH4} = Global Warming Potential for methane valid for the relevant commitment period

$PE_{Biomass,CH4,y}$ = CH_4 emissions from the combustion of biomass residues during the year *y* (tCH_4/yr)

There is a small amount of project emissions from a tractor that has the function of moving the biomass residues at the site. This project emissions is calculated as follows:

$$PE_{tractor} = FF_{tractor} * EF_{diesel}$$

Where:

$PE_{tractor}$ Project emissions from tractor

$FF_{tractor}$ Amount of fossil fuel (i.e. diesel oil) consumed by the tractor (ton/year)

EF_{diesel} CO_2 emission factor for the diesel oil (ton CO_2e/ton)

As the amount of diesel consumed by the tractor is 180 L/day (or 162 kg/day, 59 ton/yr), the amount of emissions from this source is: 59 * 3,1849 = 189 tCO_2e.

a) Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (*PET_y*)

The option chosen is Option 1, as follows:

<u>Option 1:</u>

Emissions are calculated on the basis of distance and the average truck load:

$$PET_y = \frac{\sum_k BF_{k,y}}{TL_y} \cdot AVD_y \cdot EF_{km,CO2,y}$$

Where:

PET_y	=	CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2/yr)
AVD_y	=	Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year *y* (km)
$EF_{km,CO2,y}$	=	Average CO_2 emission factor for the trucks measured during the year *y* (tCO_2/km)
$BF_{k,y}$	=	Quantity of biomass residue type *k* combusted in the project plant during the year *y* (tons of dry matter)[8]
TL_y	=	Average truck load of the trucks used (tons) during the year y.

b) Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$)

$$PEFF_y = \sum_i \left(FF_{project\ plant,i,y} + FF_{project\ site,i,y}\right) \cdot NCV_i \cdot COEF_i$$

where:

$FF_{project\ plant,i,y}$	=	Quantity of fossil fuel type *i* combusted in the biomass residue fired power plant during the year *y* (mass or volume unit per year)
$FF_{project\ site,i,y}$	=	Quantity of fossil fuel type *i* combusted at the project site for other purposes that are attributable to the project activity during the year *y* (mass or volume unit per year)
NCV_i	=	Net calorific value of fossil fuel type *i* (GJ / mass or volume unit)
$COEF_i$	=	CO_2 emission factor for fossil fuel type *i* (tCO_2/GJ)

c) CO_2 emissions from electricity consumption ($PE_{EC,y}$)

Not applicable.

d) Methane emissions from combustion of biomass residues ($PE_{Biomass,CH4,y}$)

$$PE_{Biomass,CH4,y} = EF_{CH4,BF} \cdot \sum_k BF_{k,y} \cdot NCV_k$$

where:

$PE_{Biomass,CH4,y}$	=	CH_4 emissions from the combustion of biomass residues during the year *y* (tCH_4/yr)
$BF_{k,y}$	=	Quantity of biomass residue type *k* combusted in the project plant during the year *y* (tons of dry matter)
NCV_k	=	Net calorific value of the biomass residue type *k* (GJ/ton of dry matter)
$EF_{CH4,BF}$	=	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)

Biomass Residue	Wood Waste
Default emission factor (kg CH_4 / TJ)	30
Assumed uncertainty	300%
Assigned uncertainty band (%)	150
Conservativeness factor	1.37
Final emission factor (kg CH_4 / TJ)	41,1

PET (average 10 years)	tCO2/year	**690**
$PE_{Biomass,CH4,y}$ (average 10 years)	tCO2/year	**1**
PEFF (average 10 years)	tCO2/year	**185**
Average project emissions (PE) (average 10 years)	tCO2/year	**876**

[8] Use tons of dry matter for solid biomass residues and liter for liquid biomass residues.

Emission reductions due to displacement of electricity

Calculated by multiplying the net quantity of increased electricity generated with biomass residues as a result of the project activity (EG_y) with the CO_2 baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows:

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

where:

$ER_{electricity,y}$ = Emission reductions due to displacement of electricity during the year y (tCO_2/yr)
EG_y = Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh)
$EF_{electricity,y}$ = CO_2 emission factor for the electricity displaced due to the project activity during the year y (tCO_2/MWh)

Step 1: Determination of $EF_{electricity,y}$

The project activity displaces electricity from other grid-connected sources (P4). The emission factor for the displacement of electricity should correspond to the grid emission factor ($EF_{electricity,y}$ = $EF_{grid,y}$) and $EF_{grid,y}$, as the power generation capacity of the project plant is of more than 15 MW, should be calculated as a combined margin (CM), following the guidance in the section "Baselines" in the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002). The formulae to calculate the emission factor for displacement of electricity were based on parameters used by ACM0002 to calculate the combined margin for the South-Southeast-Middle-West grid in Brazil. For more details on the grid emission factor, see Annex 3.

Step 2: Determination of EG_y

$$EG_y = MIN\left\{\begin{array}{c} EG_{project\ plant,y} \\ EG_{total,y} - \dfrac{EG_{historic,3yr}}{3} \end{array}\right\}$$

where:

EG_y = Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh/yr)
$EG_{project\ plant,y}$ = Net quantity of electricity generated in the project plant during the year y (MWh/yr)
$EG_{total,y}$ = Net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass residues as in the project plant[i], including the new power unit installed as part of the project activity and any previously existing units, during the year y (MWh/yr)
$EG_{historic,3yr}$ = Net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass residues as used in the project plant (MWh)

Fossil fuels are not intended to be used to produce steam in the biomass boiler. However, the potential need of fossil fuels will be monitored.

Emission reductions or increases due to displacement of heat

Baseline emissions are calculated by multiplying the savings of fossil fuels with the emission factor of these fuels.

$$ER_{heat,y} = \frac{Q_y \cdot EF_{CO2,BL,heat,i}}{\varepsilon_{boiler}}$$

The baseline scenario is that heat generated by the cogeneration project plant would in the absence of the project activity be generated in both fossil fuel fired boilers and heat-only boilers fired with biomass residue type(s) that are also used in the project plant.

$$Q_y = MIN\begin{Bmatrix} Q_{project\ plant,y} \\ \\ Q_{total,y} - \dfrac{Q_{historic,3yr}}{3} \end{Bmatrix} - \frac{Q_{biomass,historic,3yr}}{3}$$

where:

$ER_{heat,y}$	= Emission reductions due to displacement of heat during the year y (tCO_2/yr)
Q_y	= Quantity of increased heat generation in the project plant (incremental to heat generation in any existing cogeneration plants) that displaces heat generation in fossil fuel fired boilers during the year y (GJ/yr)
$Q_{project\ plant,y}$	= Net quantity of heat generated in the cogeneration project plant from firing biomass residues during the year *y* (GJ)
$Q_{total,y}$	= Net quantity of heat generated in all cogeneration units at the project site, generated from firing the same type(s) of biomass residues as in the project plant, including the cogeneration unit installed as part of the project activity and any previously existing units, during the year *y* (GJ)
$Q_{historic,3yr}$	= Net quantity of heat generated during the most recent three years in all cogeneration plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant (GJ)
$Q_{biomass,historic,3yr}$	= Net quantity of heat generated during the most recent three years in all boilers at the project site, generated from firing the same type(s) of biomass residues as in the project plant (GJ)
ε_{boiler}	= Energy efficiency of the boiler that would be used in the absence of the project activity
$EF_{CO2,BL,heat,i}$	= CO_2 emission factor of the fossil fuel type *i* used for heat generation in the absence the project activity (tCO_2/GJ)

The fraction of heat generated from firing biomass residues should be determined by dividing the quantity of biomass residues by the total quantity of all fuels fired, both expressed in energy units.

Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass residues

Step 1. Determination of the quantity of biomass residues used as a result of the project activity ($BF_{PJ,k,y}$)

Biomass residues are already used at the project site prior to the implementation of the project and would in the absence of the project activity continued to be used. The incremental use of biomass residues as a result of the project activity (i.e. $BF_{PJ,k,y}$) should be determined taking into account the project specific circumstances. Only the incremental increase in the use of biomass residues due to the project activity is taken into account.

Step 2. Estimation of methane emissions, consistent with the baseline scenario for the use of biomass residues (B1 and B2)

Uncontrolled burning or aerobic decay of the biomass residues (case B1)

Baseline emissions are calculated assuming, for both scenarios viz., natural decay and uncontrolled burning, that the biomass residues would be burnt in an uncontrolled manner. Baseline emissions are calculated by multiplying the quantity of biomass residues that would not be used in the absence of the project activity with the net calorific value and an appropriate emission factor, as follows:

$$BE_{biomass,y} = GWP_{CH4} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burning,CH4,k,y}$$

where:

$BE_{biomass,y}$	=	Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tCO_2e/yr)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)
$BF_{PJ,k,y}$	=	Incremental quantity of biomass residue type *k* used as a result of the project activity in the project plant during the year *y* (tons of dry matter)
NCV_k	=	Net calorific value of the biomass residue type *k* (GJ/ton of dry matter)
$EF_{burning,CH4,k,y}$	=	CH_4 emission factor for uncontrolled burning of the biomass residue type *k* during the year *y* (tCH_4/GJ)

Default CH_4 emission factor	0.0027 t CH_4/ t biomass
Assumed uncertainty	Greater than 100%
Assigned uncertainty band (%)	150
Conservativeness factor	0.73
CH_4 emission factor used	0.001971 t CH_4/t biomass

Anaerobic decay of the biomass residues (case B2)

Baseline emissions are calculated using the "*Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*", EB 26. The variable $BE_{CH4,SWDS,y}$ calculated by the tool corresponds to $BE_{biomass,y}$ in ACM0006. Use from the respective quantities of biomass residues that are prevented from anaerobic decay ($BF_{PJ,k,y}$ or fractions of it) as the waste quantities prevented from disposal ($W_{j,x}$) is in the tool.

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1-e^{-k_j}\right)$$

Where:

$BE_{CH4,SWDS,y}$	=	Methane emissions avoided during the year *y* from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO2e)
φ	=	Model correction factor to account for model uncertainties (0.9)
f	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner.
GWP_{CH4}	=	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	=	Fraction of methane in the SWDS gas (volume fraction) (0.5)
DOC_f	=	Fraction of degradable organic carbon (DOC) that can decompose
MCF	=	Methane correction factor
$W_{j,x}$	=	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tons)
DOC_j	=	Fraction of degradable organic carbon (by weight) in the waste type *j*
k_j	=	Decay rate for the waste type *j*
j	=	Waste type category (index)
x	=	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	=	Year for which methane emissions are calculated

Electricity baseline emission (average 10 years)	tCO2/year	**5 449**
Heat baseline emission (average 10 years)	tCO2/year	**37 741**
Anaerobic decay emission (average 10 years)	tCO2/year	**38 953**
Aerobic decay emission (average 10 years)	tCO2/year	**483**
Average baseline emissions (BE) (average 10 years)	tCO2/year	**82 626**

Leakage

Projects participants had chosen L_2 to demonstrate the existence of biomass surplus on the project activity site. In 2001, Project Developer has developed a study to demonstrate the biomass surplus in the region and therefore the non existence of any leakage. According to Nobrecel's report:

1. The company used a radius of 125 km from the project to research about the biomass residue supply in the vicinity;
2. The company owns approximately 4,100 hectares of its own plantation which generates approximately 150,000 tonnes of biomass residues. From this total, approximately 100,000 tonnes was destined for cellulose production and the remaining 50,000 tonnes destined for energy purposes;
3. Regarding third party forests linked with Nobrecel as biomass suppliers (mainly for process), they presented approximately 8,941 hectares in 63 properties. This area would have the potential to offer approximately 320,000 tonnes of biomass. From this total, approximately 208,000

tonnes could be destined for cellulose production and the remaining 112,000 tonnes could be destined for energy purposes;

4. Regarding the local sawmills, 20 sawmills were identified inside the Project Developer's region of influence and they represented generation potential of 50,000 tonnes of biomass residues, exclusively destined for energy purposes;
5. Inside the research region, there were no other large consumers;
6. Current consumers (2006) – Suzano and Votorantim Company – were not consumers in 2001. Their actual supply regions do not compete with Project Developer's region. Moreover these two consumers don't look for biomass residues outside their mills. Their energy matrix is not based on biomass.

Therefore, in 2001, the whole biomass residues supply in the region defined by Project Developer, corresponded to 650 000 tonnes of biomass residues. From this total, 350 000 tonnes was destined for cellulose process and the remaining 300 000 tonnes as excess for energy purposes. According to the Project Developer, the company needs 90 000 tonnes of biomass residues for its whole energy activities. This corresponds to an amount at least 25% larger that the quantity of biomass that is used.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Years	Estimation of project activity emissions (tonnes of CO2 e)	Estimation of baseline emissions (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of overall emission reductions (tonnes of CO2 e)
2002	**503**	**41 027**	**0**	**40 523**
2003	**490**	**45 440**	**0**	**44 950**
2004	**485**	**52 589**	**0**	**52 104**
2005	**992**	**80 026**	**0**	**79 034**
2006	**1 279**	**86 977**	**0**	**85 697**
2007	**1 112**	**87 256**	**0**	**86 144**
2008	**975**	**99 827**	**0**	**98 852**
2009	**975**	**105 564**	**0**	**104 589**
2010	**975**	**111 104**	**0**	**110 129**
2011	**975**	**116 454**	**0**	**115 479**
Total (tonnes of CO_2)	**8 763**	**826 264**	**0**	**817 501**

There could be some inconsistencies due to rounding.

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**$BF_{k,y}$**
Data unit:	tons of biomass residue
Description:	Quantity of biomass residue (wood residue) combusted in the project plant during the year *y*, on a wet basis
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	132 245

Description of measurement methods and procedures to be applied:	Measurment on a wet basis of biomass. All the biomass sent to the biomass storage area is weighted in truck scales. During this weight, each subtype of wood residue is identified and registered. The average monthly consumption is based on the difference of initial and final amount of biomass in the storage area, plus the amount of biomass delivered to the storage area. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	Truck scales will be maintained and calibrated according to manufacturer guidelines. Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes, and historic numbers.
Any comment:	

Data / Parameter:	$EG_{project\ plant,y}$
Data unit:	MWh/yr
Description:	Net quantity of electricity generated in the project power plant during the year y
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	19 703
Description of measurement methods and procedures to be applied:	There is a electricity meter that measure the electricity generated by each of the turbines. The steam generated by all the operative boilers are sent to the same pipeline, and after that distributed to the consumptions centres. Thus, to know the amount of electricity that was generated by each boiler, a calculation according to Annex 5 is performed. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	The electricity meter will be calibrated according to manufacter indications.
Any comment:	

Data / Parameter:	$EG_{total,y}$
Data unit:	MWh/yr
Description:	Net quantity of electricity generated in all power units at the project site, including the new power unit installed as part of the project activity and any previously existing units, during the year *y*
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	20 673
Description of measurement methods and procedures to be applied:	There is a electricity meter that measure the electricity generated by each of the turbines. The steam generated by all the operative boilers are sent to the same pipeline, and after that distributed to the consumptions centres. Thus, to know the amount of electricity that was generated by each boiler, a calculation according to Annex 5 is performed.

	This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	The electricity meter will be calibrated according to manufacter indications.
Any comment:	

Data / Parameter:	$\mathbf{Q_{project\ plant,y}}$
Data unit:	MWh
Description:	Net quantity of heat generated from firing biomass in the project plant
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	377 489
Description of measurement methods and procedures to be applied:	The amount of steam produced by the boiler will be measured by a steam flow meter. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	The steam flow meter will be maintained and calibrated according to manufacturer requirements.
Any comment:	

Data / Parameter:	$\mathbf{Q_{total,y}}$
Data unit:	MWh
Description:	Net quantity of heat generated in all cogeneration units at the project site, including the cogeneration unit installed as part of the project activity and any previously existing units, during the year *y*
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	685 684
Description of measurement methods and procedures to be applied:	The amount of steam produced by the boiler will be measured by a steam flow meter. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	The steam flow meter will be maintained and calibrated according to manufacturer requirements.
Any comment:	

Data / Parameter:	$\mathbf{W_x}$
Data unit:	Tonnes
Description:	Total amount of organic waste prevented from disposal in year *x* (tonnes)
Source of data to be used:	Project developer

Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	106 183
Description of measurement methods and procedures to be applied:	Measurment on a wet basis of biomass. All the biomass sent to the biomass storage area is weighted in truck scales. During this weight, each subtype of wood residue is identified and registered. The average monthly consumption is based on the difference of initial and final amount of biomass in the storage area, plus the amount of biomass delivered to the storage area. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	Truck scales will be maintained and calibrated according to manufacturer guidelines. Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes, and historic numbers.
Any comment:	

Data / Parameter:	**AVD_y**
Data unit:	Km
Description:	Average round trip distance (from and to) between biomass fuel supply sites and the project site
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	150
Description of measurement methods and procedures to be applied:	As the biomass is supplied from different sites, this parameter correspond to the mean value of km travelled by trucks that supply the biomass plant. In the crediting period, the amount of biomass per supplier will be monitored and the distance will be assessed individually. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	When this parameter can not be monitored a very conservative default number of 400 km (2 times 200km) will be used.
Any comment:	75 (mean value) x 2 (conservative factor) = 150 (value used)

Data / Parameter:	**TL_y**
Data unit:	Tons
Description:	Average truck load of the trucks used for transportation of biomass.
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	10
Description of measurement methods and	This data will be registered when the truck is weighted in the plant entrance. This data will be recorded monthly, and stored electronically all the crediting

procedures to be applied:	period plus two years.
QA/QC procedures to be applied:	The truck scale will be maintained and calibrated according to manufacturer instructions. When this parameter can not be monitored a very conservative default number of 10 ton per truck will be used.
Any comment:	Option 1 is chosen to estimate CO_2 emissions from transportation. 10 tons per truck is already a very conservative approach, since the average truck capacity is around 40 tons. The assumption is that the average truck load would be of 25%, what is considered very low.

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data to be used:	Interview with the Landfill operator
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	0
Description of measurement methods and procedures to be applied:	Annually the Landfill operator of Pindamonahngaba city will be interview to know if any different action was implemented in the landfill.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\mathbf{GWP_{CH4}}$
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential for CH_4
Source of data used:	IPCC
Value applied:	21
Description of measurement methods and procedures to be applied:	Monitored annually
QA/QC procedures to be applied:	Default value from references. Annually will be checked if the reference value changes.
Any comment:	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions

Data / Parameter:	$\mathbf{EF_{CO2,BL,heat,i}}$
Data unit:	tCO_2/ton fuel
Description:	CO_2 emission factor of the fossil fuel type *i* used for heat generation in the absence the project activity
Source of data to be used:	Calculated based on the NCV from Brazilian energetic value and emission factor from IPCC 2006.

Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	3.1064
Description of measurement methods and procedures to be applied:	Default value from references. Annually will be checked if the reference value changes.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\mathbf{EC_{shredder/chopper}}$
Data unit:	MWh/year
Description:	Electricity consumed by shredder/chopper of the project activity.
Source of data to be used:	Project developer
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	1 000
Description of measurement methods and procedures to be applied:	There is an electricity consumption meter for these activities. Data will be calculated according the installed capacity of the chopper times operational hours, if monitoring is not available. This is a conservative approach. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	The electricity meter, if available, will be calibrated according to manufacter indications. If not available, a conservative approach will be used.
Any comment:	

Data / Parameter:	$EF_{CO2,FF,i}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type *i*.
Source of data to be used:	IPCC 2006
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	0.0774
Description of measurement methods and procedures to be applied:	Default value from references. Annually will be checked if the reference value changes..
QA/QC procedures to be applied:	The number should be updated with the most recent IPCC report available.
Any comment:	

Data / Parameter:	FFproject plant,i,y
Data unit:	Ton
Description:	Quantity of fuel oil combusted in the biomass residue fired power plant during the year *y*
Source of data to be used:	Project Developer Operational Patterns
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	0
Description of measurement methods and procedures to be applied:	There is no entrance for fossil fuels in the project boiler, thus it is not consumed. The absence of this structure shall be measured monthly by interviews with the Project boiler engineers.
QA/QC procedures to be applied:	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	This should include fossil fuels co-fired in the project plant but not any other fuel consumption at the project site that is attributable to the project activity (e.g. for mechanical preparation of the biomass residues)

Data / Parameter:	FFproject site,i,y
Data unit:	Ton
Description:	Quantity of diesel oil combusted at the project site for other purposes that are attributable to the project activity during the year *y*
Source of data to be used:	Project Developer Operational Patterns
Value of data applied for the purpose of calculating expected emission reductions in section B.6.3	59
Description of measurement methods and procedures to be applied:	It will be measured by the entrance of diesel in the plant, and the stock difference. All the trucks are weighted in the plant entrance. Every month the stock level in the tanks are measured. The difference in the stock, plus the fuel reception will be the fuel consumed in the month. This data will be recorded monthly, and stored electronically all the crediting period plus two years.
QA/QC procedures to be applied:	The truck scales will be maintained and calibrated according to manufacturer instructions.
Any comment:	This should not include fossil fuels co-fired in the project plant but any other fuel consumption at the project site that is attributable to the project activity (e.g. for mechanical preparation of the biomass residues)

B.7.2 Description of the monitoring plan:

The monitoring plan details the actions necessary to record all the variables and factors required by the methodology ACM0006 as detailed in section B.7.1 above. All data will be archived electronically, and backed up regularly. Moreover, it will be kept for the full crediting period, plus two years after the end of the crediting period or the last issuance of CERs for this project activity (whichever occurs later).

Project staff will be trained regularly in order to satisfactorily fulfil their monitoring obligations. The authority and responsibility for project management, monitoring, measurement and reporting will be agreed between the project participants and formalised. Detailed procedures for calibration of monitoring equipment, maintenance of monitoring equipment and installations, and for record handling will be established.

All data to be monitored were already collected in baseline scenario and will not represent an obstacle. The data will be collected and cross checked by the Quality Assurance management sector, called as "Ecoeficiência sector".

Further information can be found in Annex 4.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The baseline study and the monitoring methodology were concluded on 27 July 2006. The entity determining the baseline study and the monitoring methodology and participating in the project as the Carbon Advisor is EcoSecurities, listed in Annex 1 of this document.

Personnel responsible for the baseline and monitoring of this project:

Mr. Thiago Viana	EcoSecurities Brasil Ltda.	Project Manager	Thiago.viana@ecosecurities.com
Mr. Luis Filipe Kopp	EcoSecurities Brasil Ltda.	Monitoring Manager	Luis.kopp@ecosecurities.com
Mr. Pablo Fernandez	EcoSecurities Brasil Ltda.	Team Leader	Pablo@ecosecurities.com
Mr. Bernardo Lazo	EcoSecurities UK Ltd.	Technical Reviewer	Bernardo.lazo@ecosecurities.com

Contact: EcoSecurities Brasil Ltda., Rua Lauro Müller 116, 4303/4304, Botafogo, Rio de Janeiro, Brazil. CEP: 22290-160. Phone: +55 (21) 2546-4150

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Project start date:

01 November 2001 - Defined as date on which the emission reduction installation of technology was completed and the technology became operational to reduce emissions.

C.1.2. Expected operational lifetime of the project activity:

30 years.

C.2 Crediting period

C.2.1. Starting date:

01 January 2002

C.2.2 Length:

10 years

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The co-generation plant does not require Environmental Impact Assessment studies (EIA) and they do not have significant environmental impacts. The plant received official permits from local official authorities to start activities.

The Brazilian National Environmental Council (CONAMA – from Portuguese "Conselho Nacional do Meio Ambiente), in its resolution number 001/1986, article 2, defines and exemplifies the environmental modifiers activities that require an EIA: "XI – Power generation units, from whatever primary source, above 10MW". As the power generation unit of Nobrecel has a capacity 8MW, it is clearly demonstrated that the project activity does not require an EIA.

The project will improve the local environmental condition due to the adequate destination of sawdust and woodchip residues. Currently these residues are a problem because they release methane emissions to the atmosphere when decomposing.

D.2. If environmental impacts are considered significant by the project participants or the host country, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host country:

Not applicable.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

According to the Resolution #1 dated on December 2nd, 2003, from the Brazilian Inter-Ministerial Commission of Climate Change (Comissão Interministerial de Mudança Global do Clima -CIMGC), decreed on July 7th, 1999[9], any emission reduction projects must send a letter with description of the project and an invitation for comments by local stakeholders. In this case, letters were sent to the following local stakeholders:

- City Hall of Pindamonhangaba, SP
- City Council of Pindamonhangaba, SP
- State and Municipal Environmental Agencies;
- Brazilian Forum of NGOs;
- Public Prosecution Office (known in Portuguese as Ministério Público, i.e. the permanent institution essential for legal functions responsible for defending the legal order, democracy and social/individual interests) and;
- Local communities associations.

Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation.

E.2. Summary of the comments received:

To date, no comments have been received.

E.3. Report on how due account was taken of any comments received:

Not applicable, given that no comments were received.

9 Source: http://www.mct.gov.br/clima/comunic/pdf/Resolução01p.pdf

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable.

Annex 3

BASELINE INFORMATION

Grid Emission Factor Calculation

The Brazilian electricity system has been historically divided into two subsystems: the North-Northeast (N-NE) and the South-Southeast-Midwest (S-SE-CO). This is due mainly to the historical evolution of the physical system, which was naturally developed nearby the biggest consuming centers of the country.

The natural evolution of both systems is increasingly showing that integration is to happen in the future. In 1998, the Brazilian government was announcing the first leg of the interconnection line between S-SECO and N-NE. With investments of around US$700 million, the connection had the main purpose, in the government's view, at least, to help solve energy imbalances in the country: the S-SE-CO region could supply the N-NE in case it was necessary and vice-versa.

Nevertheless, even after the interconnection had been established, technical papers still divided the Brazilian system in two (Bosi, 2000)[10]:

"… where the Brazilian Electricity System is divided into three separate subsystems:
(i) The South/Southeast/Midwest Interconnected System;
(ii) The North/Northeast Interconnected System; and
(iii) The Isolated Systems (which represent 300 locations that are electrically isolated from the interconnected systems)"

Moreover, Bosi (*op. cit.*) gives a strong argumentation in favor of having so-called *multi-project baselines*:

"For large countries with different circumstances within their borders and different power grids based in these different regions, multi-project baselines in the electricity sector may need to be disaggregated below the country-level in order to provide a credible representation of 'what would have happened otherwise'".

Finally, one has to take into account that even though the systems today are connected, the energy flow between N-NE and S-SE-CO is heavily limited by the transmission lines capacity. Therefore, only a fraction of the total energy generated in both subsystems is sent one way or another. It is natural that this fraction may change its direction and magnitude (up to the transmission line's capacity) depending on the hydrological patterns, climate and other uncontrolled factors. But it is not supposed to represent a significant amount of each subsystem's electricity demand. It has also to be considered that only in 2004 the interconnection between SE and NE was concluded, i.e., if project proponents are to be coherent with the generation database they have available as of the time of the PD submission for validation, a situation where the electricity flow between the subsystems was even more restricted is to be considered.

The Brazilian electricity system nowadays comprises of around 91.3 GW of installed capacity, in a total of 1,420 electricity generation enterprises. From those, nearly 70% are hydropower plants, around 10% are natural gas-fired power plants, 5.3% are diesel and fuel oil plants, 3.1% are biomass sources (sugarcane bagasse, black liquor, wood, rice straw and biogas), 2% are nuclear plants, 1.4% are coal plants, and there are also 8,1 GW of installed capacity in neighboring countries (Argentina, Uruguay, Venezuela and Paraguay) that may dispatch electricity to the Brazilian grid. (http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp). This latter capacity is in fact comprised by mainly 6,3 GW of the Paraguayan part of *Itaipu Binacional*, a hydropower plant operated by both Brazil and Paraguay, but whose energy almost entirely is sent to the Brazilian grid.

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[10] Bosi, M. (2000). "*An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study*" OECD and IEA Information paper, Paris. http://www.oecd.org/dataoecd/15/57/2002521.pdf

Approved methodology AM0015 (substituted by ACM 0006) and ACM0002 asks project proponents to account for “all generating sources serving the system”. In that way, project proponents in Brazil should search for, and research, all power plants serving the Brazilian system.

In fact, information on such generating sources is not publicly available in Brazil. The national dispatch center, ONS – *Operador Nacional do Sistema* – argues that dispatching information is strategic to the power agents and therefore cannot be made available. On the other hand, ANEEL, the electricity agency, provides information on power capacity and other legal matters on the electricity sector, but no dispatch information can be got through this entity.

In that regard, project proponents looked for a plausible solution in order to be able to calculate the emission factor in Brazil in the most accurate way. Since real dispatch data is necessary after all, the ONS was contacted, in order to let participants know until which degree of detail information could be provided. After several months of talks, plants’ daily dispatch information was made available for years 2002, 2003 and 2004.

Project proponents, discussing the feasibility of using such data, concluded it was the most proper information to be considered when determining the emission factor for the Brazilian grid. According to ANEEL, in fact, ONS centralized dispatched plants accounted for 75,547 MW of installed capacity by 31/12/2004, out of the total 98,848.5 MW installed in Brazil by the same date (http://www.aneel.gov.br/arquivos/PDF/Resumo_Gráficos_mai_2005.pdf), which includes capacity available in neighboring countries to export to Brazil and emergency plants, that are dispatched only during times of electricity constraints in the system. Therefore, even though the emission factor calculation is carried out without considering all generating sources serving the system, about 76.4% of the installed capacity serving Brazil is taken into account, which is a fair amount if one looks at the difficulty in getting dispatch information in Brazil. Moreover, the remaining 23.6% are plants that do not have their dispatch coordinated by ONS, since: either they operate based on power purchase agreements which are not under control of the dispatch authority; or they are located in non-interconnected systems to which ONS has no access. In that way, this portion is not likely to be affected by the CDM projects, and this is another reason for not taking them into account when determining the emission factor.

In an attempt to include all generating sources, project developers considered the option to research for available, but non-official data, to supply the existing gap. The solution found was the International Energy Agency database built when carrying out the study “Road-Testing Baselines For Greenhouse Gas Mitigation Projects in the Electric Power Sector”, published in October 2002. Merging ONS data with the IEA data in a spreadsheet, project proponents have been able to consider all generating sources connected to the relevant grids in order to determine the emission factor. The emission factor calculated was found more conservative when considering ONS data only, as the table below shows the build margin in both cases.

IEA/ONS Merged Data Build Margin (tCO_2/MWh)	ONS Data Build Margin (tCO_2/MWh)
0,205	0,1045

Therefore, considering all the rationale explained, project developers decided for the database considering ONS information only, as it was capable of properly addressing the issue of determining the emission factor and doing it in the most conservative way.

Efficiency data on fossil fuel plants were taken from IEA document. This was made after considering that there was no more detailed information on efficiency, from public, renowned, and reliable sources.

From the reference as mentioned, the efficiency of conversion (%) of fossil fuels to thermo electrical plants fed with fossil fuel was calculated based on the installed capacity of each plant and on the power effectively produced. For most thermo electrical plants under construction, a constant value of 30% was used to estimate its fossil fuel conversion efficiency.

This value was based on data as available in the literature and on observation of real conditions of this kind of plants operating in Brazil. It was assumed that the only 02 natural gas-combined cycle plants (amounting to 648 MW) have higher efficiency rate, i.e. 45%.

Also, only data relative to plants under construction in 2002 (starting operation in 2003) were estimated. All other efficiencies were calculated. As far as it is know, there has been no upgrade of the older thermo electrical plants as analyzed in the period (2002 to 2004).

Therefore project participants have concluded that the best option available was to use such numbers, although they are not well consolidated.

All this information was directed to the current CDM project validators and thoroughly discussed with them, with the purpose to clarify every item and every possible doubt.

Temperature data

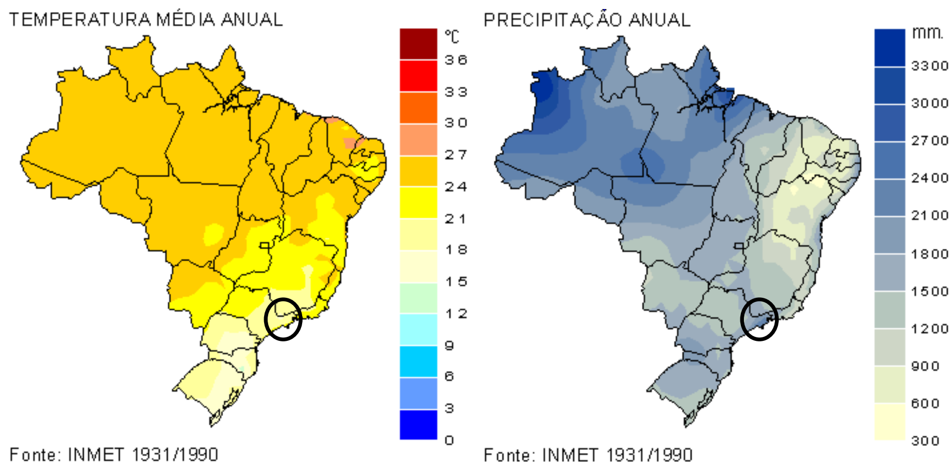

Figure: Historical data from Brazilian National Meteorological Institute (INMET) showing that the historic average temperature is around 20ºC and that precipitation is higher than 1000 mm. Source: www.inmet.gov.br.

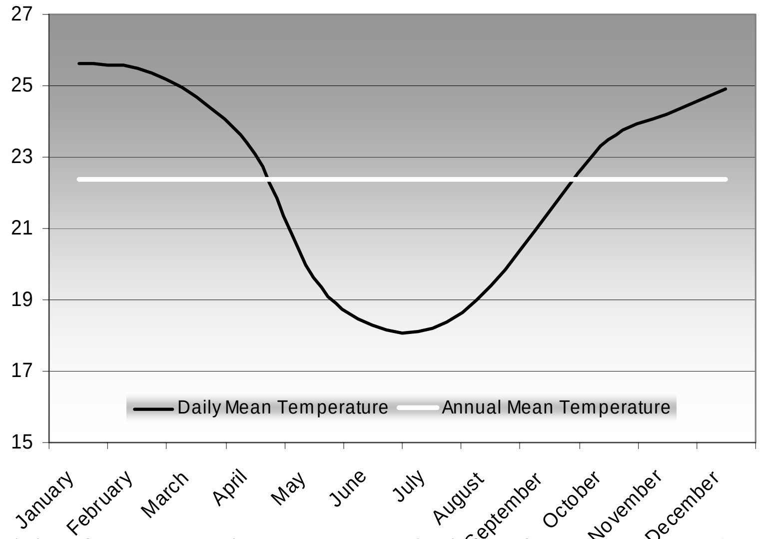

Figure: Historical data from São Paulo State Meteorological Information Center (Centro Integrado de Informações Agrometeorológicas – CIIAGRO) showing that the Mean Annual Temperature (MAT) is higher than 20ºC. Data from 1992 to 2006[11].

Data applied to the Project

Table: For the baseline emissions estimations, the parameter used are listed below:

Project emissions	Unit	Value
Methane Global Warming Potential (GWP_{CH4})	-	21
Baseline grid emission factor	tCO2/Mwh	0.2823

Table: Project developer data used for emission reduction calculation (presented in average numbers).

Variable	unit	Baseline Scenario	Project Scenario
Shredder & Chopper working	hour	943	3 843
Biomass Boiler Steam Production	MWh	0	385 784
Steam from Conterma+Menark (old biomass boilers not operational in project activity)	MWh	87 379	-
Steam from Ata+Sabroe (old fuel oil boilers not operational in project activity)	MWh	62 098	-
Biomass Truck Arrivals baseline	travels	206	2 130

Variable	unit	Baseline Scenario or Project Scenario
Efficiency of fuel oil boilers	%	100

[11] http://ciiagro.iac.sp.gov.br/ciiagroonline/Quadros/QTmedPeriodo.asp

Shredder installed capacity	Kw	200

Average Distance for Biomass Transportation	km	75	Nobrecel data
truck emission factor	tCO2e / km	0.00053	Calculated
Truck Diesel consumption	km/l	5	Nobrecel data
Diesel Density	g/ml (kg/l) (t/10^3 l)	0,84	BEN 2003
Diesel Emission factor	tonCO2/ton fuel	3.13	2006 IPCC
Description (for diesel)			
CV	Tj/10^3t	42.29	2006 IPCC
CEF	t C/Tj	20.20	2006 IPCC
CH4 emission factor (controlled burning)	Kg/TJ	41,1	2006 IPCC
CH4 emission factor (uncontrolled burning)	t CH4/t biomass	0.001971	ACM0006
Biomass Net Calorific Value	Kcal/Kg	1,600	Nobrecel Data
Biomass Baseline Consumption Average	ton	30,000	Nobrecel data

Source	Symbol	Value
ACM0006	φ	0,9
IPCC 2006	f	0
IPCC 2006	GWPch4	21
IPCC 2006	OX	0
IPCC 2006	F	0,5
IPCC 2006	DOCf	0,5
IPCC 2006	MCF	0,8
IPCC 2006	DOCj	0,50
	Kj	0,035

Financial information

Additional financial information can be found in document (spreadsheet) attached.

Annex 4

MONITORING INFORMATION

This section details the steps taken to monitor on a regular basis the GHG emissions reductions from the Nobrecel Biomass energy project, in Brazil. The main components covered within the monitoring plan are:

1. Parameters to be monitored, and how the data will be collected;
2. Operational procedures and quality assurance responsibilities.

The requirements of this MP are in line with the kind of information routinely collected by similar companies in the sector, thus, internalizing the procedures should be simple and straightforward. If necessary, the MP can be updated and adjusted to meet operational requirements, provided that such modifications are approved by a Designated Operational Entity during the process of verification.

As the project activity is currently operating, monitoring has been undertaken since November 2001. All data have been achieved electronically, and data will be kept for the full crediting period, plus two years. The list of data needed to be collected is presented in section D. The responsibilities are presented below.

The Quality Manager sector is controlling all information regarding the project. Consumption and production data are collected and are organized in folders (hard copy and electronically) as instructed by EcoSecurities.

All information about biomass is collected by Forestry resources sector. This sector needs to monitor the truck arrivals since the payment bills are based on these values.

All information about steam production is collected and analyzed by Quality management sector and is crucial to the company the precise monitoring of this variable. This is important for the company since the steam production costs depends directly on this variable.

The Monitoring Manual developed by EcoSecurities has all information updated about maintenance and calibration schedules and monitoring responsibles for each step in data flow.

Further details on the distribution of responsibilities:

Table: Operational procedures and responsibilities for monitoring and quality assurance of emissions from project activity (E = responsible for executing / data collection, R = responsible for overseeing and assuring quality, I = to be informed).

Task/Site location	Quality management coordination	Forestry resources coordination	Equipment Supplier	EcoSecurities
Collect data	E	E		
Enter data into spreadsheet	E			
Make monthly and annual reports	E			I
Achieve data & reports	E			I
Calibration / Maintenance, rectify faults	R	E	E	I

Annex 5

METHODOLOGICAL ISSUES

Methodological Issues (Minor Deviations)

Scenario 16 has been added to ACM0006 following a request for revision once the project participants realized that the methodology in its previous form was not applicable to the project, although their proposed new methodology for the "NOBRECEL Biomass energy project" had been included in the consolidation of ACM0006. However, scenario 16, which was developed specifically for this project, was once more found to be not applicable in its current form for the following three reasons:

1) The project biomass cogeneration unit is operated next to an existing biomass power generation unit, i.e. the black liquor boiler. However, scenario 16 reads that "the existing unit(s) are only fired with biomass and continue to operate in the same manner after installation of the new power unit". The black liquor boiler, however;

- was and continues to be co-fired with fuel oil, and
- does not continue to operate in the same manner after installation of the new power unit, because the quality of the black liquor is increased and the fuel oil consumption decreases.

Proposed solution: The fact that the black liquor boiler is co-fired with fuel oil and that the quality of the black liquor has been improved simultaneously to the project activity (and this has been proposed as a separate CDM project activity) does not have any consequence on the project's baseline or project emissions. The black liquor boiler uses another type of biomass than the project plant and has a higher dispatch priority because its operation is important for a good operation of a pulp and paper plant. There is thus no risk that the project receives credits from additional heat generation, which – in the absence of the project – would be produced by the black liquor boiler. The black liquor's contribution to both the electricity and heat generation is excluded from the emission reductions.

2) According to ACM0006, the net quantity of increased electricity generation should be calculated as

$$EG_y = MIN\left\{\begin{array}{c} EG_{project\ plant,y} \\ EG_{total,y} - \dfrac{EG_{historic,3yr}}{3} \end{array}\right\}$$

where:

EGy	is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh,
EGproject plant,y	is the net quantity of electricity generated in the project plant during the year y in MWh,
EGtotal,y	is the net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year y in MWh,
EGhistoric,3 yr	is the net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass as used in the project plant in MWh.

However, EGproject plant,y is not directly measured in the case of the project, because the steam of both the black liquor and the biomass boiler are fed to the same pipe entering the 8 MW turbine.

Proposed solution: The steam quantity leaving the biomass and the black liquor boiler can easily be measured. Thus, EGy can be calculated by multiplying the net electricity generation from the 8 MW turbine by the contribution (in %) of the biomass boiler. The contribution itself is calculated as

$$EG_y = EG_{8MW} \times \left(\frac{Steam\,\mathrm{Pr}\,oduction_{BiomassBoiler}}{Steam\,\mathrm{Pr}\,oduction_{BiomassBoiler} + Steam\,\mathrm{Pr}\,oduction_{BlackLiquorBoiler}} \right)$$

This approach is already used by ACM0006 for the purpose of calculating the fraction of heat generated from firing biomass residues (ref. footnote 12 on page 30).

3) Scenario 16 does not foresee the replacement of boilers and thus not refer to the guidance in determining the remaining lifetime of the four boilers that would have continued to operate in the absence of the project.

Proposed solution: The guidance provided for scenario 14 is applied: The oldest boiler was commissioned in 1986 and would hence have 26 years at the end of the 10 year crediting period. Records have been provided from the boilers' maintenance history, which confirm that they all were in operation and well maintained. The typical lifetime of well maintained boilers is well over 40 years. It is therefore justifiable to assume that none of the four displaced boilers would have had to be replaced in the absence of the project activity.