CLEAN DEVELOPMENT MECHANISM

SMALL SCALE PROJECT DESIGN DOCUMENT (CDM-PDD)

RICKLI BIOMASS ELECTRICITY GENERATION PROJECT

Version 2.0

Prepared by
EcoSecurities Ltd

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A. General description of project activity

A.1 Title of the project activity:

Rickli Biomass electricity generation project

A.2 Description of the project activity:

The Rickli Biomass electricity generation project (hereafter, the Project) developed by Rickli is a biomass electricity generation in the Carambei, Paraná state, Brasil, that will diminish Rickli's electricity demand from grid, and will also sell the surplus generated electricity to the grid. Rickli is a sawmill company, which the core business is the production of doors to be exported. The wood used by Rickli comes from it own planted *Pinus spp.* forests.

The project consists in the construction of a new biomass electricity co-generation unit with 5MW of installed capacity using biomass residues as fuel, supplying all the Rickli demand and exporting the surplus to grid. Part of the residues comes from Rickli and part from third parties. With this new thermoelectric plant, Rickli will deactivate the old boiler used only to produce steam. This old boiler uses biomass as fuel and it does not generates electricity.

One of the main activities in the region where the project is located is the wood industry, with many sawmills. The sawmills generate huge amounts of biomass residues (sawmill residues), and the Brazilian legislation prohibits the uncontrolled burning of that biomass. As result, the sawmills have huge amount of biomass that are left for decay. The Rickli project is a solution for the biomass residues problem in the region, and will greatly improve the quality of electricity service in the town of Carambei. The unique type of biomass that Rickli is going to use is sawmill residues as fuel for the boiler. The amount of biomass used by third suppliers is 72,000 tonnes of biomass per year, therefore the transport emissions were considered on the project calculations. Also, impacts relevant to noise were considered and mitigated by the environmental control plan elaborated by Rickli.

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

- Increases employment opportunities in the area where the project is located;
- Diversifies the sources of electricity generation;
- Uses clean and efficient technologies, and conserves natural resources, thus the project will be meeting the Agenda 21 and Sustainable Development Criteria of Brazil.
- Acts as a clean technology demonstration project, encouraging development of modern and more efficient generation of electricity and thermal energy using biomass fuel throughout the Country;
- Optimises the use of natural resources, avoid new uncontrolled waste disposal places, using a large amount of wood residues from region;

A.3 Project participants:

- **Carbon credit owner and project manager:** Madeireira Rickli Ltda.
- **Project CO_2 Advisor and Annex 1 Party**: EcoSecurities Ltd, UK

A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

A.4.1.1 Host country Party(ies):

Brazil

A.4.1.2 Region/State/Province etc.:

Parana state

A.4.1.3 City/Town/Community etc:

Carambei

A.4.1.4 Detailed description of the physical location, including information allowing the unique identification of this project activity *(max one page)*:

The project is located in Rickli main industrial complex, situated in the municipality of Carambei, Parana state (PR 151, Km 130, Carambei, Paraná state, CEP 84145-000).

A.4.2 Type and category(ies) and technology of project activity

The Project conforms to the small projects Type 1.D since the nominal installed capacity of the Project is below the 15 MW threshold and the plant will sell its generated electricity to the grid.

In addition, the methane avoidance component of the project is eligible under Type III.E of the simplified procedures because in the project scenario the emissions related to the combustion of the biomass thus avoiding methane production will be lower than 15,000 tCO_2e annually.

The plant to be installed is composed by a boiler manufactured by H.Bremer & Filhos Ltda, model Lignudin with an installed capacity of 25 tonnes of steam per hour (temperature of 400°C and pressure of 42 Kgf/cm2). The turbine is manufactured by Dresser Rand, working at 5700 rpm. The generator is from Toshiba with installed capacity of 6250 MVA, or 5 MW of electricity generation. There is also automation software developed by Siemens for controlling and monitoring all system.

All the employees were trained concerning new safety measures and management capacity for operating the new thermoelectric equipment. To do this, Rickli has developed the report "Programa de Gerenciamento de Riscos" (Risk Managing Programme). All employees were submitted to a specific training course and at the end each one received a certification.

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.4.3 Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity:

The proposed project activity will displace energy from a more carbon-intensive grid. In addition, the project will also lead to the avoidance of methane emissions given that the biomass used for electricity generation would otherwise be left for decay or landfilled generating methane. The estimate of total reductions from the electricity generation component is 569,478 tCO_2e over 21 years.

Another source of emission reduction of the project is avoidance of methane emissions from decomposition of wood and biomass in landfills. Brasil has a huge wood industry, with more than 1200 sawmills. Most of industries (87%) are located in south region. As an example, Parana and Santa Catarina states represent almost 80% of all *Pinus spp*. consumption (Sant'anna et.al[1]).

The Brazilian technologies in sawmills in general are very poor, and less than 50% of wood is transformed in products. The other 50% are wood residues. Given the large number of sawmills in south region the biomass residue generation is concentrated in this region, creating an excess of biomass residues that the market cannot absorb.

A study from Brand et.al. (2001)[2] reports the production and use of wood residues of 283 companies in the region around the municipality of Lages, Santa Catarina state. The study concludes that more than 20% of residues are not used or sold resulting in many large biomass piles that are left for decay, generating methane during this process. Brand et.al. study was limited to the region around the municipality of Lages and it took in to account only part of the wood industries in the region and excluded the pulp and paper sector. The selected region accounts for only 94,400 ha of *Pinus spp.* plantation.

According to a study from ABIMCI[3] (Associação Brasileira da Indústria de Madeira Processada Mecanicamente), Santa Catarina state has 598 industries in the wood sector, and a total area of *Pinus spp.* plantation of 317,000 ha. Given that Pinus is, according to Brand et.al study, an important source of residue generation in the region, we conclude that the study covers 47% of the industry (in number of industrial plants) and 30% of the *Pinus spp.*planted area.

Taking into account that the study concludes that the covered area generates around 960,000 t/year of unused residues it is reasonable to conclude that the state of Santa Catarina alone produces around 2.2 to 3.0 million t/yr of residues. This amount is more than enough to supply the project developer demand, and other potential consumers, will need for the project.

The state of Parana has a Pinus plantation area of 605,000 ha[4], almost twice as big as Santa Catarina state, and the wood sector is organized in a very similar way[5]. Although there are no specific studies

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[1] Sant'Anna, Mário; Teddy A. Rayzel; Mário C. M Wanzuita, 2004. Indústria consumidora de Pinus no Brasil. Rev. da Madeira. nº 83 - ano 14 - Agosto de 2004.

[2] Brand, Martha A; Flávio J. Simioni; Débora N. H. Rotta; Luiz Gonzaga Padilha Arruda. Relatorio Final do Projeto " Caeacterizacao da producao e uso dos residuos madeiraveis gerados na industria de base florestal da regiao serrana catarinense, 2001.

[3] "Setor de processamento Mecanico da Madeira no Estado de Santa Catarina", Associação Brasileira da Indústria de Madeira Processada Mecanicamente, 18/02/2004, available at www.abimci.com.br, accessed in 10/12/04.

[4] Data available at sbs.org.br, accessed in 10/12/04.

[5] "Setor de processamento Mecanico da Madeira no Estado do Parana", Associação Brasileira da Indústria de Madeira Processada Mecanicamente, 18/02/2004, available at www.abimci.com.br, accessed in 10/12/04.

for the region around the project, it is reasonable to conclude that Parana state alone produces around 4 to 6 million t/yr of residues.

Note that the estimation above excludes the availability of residues from the nearby state of Rio Grande do Sul that is also a big wood producer (Pinus plantation area of 137,000 ha[6]). In any case, all three states also have substantial areas of plantations of other species.

As additional information about biomass availability in Brazil, a presentation form Waldir Ferreira Quirino Eng. Florestal, Ph.D., IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis) points to an estimated production of wood and agricultural residues produced and not utilised in Brazil is of 200 million tonnes per year. His study estimates that 50 million tonnes are derived from the forestry sector (Revista Sul Ambiental, 9, March 2004). This is intimately linked to the wood processing industry, as 75% of wood processed becomes residue (Revista da Madeira 85, Nov 2004). According to Revista da Madeira 80, April 2004), the potential for wood biomass generation in the South Region of Brasil is at least 200 MW.

Under the Project Scenario these residues would not be stockpiled but instead burned in the cogeneration plant. The estimate of total reductions from the methane component is 2,117,787 tCO_2e over 21 years. Total emission reductions from the electricity and methane components are estimated as 2,687,265 tCO_2e over 21 years, which means an average annual emission reduction of 127,965 tCO_2e.

For details of the emission reduction calculations, please refer to Section E.

A.4.4 Public funding of the project activity:

The project will not receive any public funding from Parties included in Annex I.

A.4.5 Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

This small-scale renewable energy project is not part of a larger emission-reduction project given that this is the unique CDM project proposed by Rickli.

[6] Data available at sbs.org.br, accessed in 10/12/04.

B. Baseline methodology

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

- Project Activity 1.D. - Renewable electricity generation for a grid

combined with

- Project Activity 3.E. – Methane avoidance.

B.2 Project category applicable to the project activity:

According to the sectoral scope list presented by UNFCCC (http://cdm.unfccc.int/), the project is related with the sectoral scopes 1 Energy industries (renewable - / non-renewable sources) and 13 (Waste handling and disposal).

B.3 Description of how the anthropogenic GHG emissions by sources are reduced below those that would have occurred in the absence of the proposed CDM project activity *(i.e. explanation of how and why this project is additional and therefore not identical with the baseline scenario)*

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities, evidence to why the proposed project is additional can be done by conducting an analysis of the following: (a) investment barrier, (b) technological barrier, and (c) prevailing practice. The result is a matrix that summarizes the analyses, providing an indication of the barriers faced by each scenario. The most plausible scenario will be the one with the fewest barriers.

The first step in the process is to list the likely future scenarios. Two scenarios were considered:

- <u>Scenario 1 - The continuation of current activities</u> – This scenario represents the continuation of current practices, which is the electricity generation based on a higher carbon intensity. Methane emissions from biomass residues decay.
- <u>Scenario 2 - The construction of the new renewable energy plant</u> – In this scenario, a new source of low carbon emissions electricity will be available and will displace the higher carbon intensity electricity prevailing in the baseline scenario. No methane emissions from biomass residues decay.

The barriers are as follows:

- <u>Financial/economical</u> – This barrier evaluates the viability, attractiveness and financial and economic risks associated with each scenario, considering the overall economics of the project and/or economical conditions in the country.

- <u>Technical/technological</u> – This barrier evaluates whether the technology is currently available, if there are indigenous skills to operate it, if the application of the technology is a regional, national or global standard, and generally if there are technological risks associated with the particular project outcome being evaluated.

- Prevailing business practice – This barrier evaluates whether the project activity represents prevailing business practice in the industry. In other words, this barrier assesses whether in the absence of regulations it is a standard practice in the industry, if there is experience to apply the technology and if there tends to be high-level management priority for such activities.

With respect to **financial/economical** barriers:

- The continuation of current practices (Scenario 1) does not pose any financial/economical barrier to the project developer, and requires no further financing.

- The construction of a renewable energy plant (Scenario 2) faces specific financial/economic barriers due to the fact that the capital costs related to biomass units 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. Although the PROINFA Brazilian Government Programme is a compulsory program, which promotes renewable energies (e.g., biomass, wind, and small hydro units). It works by providing guaranteed prices that are higher than the market price for electricity for the next 20 years. However, the project proponents has opted to not receive subsides under PROINFA. Besides, part of the electricity will be consumed internally and therefore will not be sold for the grid.. The financial barrier is demonstrated through a financial analysis, which the results are presented in table 1 below. Values used in the financial analysis are presented in the Annex 4. The carbon revenues increase the returns of the project to an acceptable level compared to other investments in Brasil.

Table 1: **Financial Analysis Results**

	with carbon	**without C**
Net Present Value ($)	828,801	(792,019)
IRR	15,11%	8,64%
Discount rate	12%	
Present Value of carbon sold (21 years) $	**2,857,424**	

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

- In the case of Scenario 1 (continuation), there are no technical/technological issues as this simply 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 Scenario 2, 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 analysis of **prevailing business practice**:

- The continuation of current practices (Scenario 1) 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.

Moreover, and as mentioned in section A.4.3, Brasil has a huge wood industry, with more than 1200 sawmills. Most of industries (87%) are located in south region. As an example, Parana and Santa Catarina states represent almost 80% of all *Pinus spp*. consumption (Sant'anna et.al, 2004).

The Brazilian technologies in sawmills are very poor, and less than 50% of wood is transformed in products. The other 50% are wood residues. Given the large number of sawmills in south region the biomass residue generation is concentrated in south region, creating an excess of biomass residues that the market cannot absorb. According to Brand et.al. (2001), more than 20% of residues are not used or sold. Thus, there are many large biomass piles that are left for decay, generating methane during this process.

- The construction of a new renewable energy plant (Scenario 2) represents a deviation from the company's core business (door 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 a fuel represents a barrier. Also, Rickli will use exclusively residues like sawdust, wood ships and forest biomass, that have a small value on the biomass market and therefore, in the absence of the project definitely would be left to decay. To make this scenario possible a new, expensive, and complex process must be installed, given that the residues are composed of materials of different types, with significant differences of granulometry and calorific content. This 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 high management capacity and have high economic costs. Finally, the outsourcing of some activities (e.g., energy production) is a market trend because it tends to simplify operations at the facility.

Table 2 below summarises the results of the analysis regarding the barriers faced by each of the plausible scenarios. As the table indicates, Scenario 1 faces no barriers, whereas Scenario 2 faces two important barriers – the financial/economic and the prevailing business practice barriers.

Table 2: Summary of Barriers Analysis

Barrier Evaluated		Scenario 1	Scenario 2
		Continuation of current activities	Construction of a new plant
1.	Financial / Economical	No	**Yes**
2.	Technical / Technological	No	No
3.	Prevailing Business Practice	No	**Yes**

To conclude, the barrier analysis above has clearly shown that the most plausible scenario is the continuation of current practices (continuation of use of electricity from the grid). Therefore, the scenario 2 is not the same as the baseline scenario, and these are defined as follows:

- The **Baseline Scenario** consists in an old boiler that produces only steam (8 tonnes of steam/hour), used to dry the wood, with no electricity generation, and importation of energy to supply Rickli demand. This old boiler consumes 14,317 tonnes of biomass per year and it will be replaced by a new one (25 tonnes of steam/hour) that will consume 96,023 tonnes of biomass per year. This scenario is represented by the continued use of electricity from the grid. Additionally, biomass which will be used in the project activity will decay in landfills, generating methane.

- The **Project Scenario** is represented by the construction of a new renewable energy plant of 5 MW with deactivation of the old one. Therefore, the amount of biomass previously consumed

(14,317 tonnes of biomass per year) will not be considered for the methane avoidance component calculations. The new plant will displace electricity imported from a more carbon-intensive source, thus resulting in significant GHG emission reductions. The surplus of electricity generated will be exported to grid. Additionally, biomass residues will be used avoiding landfilling, and associated methane emissions.

The Project Scenario is environmentally additional in comparison to the baseline scenario, and therefore eligible to receive Certified Emissions Reductions (CERs) under the CDM.

B.4 Description of the project boundary for the project activity:

The project boundary is defined as the national margin around a project within which the project's impact (in terms of carbon emission reductions) will be assessed. As referred to in Appendix B for small-scale project activities, the project boundary for a small scale renewable energy project that provides electricity to a grid encompasses the physical, geographical site of the renewable generation source. For the Project this includes emissions from activities that occur at the project location.

The system boundary for the baseline is defined as the sub-national interconnected grid of the S-SE Brazil, and will include all the direct emissions related to the electricity produced by the power plants to be displaced by the Project.

B.5 Details of the baseline and its development:

B.5.1 Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:

The Project uses baseline Type 1.D with option (a) of paragraph 29 of Appendix B, related to the generation and supply of renewable energy to the grid.

In addition, the project also includes a methane avoidance component that will use baseline Type III.E, as defined in paragraph 93 of Appendix B.

B.5.2 Date of completing the final draft of this baseline section *(DD/MM/YYYY)*:

17/02/2005

B.5.3 Name of person/entity determining the baseline:

The entity determining the baseline and participating in the project as its Carbon Advisor is EcoSecurities Ltd. The individuals at EcoSecurities that prepared the baseline is Pablo Fernandez de Mello e Souza and Flávia Resende.

C. Duration of the project activity and crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

17/06/2004

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

30 years

C.2 Choice of the crediting period and related information:

(Please <u>*underline*</u> *the selected option (C.2.1. or C.2.2.) and provide the necessary information for that option.)*

<u>**C.2.1. Renewable crediting period (at most seven 7 years per period)**</u>

C.2.1.1. Starting date of the first crediting period *(DD/MM/YYYY):*

01/01/2005

C.2.1.2. Length of the first crediting period:

7y – 0m

C.2.2. Fixed crediting period (at most ten (10) years)

C.2.2.1. Starting date *(DD/MM/YYYY):*

C.2.2.2. Length (max 10 years):

D. Monitoring methodology and plan

D.1. Name and reference of approved methodology applied to the project activity:

Monitoring methodology described in paragraph 31 of Appendix B of the Simplified Modalities and Procedures for Small Scale CDM project activities, Baseline Type 1.D.

In addition, the project also includes a methane avoidance component that will use the monitoring methodology listed for baseline Type III.E, as defined in paragraph 95 of Appendix B.

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

As the project is eligible for using the methodologies listed in Appendix B of the Simplified Modalities and Procedures for Small Scale CDM project activities, it was felt that it should use the monitoring methodologies proposed for this project type.
The methodology applied to the project does not require monitoring of transport emissions. Besides, it would be expensive, difficult and inaccurate to monitor emissions released by biomass transportation. Therefore, it was created a transport emission factor (TEF) (see section E and annex 4 for more information about TEF). The emissions by biomass transportation are equivalent to: amount of biomass multiplied by TEF. For all biomass purchased by third parties this factor will be applied for leakage calculation.

D.3 Data to be monitored:

Table 3: Data to be collected in order to monitor emissions from the project activity, and how this data will be archived.

ID n°	Data type	Data variable	Data unit	Measured (m), calculated (c) indicated (I) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
D.3.1	Energy	Gross Electricity generated by the project	MWh	M	Continuous	100%	Electronic and paper	During the whole crediting period + 2 years	The net electricity produced will displace electricity imported from grid, and the surplus will be exported to grid.
D.3.2		Electricity consumed by the project (new plant)							
D.3.3	Fuel	Amount of Biomass consumed by the project and generated by Rickli	tonne/ month	M	Monthly	100%	Electronic and paper	During the whole crediting period + 2 years	Rickli will monitor the biomass consumed by the project through the invoices emitted by the suppliers.
D.3.4		Amount of Biomass consumed by the project and obtained from third parties							
D.3.5		Total annual project activity (methane component) related emissions	tCO_2e/yr	C	Yearly	100%	Electronic and paper	During the whole crediting period + 2 years	

D.4. Name of person/entity determining the monitoring methodology:

EcoSecurities Ltd. is the entity determining the monitoring plan and participating in the project as the Carbon Advisor.

E. Calculation of GHG emission reductions by sources

E.1 Formulae used:

E.1.1 Selected formulae as provided in appendix B:

No formula is provided to quantify emission reduction of electricity generation in the Baseline Type 1.D.

The methane avoidance component of the project used the formulae listed in the simplified methodology type III.E, as follows:

$CH_4\_IPCC_{decay}$ = (MCF * DOC * DOC_F * F * 16/12)

where,
$CH_4\_IPCC_{decay}$ = IPCC CH_4 emission factor for decaying biomass in the region of project activity (tonnes of CH_4/tonne of biomass or organic waste)
MCF = methane correction factor (fraction) (default is 0.4)
DOC = degradable organic carbon (fraction, see equation below or default is 0.3)
DOC_F = fraction DOC dissimilated to landfill gas (default is 0.77)
F = fraction of CH_4 in landfill gas (default is 0.5)

For DOC, the following equation may be used instead of the default:

DOC = 0.4 (A) + 0.17 (B) + 0.15 (C) + 0.30 (D)

where,
A = per cent waste that is paper and textiles
B = per cent waste that is garden waste, park waste or other non-food organic putrescibles
C = per cent waste that is food waste
D = per cent waste that is wood or straw

$BE_y = Q_{biomass} * CH_4\_IPCC_{decay} * GWP\_CH_4$

where,
BE_y = Baseline methane emissions from biomass decay (tonnes of CO_2 equivalent)
$Q_{biomass}$ = Quantity of biomass treated under the project activity (tonnes)
CH_4_GWP = GWP for CH_4 (tonnes of CO_2 equivalent/tonne of CH_4)

According to the same guidelines for type III.E small-scale emission reduction projects, the project emissions are calculated using the following formula:

$PE_y = Q_{biomass} * E_{biomass} (CH_4bio\_comb * CH_4\_GWP + N_2Obio\_comb * N_2O\ \_GWP)/10\verb|^|3$

where,
PE_y = Project activity emissions (kilotonnes of CO_2 equivalent)
$Q_{biomass}$ = Quantity of biomass treated under the project activity (tonnes)
$E_{biomass}$ = Energy content of biomass (TJ/tonne)
CH_4bio_comb = CH_4 emission factor for biomass and waste (which includes dung and agricultural, municipal and industrial wastes) combustion (kg of CH_4/TJ, default value is 300)
CH_4_GWP = GWP for CH_4 (tonnes of CO_2 equivalent/tonne of CH_4)

N_2Obio_comb = N_2O emission factor for biomass and waste (which includes dung and agricultural, municipal and industrial wastes) combustion (kg/TJ, default value is 4)
N_2O_GWP = GWP for N_2O (tonnes of CO_2 equivalent/tonne of N_2O)

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

No formula is needed. Emissions by sources are nil since renewable energy is either a zero CO_2 or CO_2 neutral source of energy.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

The methodology applied to the project does not require the calculation of transport emissions. Although the validator required the inclusion of transport emissions for biomass from third parties. The formula is described below:

$$L = TEFxQ_{biomass}$$

Where:
L: Leakage (t CO2e/year)
TEF: Transportation Emission Factor (tCO2e/t of biomass transported)
$Q_{biomass}$: Amount of biomass from third parties used in project activity(t biomass/year)

$$TEF = 2^* \times (FC \times D) \times EF / TC$$

Where:
TEF: Transportation Emission Factor (tCO_2e/t of biomass transported)
FC: Fuel Consumption (Km/l)
D: Distance (km)
EF: Fuel Emission Factor (t CO_2e/ 10^3 litters of fuel)
TC: Truck Capacity (tonne)
*This value corresponds to going and coming back.

The TEF used for this project activity is 0.00674 tCO_2e/t of biomass transported. All parameters used to estimate transport emissions are in annex 4. The leakage was calculated as 485 t CO_2e per year.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions:

485 t CO_2e per year due to transport emissions. Project emissions from the methane are in section E.1.1.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

The baseline emissions (BE_y) resulting from the electricity supplied and/or not consumed from the grid is calculated as follows, where EG_y is the annual net electricity generated from the Project.

$$BE_y = EG_y * EF_y$$

The baseline emissions factor (EF_y) is a weighted average of the EF_OM_y and EF_BM_y:

$$EF_y = (\omega_{OM} * EF\_OM_y) + (\omega_{BM} * EF\_BM_y)$$

where the weights ω_{OM} and ω_{BM} are by default 0.5.

The Operating Margin emission factor (EF_OM_y) is calculated using the following equation:

$$EF\_OM_y\,(tCO_2/MWh) = \frac{\sum_{i,j} F_{i,j,y} * COEF_{i,j}}{\sum_j GEN_{j.y}]}$$

Where:
$F_{i,j,y}$ is the amount of fuel i (in GJ) consumed by power source j in year y;
j is the set of plants delivering electricity to the grid, not including low-cost or must-run plants and carbon financed plants;
$COEF_{i,j,y}$ is the carbon coefficient of fuel i (tCO_2/GJ);
$GEN_{j.y}$ is the electricity (MWh) delivered to the grid by source j.

The Build Margin emission factor (EF_BM_y) is the weighted average emission factor of a sample of power plants m. This sample includes either the last five plants built or the most recent plants that combined account for 20% of the total generation, whichever is greater (in MWh). The equation for the build margin emission factor is:

$$EF\_BM_y\,(tCO_2/MWh) = \frac{[\sum_{i,m} F_{i,m,y} * COEF_{i,m}]}{[\sum_m GEN_{m.y}]}$$

where $F_{i.m,y}$, $COEF_{i,m}$ *and* GEN_m are analogous to the *OM* calculation above.

For this project, data and assumptions for combined margin calculation have been based on a study from the International Energy Agency (Bosi et al., 2002[7]), and the COEF used was already validated for another project (Celulose Irani, Brasil, validated by DNV in January 2005).

[7] Bosi, M. et al. 2002. Road-Testing Baselines for Greenhouse Gas Mitigation Projects in the Electric Power Sector (OECD and IEA Information Paper COM/ENV/EPOC/IEA/SLT - 2002 6). Paris:OECD. Available at: http://www.oecd.org/env/cc (20 Apr 2004).

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Total annual emissions reductions from electricity generation and methane avoidance is 127,965 tons CO_2e per year.

E.2 Table providing values obtained when applying formulae above:

Table 4: Electricity generation emission reductions in project scenario.

Electricity generation emission reductions	**Per year**	**Total (crediting period)**
Operating Margin Emissions Factor ($EF\_OM_{y,}$ in tCO_2/MWh)	0,957	n/a
Build Margin Emissions Factor ($EF\_BM_{y,}$ in tCO_2/MWh)	0,421	n/a
Baseline Emissions factor (EF_y)	0,689	n/a
Electricity generated by the project (EG, in MWh)	39.353	826.403
Baseline Emissions (BE, in tCO_2)	27.118	569.478
Project emissions (PE, in tCO_2)	0	0
Emission reductions from electricity generation (tCO_2)	27.118	569.478

Table 5: Methane avoidance emission reductions in project scenario.

Methane avoidance emission reductions	**Per year**	**Total (crediting period)**
DOC	0,3	n/a
$CH_4\_IPCC_{decay}$ (tCH_4/tonne of biomass or organic waste)	0,0616	n/a
Quantity of biomass ($Q_{biomass}$, in tonnes)	81.706	1.715.829
Baseline Emissions (BE, in tCO_2e)	105.695	2.219.597
Energy content of biomass ($E_{biomass}$, in TJ/tonne)*	0,007082	n/a
Project emissions (PE, in tCO_2e)	4.363	91.619
Leakage due to project emissions	485	10.190
Emission reductions from methane avoidance (tCO_2)	100.847	2.117.787

* Based on Brand *et al* (2001) from UNIPLAC, Santa Catarina, Brasil.

Table 6: Total project emission reductions due to renewable electricity generation and methane avoidance components.

Total project emission reductions	**Per year**	**Total**
Emission reductions from electricity generation (tCO_2)	27.118	569.478
Emission reductions from methane avoidance (tCO_2)	100.847	2.117.787
Total emission reductions (tCO_2)	127.965	2.687.265

F. Environmental impacts

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Documentation

The renewable energy plant has received permit for construction from ANEEL, the Brazilian electricity energy National Agency (License ANEEL n°123, published in the Brazilian Official Diary, n° 45 section 1, 7th march 2002.

The environmental permit for operation from the Environmental Agency of Paraná state (IAP – Instituto Ambiental do Paraná) has the number 4361, and it was emitted in 6th April 2004, valid until 6th April 2006.

Renewable electricity generation

The project will contribute to displace more carbon-intensive electricity generation sources from the South-Southeast grid, promoting the use of renewable fuels (biomass) for electricity generation.

Sawdust and woodchips residues

The project will improve the local environmental condition due to the adequate treatment of sawdust and woodchip residues. Currently these residues are a problem because they are left decomposing in landfills, releasing methane emissions to the atmosphere.

G. Stakeholders comments

G.1 Brief description of the process by which 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[8], any CDM 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 Carambei;
- Chamber of Carambei;
- Environment agencies from the state and Local Authority;
- Brazilian Forum of NGOs;
- District Attorney (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. EcoSecurities and the project developer addressed questions raised by stakeholders during this period.

G.2 Summary of the comments received:

To date, no comments have been received.

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

To date, no comments have been received.

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[8] Source: http://www.mct.gov.br/clima/comunic/pdf/Resolução01p.pdf

Annex 1

CONTACT INFORMATION FOR PARTICIPANTS IN THE PROJECT ACTIVITY

Project sponsor:

Organization:	Madeireira Rickli Ltda.
Street/P.O.Box:	PR-151, Km 130
Building:	-
City:	Carambei
State/Region:	Parana
Postcode/ZIP:	84145-000
Country:	Brazil
Telephone:	+55 42 231-1481
FAX:	-
E-Mail:	info@madeireirarickli.com.br
URL:	www.madeireirarickli.com.br
Represented by:	
Title:	-
Salutation:	Mr.
Last Name:	Rickli
Middle Name:	-
First Name:	Marcelo
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Project Carbon advisors and Project Annex 1 sponsor:

Organization:	EcoSecurities Ltd.
Street/P.O.Box:	
Building:	21 Beaumont Street
City:	
State/Region:	Oxford
Postcode/ZIP:	OX1 2NH
Country:	UK
Telephone:	+44 1685 202 635
FAX:	+44 1865 251 438
E-Mail:	
URL:	www.ecosecurities.com
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Moura Costa
Middle Name:	
First Name:	Pedro
Department:	
Mobile:	
Direct FAX:	
Direct tel:	+44 1865 297 483
Personal E-Mail:	pedro@ecosecurities.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funds.

Appendix 1

REFERENCES

Bosi, M. et al. 2002. Road-Testing Baselines for Greenhouse Gas Mitigation Projects in the Electric Power Sector (OECD and IEA Information Paper COM/ENV/EPOC/IEA/SLT - 2002 6). Paris:OECD. Available at: http://www.oecd.org/env/cc (20 Apr 2004)

Brand, Martha A; Flávio J. Simioni; Débora N. H. Rotta; Luiz Gonzaga Padilha Arruda, 2001. Relatorio Final do Projeto " Caracterizacao da producao e uso dos residuos madeiraveis gerados na industria de base florestal da regiao serrana catarinense.". Univer. Planalto Catarinense (UNIPLAC).

Sant'Anna, Mário; Teddy A. Rayzel; Mário C. M Wanzuita, 2004. Indústria consumidora de Pinus no Brasil. Rev. da Madeira. nº 83 - ano 14 - Agosto de 2004.

Appendix 2

CALCULATION PARAMETERS

FINANCIAL ANALYSIS PARAMETERS	
I) Electricity generation	
Tariff (U$/MWh)	35,00
VAT	17%
Price of carbon (U$/tCO2)	3,75
Pre-operational Costs	50.000
Investment	4.363.000
Eletricity Plant - Operating Costs ($/MWh)	12,00
Carbon Offset Monitoring and verification	50.000
Insurance	2%
Contingencies	5%
Depreciation	10%
Income tax	32%
Discount rate	12%

ESTIMATION OF TRANSPORT EMISSIONS FOR RICKLI PROJECT

Description	Value	Unit	Source
Biomass/truck	20	t	Client
Truck Diesel consumption	4,0	km/l	Client
Average distance	100	km	Client
Biomass consumed/year (third parties)	72.000	t	Client
Diesel consumption/year	180.000	l	=2*C6*C7/(C4*C5)/1000
Carbon emission factor Diesel	2,696	t CO2/10^3 l	=C23
Transport CO2 emission	485,2	tCO2/y	=C9*C8
Project emission	4.357	tCO2/y	PDD
Emission reduction methane	100.715	tCO2/y	PDD
Emission reduction electricity	27.118	tCO2/y	PDD
Emission reduction total	105.073	tCO2/y	PDD
Transport Emission Factor	0,00674	tCO2/ton biomass	
% Transport emissions	0,46%		PDD

Description (for diesel)	Value	Unit	Source
CV	43,33	Tj/10^3t	IPCC
CEF	20,20	t C/Tj	IPCC
CEF	875,27	t C/10^3t	=C18*C17
CEF	3.209	t CO2/10^3t	=C19*44/12
Density	0,84	g/ml (kg/l) (t/10^3 l)	BEN 2003
CEF	2.696	t CO2/10^6 l	=C20*C21
CEF	2,696	t CO2/10^3 l	=C22/1000