CLEAN DEVELOPMENT MECHANISM SIMPLIFIED PROJECT DESIGN DOCUMENT FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD) Version 02

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

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Inácio Martins Biomass Project, version 5C[1] ~~5B~~.

The only changes made to this version of the PDD compared to the PDD submitted to the Interministerial Comission on Global Climate Change on 24 October 2005 referred to in the letter of approval of the DNA of Brazil, are related to the recalculation of the build margin emission factor with the plant efficiencies recommended by the CDM Executive Board at its 22nd meeting and to the changes in "Project Participants" and "Annual Emission Reductions", guided by the new "GUIDELINES FOR COMPLETING CDM-SSC-PDD and F-CDM-SSC-Subm".

A.2. Description of the small-scale project activity:

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The Inácio Martins Biomass Project (hereafter, the Project) developed by Usina Termoelétrica Abílio Bórnia, S.A., a joint venture between Propower Energy S.A., and Winimport S.A. (hereafter referred to as the Project Developer) is a biomass power plant generation project in the town of Inácio Martins, State of Paraná.. The project developer is close to an agreement with an independent energy consumer to buy the electricity generated by the proposed project activity. The independent energy consumer currently purchases electricity from the national grid and has a total installed capacity of 11,2 MW.

The project is greatly improving the renewable electricity generation in the town of Inácio Martins, avoiding future problems with electricity supply. The Project Developer is proposing to build a biomass generation plant to supply the energy to displace electricity generation from a more fossil-intensive grid, thus reducing GHG emissions in the process. This new biomass generation plant will use approximately 200,000 tonnes of biomass per year, which will be provided by 25 sawmill companies. -The sawmills in the region use wood from *Pinus* and *Eucaliptus* plantations. There are about 150 sawmills in the region of Inácio Martins, which pile the sawdust forming real hills of up to 10 metres, representing a big environmental problem in the region. Thus, the project scenario also involves avoiding releasing methane emissions from the biomass sent to landfills and/or left to decompose.

[1] Version 5B of the PDD was updated to reflect changes requested during a request for review process undertaken by the CDM Executive Board in June 2006.

The electricity currently generated by the grid is relatively carbon intensive, with an operating margin emission factor of 0.947 tCO_2/MWh and a build margin emission factor of 0.105 tCO_2/MWh (see section B for further details). In the last decade, the electricity generation in Brazil was mainly based on hydropower. However, the share of coal and natural gas has been increasing over the last years in order to provide security of electricity supply. The amount of biomass used by third suppliers is 200,00 tonnes of biomass per year, therefore the transport emissions were considered on the project calculations. Biomass pre-processing involves transportation and shredding of the biomass residuals and the energy consumption of this process is considered in project emissions. Also, impacts relevant to noise were considered and mitigated by the engineering project elaborated by projects proponents.

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, specifically, it is expected that over 60 indirect jobs will be created;
- 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 ~~co~~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:

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Table 1: Project participants.

Name of Party involved	Private and/or public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (Host Country)	Usina Termoelétrica Abílio Bornia S/A	No
United Kingdom	EcoSecurities Ltd	No

Further contact information of project participants is provided in Annex 1.

A.4. Technical description of the small-scale project activity:

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A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

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Brazil

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

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South Region, State of Paraná

A.4.1.3. City/Town/Community etc:

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City of Inácio Martins.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

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The project is located within the City of Inácio Martins in the Department of Irati-Pr, at the property called Boa Vista, premise of Beira Linha, parcel of land #8.

A.4.2. Type and category(ies) and technology of the small-scale project activity:

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The Project conforms to the small scale 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 Biochamm Ltda., a Brazilian company. The boiler will use 4 types of biomass as fuel that corresponds to the typical biomass mix found in the landfills in the region. Biomass of high quality, such as wood ships (*cavaco* in Portuguese), will not be purchased by the plant. Only wood residues, known generically in the region as biomass (*biomassa* in Portuguese) will be purchased. The boiler will generate steam with temperature of 420°C ~~and~~ , pressure of 43 bar, flow of 53 t/h and enthalpy of 779,09 kcal/h. The steam turbine is manufactured by German company Tuthill. It has more than 96% hours/year of availability and it's electrical power generation equals 12.33 MW. This is a case of technology transfer, since this type of technology is a new development and it is still not available from any Brazilian company. The new biomass generation plant will not use any fossil fuels for the start-up during the crediting period. The biomass pre-processing involves transportation and shredding of the biomass residuals and the energy consumed i~~o~~n this process ~~is around 540 MWh~~will be captured within the monitoring plan.

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 explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

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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 landfilled generating methane. The estimate of total reductions from the electricity generation component is 973,490 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. Brazil 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* [2]).

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 south region, creating an excess of biomass residues that the market cannot absorb.

A study from Brand *et al.* (2001).[3] 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. Nevertheless Brand et.al. study was limited to the region around the municipality of Lages , Santa Catarina state.and iIt took in to account only part of the wood industries in the region and excluded the pulp and paper sector. Furthermore the selected region accounts for only 94,400 ha of *Pinus spp.* plantation.

[2] 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.

[3] 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.

According to a study from ABIMCI[4] (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.

The state of Parana has a Pinus plantation area of 605,000 ha[5], almost twice as big as Santa Catarina state, and the wood sector is organized in a very similar way[6]. Although there are no specific studies 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.

As additional information about biomass availability in Brazil, a presentation from 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 sustainable forestry sector (Revista Sul Ambiental, 9, March 2004). This is intimately linked to the wood processing industry, as 75% of wood processed becomes residues (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 Brazil is at least 200 MW.

Under the Project Scenario these residues would not be stockpiled but instead burned in the ~~cogeneration~~ thermoelectric plant. The estimate of total reductions from the methane component is 5,197,525 tCO_2e over 21 years. Total emission reductions from the electricity and methane components are estimated as 6,171,015 tCO_2e over 21 years, which means an average annual emission reduction of 293,858 tCO_2e.

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

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4 "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.

5 Data available at sbs.org.br, accessed in 10/12/04.

6 "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.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:
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Table 2: Annual estimation of emission reductions over the chosen crediting period:

Years	**Annual estimation of emission reductions over the chosen crediting period**
Year 1	293.858
Year 2	293.858
Year 3	293.858
Year 4	293.858
Year 5	293.858
Year 6	293.858
Year 7	293.858
Year 8	293.858
Year 9	293.858
Year 10	293.858
Year 11	293.858
Year 12	293.858
Year 13	293.858
Year 14	293.858
Year 15	293.858
Year 16	293.858
Year 17	293.858
Year 18	293.858
Year 19	293.858
Year 20	293.858
Year 21	293.858
Total estimated reductions (tonnes of CO_2)	6.171.015
Total number of crediting years	21
Annual average over the crediting period of estimated reductions (tonnes of CO_2)	293.858

A.4.4. Public funding of the small-scale project activity:

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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:

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This small-scale renewable energy project is not part of a larger emission-reduction project. The distance between Imbituva Biomass Project boundaries and Inácio Martins Biomass Project boundaries are approximately 100 km and therefore it is not a debundling of a larger project.

SECTION B. Application of a baseline methodology:

B.1. Title and reference of the approved baseline methodology applied to the small-scale project activity:

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- 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 small-scale project activity:

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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 emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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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:

- Scenario 1 - The continuation of current activities – This scenario represents the continuation of current practices, which is the electricity generation based on a higher carbon intensity, and landfilling of sawmill residues releasing methane as a result.

- Scenario 2 - The construction of the new renewable energy plant – In this scenario, a new source of neutral carbon emissions electricity will be available and will displace the higher carbon intensity electricity prevailing in the baseline scenario. Additionally, in this scenario generation of methane emissions will be avoided.

The barriers are as follows:

- Financial/economical – 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.

- Technical/technological – 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 generation plant (Scenario 2) faces specific financial/economic barriers due to the fact that technical/technological innovations carry with them risk premiums in terms of financing. The capital costs involved in the project pose a barrier, especially considering the high interest rates prevalent in Brazil. It is worth noting that there are no direct subsides or promotional support for the implementation of independent renewable energy generation plants. The financial/economical barrier to the project activity is demonstrated through a cash flow financial analysis. Comparing the project results with and without carbon, it is clearly demonstrated that the project would not occur without carbon revenues (see table 1 below). The investment analysis considers all savings and expenses associated to the project such as the revenues from costs reduction with electricity and fuel purchases and the costs associated to the installation and operation of new plant. The carbon revenues increase the project returns to an acceptable level compared to other investments in Brazil

Table 1: Financial Results for project scenario.

	with carbon	**without C**
Net Present Value ($)	783.555	(3.833.944)
IRR	12,74%	8,03%
Discount rate	12%	
Present Value of carbon sold (21 years) $	**6.211.701**	

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 is a significant technical/technological barrier. The technology used in the plant is the ultimate German technology for biomass energy generation. This new technology requires precise operation of plant, requiring also very specialized labour. Moreover, the technical assistance is from Germany, and any problem related to equipment replacement, the new one must come from Germany. It represents a risk for the continuous operation of the plant. An equipment replacement problem can represent a long period of non-activity Finally, the use of biomass residues as fuel is also a technical barrier. The residues are not homogeneous, requiring additional operational efforts. Different types of biomass, stockpiled under different conditions, will be used. Moreover usually biomass residues come from landfills, so it may be contaminated with sand, sludge or other substances which turns the plant operation more difficult.

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.

- The construction of a new renewable energy plant (Scenario 2) represents a deviation from the electricity generation current practices. 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). As a result, such changes require high management capacity and have high economic costs. Still, it is worth noting that the consumption of biomass residues as fuel represents a barrier. Also, Propower will use exclusively residues like sawdust, bark, and shavings (in Portuguese: lamina, serragem, and lamina), 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 practicable, a new expensive and complex process to treat the residues before its use as fuel, must be installed. All the residues are composed by materials of distinct types granulometry and calorific powers This new equipment shreds triturates and homogenizes the wood residues mixture, prior to using it and adds wood to produce a mix of fuel. Moreover, a complex logistic process must be implemented to a non-stop supply of wood residues and wood 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. 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 three important barriers – the financial/economic, the technical/technological and 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	**Yes**
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 project scenario is not the same as the baseline scenario, and these are defined as follows:

- The **Baseline 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. The new plant will displace electricity from a more carbon-intensive source, thus resulting in significant GHG emission reductions. Additionally, biomass will be used avoiding landfilling, and associated methane emisisons.

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 how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

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The project boundary is defined as the notional 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 South-Southeast grid of Brazil, and will include all the direct emissions related to the electricity produced by the power plants to be displaced by the Project. Additionally, based on the contracts signed with the sawmills for biomass supply, the project boundary can be extended to their sites and therefore emissions reductions can be claimed for the methane emissions avoidance of such biomass waste.

Conforming to the guidelines and rules for the small-scale project activities, the emissions related to production, transport and distribution of the fuel used in the power plants in the baseline are not included in the project boundary, as these do not occur at the physical and geographical site of the project. For the same reason the emissions related to the transport and distribution of electricity are also excluded from the project boundary.

B.5. Details of the baseline and its development:

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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.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

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C.1.1. Starting date of the small-scale project activity:

>>

26/10/2004

C.1.2. Expected operational lifetime of the small-scale project activity:

>>

At least 21 years

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

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C.2.1. Renewable crediting period:

>>

C.2.1.1. Starting date of the first crediting period:

>>

01/01/2007~~01/06/2006~~

C.2.1.2. Length of the first crediting period:

>>

7y – 0m

C.2.2. Fixed crediting period:

>>

Not applicable

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

SECTION D. Application of a monitoring methodology and plan:

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D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

>>
Monitoring methodology described in paragraph 31 of Appendix 3 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 small-scale project activity:

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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 appendix 2 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:

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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	Electricity sold to the grid	MWh	M	Continuous	100%	Electronic and paper	During the whole crediting period + 2 years	This item will be monitored by meters
D.3.2		Electricity consumed by ~~Thermo~~pre-processing of biomass							
D.3.3	Fuel	Amount of Biomass consumed by the project and obtained from third parties	tonne/ month	M	Monthly	100%	Electronic and paper	During the whole crediting period + 2 years	All the biomass consumed by the project is obtained from third parties.

D.3.4		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. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>
This monitoring plan contains simplified monitoring requirements to reduce monitoring costs as permitted by small-scale project procedures. Once implemented, the relevant data report will be submitted to a designated operational entity contracted to verify the emission reductions achieved during the crediting period. Any revisions requiring improved accuracy and/or completeness of information will be justified and will be submitted to a designated operational entity for validation. The plan is designed to collect and archive all data needed to:

- Estimate or measure anthropogenic emissions by sources of greenhouse gases occurring within the project boundary during the crediting period as specified in appendix B for the Type/Categories I.D. and III.E.;
- Determine the baseline of anthropogenic emissions by sources of greenhouse gases occurring within the project boundary during the crediting period, as specified in appendix B for the Type/Category I.D. and III.E.;
- Calculate the reductions of anthropogenic emissions by sources by the proposed small-scale CDM project activity, and for leakage effects, in accordance with provisions of appendix B for the Type/Category I.D. and III.E.

The plan does not include monitoring of any variable regarding leakage since no leakage is expected. Nevertheless, in the case of evidence of any leakage, this plan will be revised in order to include a suitable variable.

With regards to quality control, project proponents will be providing relevant quality and assurance procedures when plant operations start. Inácio will use these systems to ensure that data collected for the project are subject to the most rigid quality control systems.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>>
All data to be monitored will be collected and cross checked by the Quality Assurance management sector.

D.6. 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.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

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E.1.1 Selected formulae as provided in appendix B:

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No formula is provided for the baseline for Project Category I.D., paragraph 29 a.

For the methane component, project activity reduces the methane (CH4) emissions due to the burning of the biomass used as fuel. For this component, we used the formulae provided by approved simplified methodology type III.E. All parameters and defaults used are based on IPCC sources, as the methodology III.E requires. More specifically, those values are based on "Revised 1996 IPCC Guidelines for National Greenhouse Gases Inventories." Therefore, all the formulae below are exactly the same present on methodology III.E.

According to the simplified methodology for type III.E small-scale emission reduction projects, the baseline emissions are calculated using the following formulae:

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

where,

CH4_IPCCdecay = 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)

DOCF = 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

$BE_y = Q_{biomass} * CH4\_IPCC_{deca}y * GWP\_CH_4$

where,

BEy = 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:

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

where,

PEy = 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:

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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:

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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. For Methane component see E.1.1.

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

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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:

$$L = TEF * Q_{biomass}$$

Where:

L: Leakage (t CO_2e/year)

TEF: Transportation Emission Factor (tCO_2e/t of biomass transported)

$Q_{biomass}$: Amount of biomass from third parties used in project activity (t biomass/year)

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

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 values corresponds to comings and goings

The TEF used for this project activity is 0,00270 tCO_2e/t of biomass transported. All parameters used to estimate transport emissions are in appendix 2. The leakage was calculated as 539,2 t CO_2e per year.

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

>>

Zero emissions for the electricity generation component. As for the methane component, project emissions are calculated using the formula described in E.1.1.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs 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:

>>

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.

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)[7]:

"… 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 (2000) 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

[7] Bosi, M. *An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study.* International Energy Agency. Paris, 2000.

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 PDD 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.

Approved methodology AM0015 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.

The table below summarizes conclusions of the analysis, with the calculation of the emission factor as presented.

SSC Emission factors for the Brazilian South-Southeast-Midwest interconnected grid		
Small-scale baseline (without imports)	OM (tCO2e/MWh)	Total generation (MWh)
2002	0,9304	276.731.024
2003	0,9680	295.666.969
2004	0,9431	301.422.617
	Average OM (2002-2004, tCO2e/MWh)	Total = 873.820.610
		BM 2004 (tCO2e/MWh)
	0,9472	0,1045
	OM*0.5+BM*0.5 (tCO2e/MWh)	
	0,5258	

~~For this project, data for combined margin calculation have been based on ONS – Operador Nacional do Sistema.~~

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:

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Total annual emissions reductions from electricity generation and methane avoidance is 293,858 tons CO_2e per year.

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

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Table 4: Table providing emissions reductions from electricity generation component.

Electricity generation emission reductions	**Per year**	**Total (crediting period)**	**Formula**
Operating Margin Emissions Factor (EF_OM_y, in tCO_2/MWh)	0,947	n/a	-
Build Margin Emissions Factor (EF_BM_y, in tCO_2/MWh)	0,105	n/a	-
Baseline Emissions factor (EF_y)	0,526	n/a	=(EF_OMy + EF_BMy) / 2
Electricity generated by the project (EG, in MWh)	89.600	1.881.600	-
Baseline Emissions (BE, in tCO_2)	46.357	973.490	=EFy * EGy

Project emissions (PE, in tCO_2)	0	0	-
Emission reductions from electricity generation (tCO_2)	46.357	973.490	=BEy

Table 5: Table providing emissions reductions from methane avoidance.

Methane avoidance emission reductions	**Per year**	**Total (crediting period)**	**Formula**
DOC	0.3	n/a	IPCC values
MCF	0.4	n/a	IPCC values
DOCf	0.77	n/a	IPCC values
Fraction of methane	0.5	n/a	IPCC values
CH_4_IPCC$_{decay}$(tCH_4/tonne of biomass or organic waste)	0.0616	n/a	=MCF x DOC x DOCf x F x 16/12) -
Quantity of biomass ($Q_{biomass,}$ in tonnes$_{)}$	200,000	4,200,000	-
Baseline Emissions (BE, in t CO_2e)	258,720	5,433,120	= Qbiomass x CH4 IPCC decay x GWP CH4
Energy content of biomass ($E_{biomass}$, in TJ/tonne)*	0.006367	n/a	-
CH_4 bio comb (kg of CH_4/TJ)	300	n/a	IPCC values
N2O bio comb (kg of N2O/TJ)	4	n/a	IPCC values
Project Emissions (PE, in tCO_2e)	10,680	224,273	=Qbiomass x Ebiomass x [(CH4 bio

			comb x CH4 GWP) + (N2O bio comb x N2O GWP)] / 1000
Leakage due to project emissions (L)	539	11,322	See Apendix 2
Emission reductions from methane avoidance (tCO2)	247,501	5,197,525	= EB - PE - L

Table 6: Table providing project total emissions reductions annually and for the entire 21-year crediting period.

Total project emission reductions	**Per year**	**Total**
Emission reductions from electricity generation (tCO_2)	46.357	973.490
Emission reductions from methane avoidance (tCO_2)	247.501	5.197.525
Total emission reductions (tCO_2)	293.858	6.171.015

SECTION F.: Environmental impacts:

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

>>

The Paraná Environmental Institute conceded the licence, so-called “Preliminary License” (in Portuguese, “Licença Prévia”), which is specifically required to initiate the bureaucratic process of obtaining the remainder permits for construction and operation of the plant. The project proponents developed a preliminary report, known as RAS (Simplified Environmental Report), which was presented to receive the above mentioned permit. The outcome of the previous license was favourable and the project was found to have no significant environmental impacts. The Paraná Environmental Institute has also conceded the “Installation Licence” N2322 (in Portuguese, “Licença de Instalação”). Where impacts were identified, mitigation measures were defined. The project also brought about more positive environmental benefits than adverse impacts.

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 wood residues

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

SECTION G. Stakeholders’ comments:

G.1. Brief description of 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, 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 Inácio Martins;
- Chamber of Inácio Martins;
- 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. No comments or questions were received during this period. ~~Therefore, since no comments were received, no comments were addressed.~~
~~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:

>>
Not applicable.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY
Project sponsor:

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funding.

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)

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Appendix 2 – Values Used in Financial Analysis

CALCULATION PARAMETERS

Description	Value	Unit	Source
Biomass/truck	20	t	Client
Truck Diesel consumption	2.5	km/l	Client
Average distance	25	km	Client
Biomass consumed/year (third parties)	200,000	t	Client
Diesel consumption/year	200,000	l	=2*C6*C7/(C4*C5)/1000
Carbon emission factor Diesel	2.7	t CO_2/10^3 l	=C23
Transport CO_2 emission	539.2	tCO_2/y	=C9*C8
Project emission	4,363	tCO_2/y	PDD
Emission reduction methane	247.501	tCO_2/y	PDD
Emission reduction electricity	46.357	tCO_2/y	PDD
Emission reduction total	293.858	tCO_2/y	PDD
Transport Emission Factor	0.00270	tCO_2/ton biomass	PDD
% Transport emissions	0.51%		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 CO_2/10^3t	=C19*44/12
Density	0.84	g/ml (kg/l) (t/10^3 l)	BEN 2003

CEF	2,696	t CO_2/10^6 l	=C20*C21
CEF	2,696	t CO_2/10^3 l	=C22/1000

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