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

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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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CAMIL Camaquã Biomass Electricity Generation Project

A.2. Description of the small-scale project activity:
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Purpose
The CAMIL Camaquã Biomass Electricity Generation Project developed by CAMIL in close co-operation with PTZ, is a project in the Camaquã city, Rio Grande do Sul state, Brazil, that will eliminate CAMIL's electricity demand from the grid, will sell the small surplus generated electricity to the grid and provide process steam to the rice mill. The purpose of the project is to avoid methane emissions due to the decay of unutilised rice husks and to avoid carbon emissions from grid related electricity generation.

Project description
CAMIL is a rice mill company, of which the core business is the production of paddy and parboiled rice to the internal market in Brazil. CAMIL is the biggest rice company in Rio Grande do Sul state (Brazilian Rice Year Book, pg 59)[1].

The main activity in the region where the project will be located is rice production and industrialization. The rice mill of CAMIL generates huge amounts of biomass residues (rice husks), and the Brazilian and local state legislation prohibits the unlicensed displacement and/or uncontrolled burning of rice husks, and restricts the land filling of it, allowing the displacement only in previously licensed areas. As a result, the rice mills have huge amounts of biomass that are left for decay.

The CAMIL project will be the solution for the high costs associated to electricity consumption in rice production, and will improve the quality of electricity at the CAMIL's plant. A better quality and control of the steam supplied to the process is targeted with the project implementation. CAMIL is an experienced company in energy generation from rice husks, once it has a 4.2 MWe power plant operating at its unit located at Itaqui city since 2001.

The CAMIL's project consists of a new biomass co-generation unit of 3.5 MWe installed capacity, using only rice husks as fuel, complying with CAMIL's energy demand and exporting surplus power to the grid. With this new thermo power plant, two old and non-environmental compliant boilers will be deactivated. The two old boilers burn annually 26,255 tonnes of rice husk to produce process steam, but do not generate electricity. Therefore, 26,255 tonnes of rice husks are already prevented from decay in the baseline scenario. After full implementation of the project 40,667 tonnes of rice husks are combusted, so the project activity prevents annually net 14,412 tonnes of rice husks from decay, avoiding methane emissions.

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[1] Rosa, Gilson R. Da Et. Al., Anuário Brasileiro do Arroz 2005, Gazeta Santa Cruz, Santa Cruz do Sul, Brasil, 2005, pg 59

The only biomass that CAMIL is going to use are its own rice mill residues as fuel for the boiler. The amount of biomass used by third suppliers is null, once the company doesn't depend on external sources of biomass to maintain the power plant fully operational. Internal transportation of the fuel is facilitated by with electrical screws, conveyors and elevators.

As all big rice mills, CAMIL generates a substantial amount of rice husks that is disposed on lands located in the rural areas. The project activity avoids the emissions related to the transport of around 10 trucks of husks per day, but causes emissions related to a much smaller number of truck transports for ash removal. The expected net avoided transportation emissions caused by the use of fossil fuels have been calculated, but not considered in the project.

Contribution of the project to sustainable development
The project will help the Host Country fulfil its goals of promoting sustainable development.
Specifically, the project:

- Increases in employment opportunities in the area where the plant 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 rice residues from region.

A.3. Project participants:
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Name of Party involved (*) ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Brazil (host)	Camil Alimentos S.A.	No
Brazil (host)	PTZ BioEnergy Ltd.	No
The Netherlands	Bioheat International B.V.	No

(*)In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

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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Rio Grande do Sul State

A.4.1.3. City/Town/Community etc:
>>

Camaquã

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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CAMIL is a rice mill located in Camaquã City, in the south-eastern region of Rio Grande do Sul State, Address: BR 116, km 388. CEP: 90050-240. CAMIL is 120 km near from Porto Alegre, the capital city of the state.

A.4.2. Type and category(ies) and technology of the small-scale project activity:
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As per appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project activity falls under the following two categories:

Type I; Category I.D.: Grid connected renewable electricity generation

Type III; Category III.E.: Avoidance of methane production from biomass decay through controlled combustion.

Reference: version 07: 28 November 2005 of Appendix B of the simplified modalities and procedures for small scale CDM project activities.

A bundle is formed of small-scale project activities of different types (type I and type III) as to both reduce carbon emissions by replacement of electricity from the grid and to avoid the decay of rice husks through controlled combustion, thereby following the rules and principles as indicated 'EB 21 Report, annex 21, general principles for bundling' and 'Guidelines for completing the simplified project design document (CDM-SCC-PDD) and the form for submissions on methodologies for small-scale CDM project activities (F-CDM-SSC-Subm) (version 01)'.

Justification of how the proposed CDM project adheres to the applicability criteria of the selected project categories.

Type I; Category I.D.: Grid connected renewable electricity generation
Type I

Type I project activities are defined as renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts (or an appropriate equivalent) (decision 17/CP.7, paragraph 6 (c) (i)).

The project comprises combustion of renewable rice husks in a biomass boiler for electricity generation. The nominal capacity of the installation is 3.5 MWe, which is below the limit of 15 MW for type I projects.

Category I.D.
The applicability criteria of the Category I.D. 'Grid connected renewable electricity generation' are:
Technology/measure
1. This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit.
2. If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires non-renewable biomass or fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.
3. Biomass combined heat and power (co-generation) systems that supply electricity to and/or displace electricity from a grid are included in this category. To qualify under this category, the sum of all forms of energy output shall not exceed 45 MWthermal. E.g., for a biomass based co-generating system the rating for all the boilers combined shall not exceed 45 MWthermal.

The project conforms to the above mentioned conditions in the following ways:
1. The project comprises the use of rice husks, which is a renewable biomass to be used to supply electricity to and/or displace electricity from the electricity distribution system of Rio Grande do Sul. Rio Grande do Sul and Santa Catarina States are the only two states in Brazil who presents coal fired power plants complementing the energy demand in the integrated electrical south Brazilian grid. Thus the project activity replaces the use of at least one fossil fuel.
2. The unit uses only rice husks, which is renewable biomass.
3. The plant has a maximum output of heat (8.44 MWth) and power (3.5 MWe). The sum of these outputs is below the limit of 45 MWthermal.

It is concluded that category AMS I.D. is applicable to the small scale project activity.

Type III; Category III.E.: Avoidance of methane production from biomass decay through controlled combustion.
Type III project activities are defined as other project activities that both reduce anthropogenic emissions by sources and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually (decision 17/CP.7, paragraph 6 (c) (iii) .

The applicability criteria of the Category III.E. 'Avoidance of methane production from biomass decay through controlled combustion' are:
Technology/measure
1. This project category comprises measures that avoid the production of methane from biomass or other organic matter that would have otherwise been left to decay as a result of anthropogenic activity. Due to the project activity, decay is prevented through controlled combustion and less methane is produced and emitted to the atmosphere. The project activity does not recover or combust methane (unlike III D).

Measures shall both reduce anthropogenic emissions by sources, and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually.

Decay is prevented through controlled combustion of rice husks and less methane is produced and emitted to the atmosphere. The direct carbon emissions are related to the emission of methane and nitrous oxide by combustion of the rice husks, which is maximally 1,454 tonnes of carbon dioxide equivalent annually. Therefore, project emissions leads to direct carbon emissions of less than 15 kilo tonnes of carbon dioxide equivalent annually.

It is concluded that category AMS III.E. is applicable to the small scale project activity.

Use of environmentally sound technologies and transfer of know how

Commercially state of art of conventional Rankine steam cycle technology will be used. The combustion of the fuel will be performed with proven technologies as a medium pressured boiler (42 bar). The power plant control will be supervised by a high standard set of LPCs and computers, composing the automation system.

A condensing steam turbine with controlled extraction of steam for process heating (co-generation), driving an electrical generator will be used. Under these characteristics and the concept of co-generation, the total efficiency of the process will reach up to 53% (power +heat).

Control panels and devices that keep a steady condition of voltage, frequency and load will manage the energy production and supply.

Under fully operational conditions, the boiler will produce approximately 25t/h of steam at 42 bar and 420°C while consuming 6.35t/h of rice husks. The steam will be fed to a multistage steam condensing turbine at 0.09 bar with controled extraction. A controlled steam extraction will provide up to 18 t/hr of low-pressure steam for general processes. The steam turbine will drive a 3 phase synchronous generator producing up to 3.5 MWe at 13.8 kV and 60 Hz. A recovery boiler with nominal capacity of 4t/h in the flue gas stream will generate low-pressure steam for direct injection over the rice in the parboiled process.

An integration panel will allow synchronicity and full load control for the auxiliary power plant services, rice mill and export to the grid. Electricity will be sent to the utility distribution lines through a transformer of 22 kV. The project already has obtained all necessary licences to be installed and complies with the Brazilians and State environmental standards, mainly regarding to the control flue gas emissions and wastes. The ash from the plant will be sold as a beneficial by-product.

The project uses the above described environmentally safe and sound technology, which leads to utilization of husks otherwise left for decay and replacement of carbon based electricity generation. PTZ Bioenergy Ltd already has accumulated a large experience in engineering, projecting and constructing power plants at rice industries with conventional high pressure boilers in co-generation, with a similar concept of process engineering. Similar technology has been used by PTZ to combust rice husks at the CAMIL rice mill project (2001), a 4.2 MWe power plant in Itaqui-RS, Brazil, and a 3.0 MWe project at the URBANO rice mill Project (1999) in Jaraguá do Sul city, Santa Catarina State, Brazil, differing only in the equipment's scale.

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 small-scale project activity reduces carbon emissions by replacement of fossil fuel based electricity generation, and prevents rice husks to be left to decay.

In absence of the project activity, carbon emissions from fossil fuel based electricity generation would have occurred.

Rio Grande do Sul and Santa Catarina States are the only two states in Brazil which have coal fired thermal power plants complementing the electricity demand in the integrated electrical grid. In south Brazil it is reasonable to assume that when, supplying the public and private grids, CO_2 emitted from the coal is avoided when there is an interference of renewable sources at the same grid.

According to the 1999/2000 Consolidate Power Balance of Rio Grande do Sul State (Silveira, 2002)[2], oil by-products represented 61.4% of total energy demand, against 19.2% of wood and biomass by-products, 10.6% of electricity and 7.2% of coal. Beside those, at 2000, it was noticed the entrance of natural gas to the state power matrix (0.8%) that has 75% of its consumption promoted by AES-Sul Thermal Power Plant located at Uruguaiana city and the surplus by industries at the region.

The grid emission factor was calculated in a transparent way, using the most recent data from ONS[3], Eletrobrás[4] and ANEEL[5] corresponding to the south-southeast-midwest Brazilian interconnected Electrical System. The carbon emission factor obtained was 0,463 tonnes of CO_2/MWh. Full details about calculation methods are presented in the confidential PTZ's document: "Fator de Redução de Emissões no Grid Interconectado do Sistema Sul-Sudeste-Centro-Oeste".

In absence of the project activity the rice husks would have been left to decay

Operating thermal plants, in Itaqui and São Gabriel cities, presented a share of husk, in dry base, of about 23 and 22% of total grain mass, respectively. So, for all adopted base calculations, 22% seems to be a reasonable value, being a conservative number, taking into account all predominating varieties of Rio Grande do Sul state. As showed in Table 1, Brazil has a huge potential of thermal generation due to the abundant availability of residues from rice mills.

Table 1: Production of rice and rice husks in 2004 (millions of tonnes)

	Rice	Rice husk
Brasil	11.78	2.59
Rio Grande do Sul	6.31	1.39

Source: IRGA[6] (2004)

[2] Silveira, Eberson J. T.; Balanço Energético Consolidado do Estado do Rio Grande do Sul – Sumário Executivo, Porto Alegre: Secretaria de Energia, Minas e Comunicações, 2002, pg. 78.

[3] Operador Nacional do Sistema Elétrico - Dados Relevantes do Ano de 2003 (www.ons.org.br)

[4] Eletrobrás – Sistemas Interligados, Acompanhamento de Combustíveis; (www.eletrobras.gov.br)

[5] Agência Nacional de Energia Elétrica - Banco de Informações de Geração (www.aneel.gov.br)

[6] RUCATTI, Evely Gischkow, KAYSER, Victor Hugo, 2004. Produção e Disponibilidade de Arroz por Região Brasileira Instituto Riograndense do Arroz. Rio Grande do Sul, Brasil.

A survey done in 1987 by CIENTEC[7], taking into account almost one hundred mills, corresponding to 57 up to 60% of rice production, in cities that presented productions up to 100,000 rice bags per year, obtained the following proportions and amounts for rice husks uses as showed in Table 2. Last CIENTEC's data updates and publications still keep the same ratio between the use and sources of rice husks at Rio Grande do Sul State.

Table 2: Application and uses relations for the rice husks in Rio Grande do Sul State

Application	Production (tonnes)	Percentage (%)
1.Destined to grain drying	87,000	15.20
2.Destined to steam generation	80,000	14.00
3. Used as cement additive	40,000	7.00
4. Used for motor power generation	24,000	4.20
5. Rice husks Surplus	340,000	59.60
Total	571,000	100.00

The rice husk surplus of 59.60% is considerable. The project activity aims to prevent part of this surplus not to be left for decay, avoiding the emission of methane.

[7] CIENTEC, 1986. Programa Energia: Aproveitamento Energético da Casca de Arroz. Relatório do Projeto de Pesquisa. Porto Alegre, Fundação de Ciência e Tecnologia.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

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Table 2: Net emission reduction by the bundle of projects (tonnes CO2 equivalent per year)

	Type I.D grid connected electricity generation			**Type III.E Avoidance of methane production**			**Total net emission reduction**
Year	Baseline emissions (A)	Project emissions (B)	Net emission reduction (A-B)	Baseline emissions (C)	Project emissions (D)	Net emission reduction (C-D)	(A-B) + (C-D)
1 Aug - 31 Dec 2007	**5,040**	**0**	**5,040**	**7,768**	**606**	**7,162**	**12,202**
2008	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2009	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2010	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2011	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2012	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2013	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
1 Jan - 31 Jul 2014	**7,055**	**0**	**7,055**	**10,875**	**848**	**10,027**	**17,082**
Total estimated reductions	**84,668**	**0**	**84,668**	**130,504**	**10,175**	**120,329**	**204,997**
Total number of crediting years	**7**	**7**	**7**	**7**	**7**	**7**	**7**
Annual average over the first crediting period of estimated reductions (tonnes of CO_2 e)	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**

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

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There will be no public funding to the project.

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

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According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities, a small-scale project is considered a debundled component of a large project activity if there is a registered small-scale activity or an application to register another small-scale activity:

- With the same project participants;
- In the same project category and technology/measure; and

- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

There is no other small-scale activity that meets the above mentioned criteria. Accordingly, the proposed project activity is not a debundled component of a larger project activity.

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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Type I; Category I.D.: Grid connected renewable electricity generation

Type III; Category III.E.: Avoidance of methane production from biomass decay through controlled combustion.

Reference: Appendix B of the simplified modalities and procedures for small scale CDM project activities (version 07: 28 November 2005).

B.2 Project category applicable to the small-scale project activity:

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The applicability criteria of the Category I.D. 'Grid connected renewable electricity generation' are:
Technology/measure
1. This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit.
2. If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires non-renewable biomass or fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.
3. Biomass combined heat and power (co-generation) systems that supply electricity to and/or displace electricity from a grid are included in this category. To qualify under this category, the sum of all forms of energy output shall not exceed 45 MWthermal. E.g., for a biomass based co-generating system the rating for all the boilers combined shall not exceed 45 MWthermal.

The project conforms to the above mentioned conditions in the following ways:
1. The project comprises the use of rice husks, which is a renewable biomass to be used to supply electricity to and/or displace electricity from the electricity distribution system of Rio Grande do Sul. Rio Grande do Sul and Santa Catarina States are the only two states in Brazil who presents coal fired power plants complementing the energy demand in the integrated electrical south Brazilian grid. Thus the project activity replaces the use of at least one fossil fuel.

2. The unit uses only rice husks, which is renewable biomass.
3. The plant has a maximum output of heat (8.44 MWth) and power (3.5 MWe). The sum of these outputs is below the limit of 45 MWthermal.

It is concluded that project category I.D is applicable to the small-scale project activity.

Type III; Category III.E.: Avoidance of methane production from biomass decay through controlled combustion.

The applicability criteria of the Category III.E. 'Avoidance of methane production from biomass decay through controlled combustion' are:
Technology/measure
1. This project category comprises measures that avoid the production of methane from biomass or other organic matter that would have otherwise been left to decay as a result of anthropogenic activity. Due to the project activity, decay is prevented through controlled combustion and less methane is produced and emitted to the atmosphere. The project activity does not recover or combust methane (unlike III D). Measures shall both reduce anthropogenic emissions by sources, and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually.

Decay is prevented through controlled combustion of rice husks and less methane is produced and emitted to the atmosphere. The direct carbon emissions are related to the emission of methane and nitrous oxide by combustion of the rice husks, which is maximally 1,454 tonnes of carbon dioxide equivalent annually. Therefore, project emissions leads to direct carbon emissions of less than 15 kilo tonnes of carbon dioxide equivalent annually.

It is concluded that project category III.E is applicable to the small-scale project activity.

Assumptions of the baseline methodology
To estimate the baseline emissions related to grid connected renewable electricity generation the baseline calculations as indicated under category I.D. of Appendix B are applied. This methodology allows to calculate the baseline emissions by either using *the average of the approximate "operating margin" and the "build margin"* or taking *the weighted average emissions of the current generation mix.* It was decided to calculate the baseline emissions by using the average of the approximate "operating margin" and the "build margin".

To estimate the baseline emissions related to the avoidance of methane production from biomass decay through controlled combustion, the baseline calculations as described under category III.E. of Appendix B are used. This methodology allows to calculate the Degradable organic carbon (DOC), by taking either the default value (0.3), or by making use of the equation 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 non-food organic putrescibles, C: per cent waste that is food waste; D: per cent waste that is wood or straw. Because rice husks are a homogeneous feedstock, not consisting of the factors A, B, C, or D, it is decided to use the default value of DOC of 0.3.

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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Attachment A to Appendix B indicates that project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:
(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

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

Scenario 1 - Continuation of current activities
This scenario represents continuation of the current practices in which two old boilers provide process steam and steam for the rice drying process, using only part of the rice husks. Rice husks are left for decay, producing methane, and because no electricity is produced with rice husks, all needed -fossil fuel based- electricity is delivered by the grid.

Scenario 2 - The construction of a renewable energy plant
In this scenario, the CAMIL Camaquã biomass electricity generation plant is established. Rice husks will be used to produce heat and power. The power replaces fossil fuel based power formerly delivered by the grid. In addition surplus power will be delivered to the grid, thereby replacing fossil fuel based electricity. Methane emissions from the decay of biomass residues will be interrupted.

With respect to the **investment** barrier:
- The continuation of current practices (Scenario 1) does not pose any investment barrier to the project developer, and requires no further financing.
- The construction of a renewable energy plant (Scenario 2) faces specific investment barriers due to the fact that the capital costs related to biomass CHP 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 subsidies or promotional support for the implementation of independent renewable energy plants. Besides, almost all energy will be reserved to internal consumption of the rice processing plant, a small part will be delivered to MAE (Wholesale Energy Market). The financial barrier is demonstrated through a financial analysis, which the results are presented in Table 3 below. The carbon revenues increase the returns of the project transforming this into an attractive investment for the company and to the financial agents.

Table 3: Financial Analysis Results

	With Carbon	Without Carbon
Net Present Value ($)	-2,553,176.54	-3.854.282,75
IRR	10,3 %	0.9 %
Discount Rate	13.75 %	
Present Value of carbon sold (7 years) $	3,110,096.24	

With respect to the **technological** barrier:

- In the case of Scenario 1, there are no technical/technological issues as this simply represents a continuation of current practices and did not involve any new technology or innovation. Indeed, in this scenario there were 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 commercially, and have been used effectively in the Host Country.

With respect to the analysis of **prevailing 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, Brazil has a huge rice industry, with more than 350 rice mills. A considerable fraction, about 60%, of rice production is located in the south region (IRGA 2004). The south Brazilian region, i.e the states of Rio Grande do Sul, Santa Catarina and Paraná, have no recorded problems with power supply, even along the electricity crisis observed at 2001. Environmental agencies have been approving new areas for disposing the industrial residues, as rice husks, with clear and effective rules, in such a way that only the distance, and by consequence the costs, will represent obstacles for taking the residues into consideration as a pressure to perform future projects.
- The Brazilian technologies in rice mills are very updated with global technologies employed, representing the state of art on rice mill technology. The efficiency of the process reaches around 98% of the commercial matter in the grain. Usually 78% of the rice is transformed in products. The other 22-23% are rice residues. Given the large number of rice mills in the south region the biomass residue generation is concentrated in the south region, creating an excess of biomass residues that the market cannot absorb. According to CIENTEC[7] more than 59,60 % of residues are not used or sold. Only 6 small-scale power plants operate in the south region of Brazil. From 2002, no new plants were build, mainly due to the lack of feasibility. 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) doesn’t represent a deviation from the company’s core business (rice production) once the energy costs avoided will be utilised to sell beneficed rice for a lower price or to increment the profit margin of the product. The steam generated by the boiler will be used to achieve a higher quality in the rice process. Currently Camil has a great amount of rice husks that guaranties the supply for the future plant.

With respect to the analysis of **other barriers**

- In case of scenario 1, no other barriers were identified.
- In case of scenario 2, no other barriers were identified.

Table 4 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 an investment barrier.

Table 4: Summary of Barriers Analysis

Barrier Evaluated	Scenario 1 Continuation of Current Activities	Scenario 2 Construction of a new plant
1. Investment barrier	No	Yes
2. Technological barrier	No	No
3. Prevailing practice	No	No
4. Other barriers	No	No

Because the investment barrier would have prevented that the project would have occurred anyway, it is concluded that the project is additional.

The implementation of the project will eliminate the amount of biomass disposed in the landfills as well as the energy consumed from the grid, consequently reducing the CO_2 emissions, as showed in the following analysis:

- The Baseline Scenario is represented by two old boilers that provides process steam and steam for the rice drying process. This boilers consumes 26,255 tonnes of rice husks per year, or 65% of the total production. The surplus of biomass, nearly 14,412 tonnes, is left to decay in landfills, generating a considerable amount of methane. The industry will continue to use electricity from the grid that has a production of CO_2 associated to the electricity produced.

- The Project Scenario is represented by the construction of a new renewable energy plant of 3.5 MW. This implementation will imply in substitution of the two old boilers by one boiler that will provides steam for the drying rice process, process heat and power generation. The amount of rice husks consumed will be 40,667 tonnes per year, avoiding methane generation caused by biomass decay. The electricity imported from the grid, which is partly generated by fossil fuels, will be displaced, thereby contributing to GHG emission reductions. The rice husks transportation will be decreased as well as ash generation will be increased, resulting in a final balance where the diesel consumption is reduced and, consequently, the CO_2 equivalent emissions. CAMIL has a diesel generation system with a capacity of 850 kVA each. This is used during three hours per day, due to the high energy cost from the grid during peak hours.

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:

>>

According to category I.D. the project boundary encompasses the physical, geographical site of the renewable generation source.

According to category III.E. the project boundary is the physical geographical site where the treatment of biomass takes place.
The rice husks are combusted for electricity generation at the site of the rice mill. This is also the location where the rice husks are produced from the rice milling process. Therefore the project boundary of both project activities is the physical, geographical site of the rice mill as indicated in paragraph A 4.1.

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

>>

The baseline for grid connected renewable electricity generation is based on methodology AMS I.D. of annex B of the simplified modalities and procedures for small-scale CDM project activities (Version 07: 28 November 2005). The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient, calculated in a transparent and conservative manner as the average of the approximate operating margin and the build margin.

The baseline for avoidance of methane production from biomass decay through controlled combustion is based on methodology AMS III.E. of annex B of the simplified modalities and procedures for small-scale CDM project activities (Version 07: 28 November 2005). The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter is left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane from the decay of the biomass or organic waste treated in the project activity.

Date of completion
20/01/2006

Name of person/entity determining the baseline:

- Ricardo Pretz and Ronaldo Hoffmann from PTZ Bioenegy Ltda and;
- Martijn Vis from BTG biomass technology group B.V.

Contact details are listed in annex I.

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

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

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

01/06/2006

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

30 years

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

C.2.1. Renewable crediting period:
>>

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

01/08/2007

C.2.1.2. Length of the first crediting period:
>>

7 years, 0 months

C.2.2. Fixed crediting period:
>>

C.2.2.1. Starting date:
>>

C.2.2.2. Length:
>>

SECTION D. Application of a monitoring methodology and plan:

>>

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

>>

Monitoring methodology of category I.D. as described in 'Appendix B of the simplified modalities and procedures for small-scale CDM project activities' (Version 07: 28 November 2005)

Monitoring methodology of category III.E. as described in 'Appendix B of the simplified modalities and procedures for small-scale CDM project activities' (Version 07: 28 November 2005)

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

>>

The monitoring methodology of category I.D. describes that: *Monitoring shall consist of metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass and fossil fuel input shall be monitored.*

Conform the monitoring methodology, the monitoring plan foresees in the metering of electricity generated by the rice husk combustion installation. It is an effective and reliable way to measure the replaced electricity from the grid.

The monitoring methodology belonging to category III.E. describes that:

- The amount of biomass and / or other organic matter combusted (Qbiomass) by the project activity in a year shall be monitored.
- Emissions of CH4 and N2O will be determined using the most recent IPPC default values
- The total annual project related emissions will be monitored and should be less than or equal to 15 kt of CO2 equivalent.

In the project activity, rice husks are collected from at the plant location and combusted in the rice husk combustion and electricity generation installation. The biomass (rice husks) are produced at the rice processing plant, and will be either combusted in the biomass electricity plant or transported outside the plant to be left for decay. The amount of biomass combusted is monitored by calculation of the rice husk production and monitoring the rice husks leaving the factory.

The project related emissions are negligible, except for the emissions of methane and nitrous oxide, due to biomass combustion. The monitoring methodology of category III.E. allows monitoring of the emission of methane and nitrous oxide, due to biomass combustion, by determination of:

$$PE_y = Q_{biomass} * E_{biomass} (CH_4bio\_comb * CH_4\_GWP + N_2Obio\_comb * N_2O\ \_GWP)/10^6$$

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 NO_2)

As indicated before, $Q_{biomass}$ can be measured accurately; because rice husks are a homogeneous biomass feedstock $E_{biomass}$ can be determined accurately. The other factors will be determined using the most recent IPPC default values. The project emissions will be monitored and it is proved that they value less than or equal to 15 kt of CO2 equivalent.

It is justified to apply monitoring methodology belonging to category E.III as described in 'Appendix B of the simplified modalities and procedures for small-scale CDM project activities' (Version 07: 28 November 2005).

D.3 Data to be monitored:

>>

Table 6: D 3.1 Data to be collected necessary for determining the baseline of anthropogenic emissions and the project emissions and how this data will be archived, related to project category I.D. ' grid connected electricity generation':

ID-number	*Data variable*	*Source of data*	*Data unit*	*Measured (m), calculated (c) or estimated (e)*	*Recording frequency*	*Proportion of data to be monitored*	*How will the data be archived? (Electronic/ paper)*	*Comment*
D.3.1	Electricity imported from the grid	Electricity ingress register and electricity bills	KWh	m	Continuous and monthly	100%	Electronic and paper	The electricity imported from the grid is monitored by an energy ingress register and by the energy bills expedited monthly by the electricity concessionary
D.3.2	Gross electricity generated by the project	Electronic supervisory system of the biomass power plant.	KWh	m	Continuous	100%	Electronic and paper	The gross electricity generated by the project activity (electricity delivered to the grid and delivered to the own rice mill) is recorded in the electronic supervisory system of the power plant.
D.3.3	Net electricity delivered to the grid	Electronic supervisory system of the biomass power plant.	KWh	m	Continuous	100%	Electronic and paper	The net electricity delivered to the grid is recorded in the electronic supervisory system of the power plant.

D 3.4	Baseline emission factor	ONS , Eletrobrás and ANEEL	tonnes CO_2/ MWh	c	Yearly	100%	Electronic and paper	Baseline emission factor consists of Operating Margin emission factor and Build Margin emission factor, and calculated from the installed capacity, carbon emission factor , electricity production and fuel consumption of the electricity generation plants connected to the south-southeast-midwest interconnected grid.

Table 7: D 3.2 Data to be collected necessary for determining the baseline of anthropogenic emissions and the project emissions and how this data will be archived, related to project category III.E. ' Avoidance of methane production from biomass decay through controlled combustion':

ID-number	*Data variable*	*Source of data*	*Data unit*	*Measured (m), calculated (c) or estimated (e)*	*Recording frequency*	*Proportion of data to be monitored*	*How will the data be archived? (Electronic/ paper)*	*Comment*
D.3.5	Amount of rice husks generated	Rice production	tonne / month	m	Monthly	100%	Electronic and paper	The monthly rice production times the rice to husk factor (22%) indicates the amount of rice husks generated.
D. 3.6	Amount or rice husks removed by truck	Documentation on transportation transactions	tonne/ month	m	Monthly	100%	Electronic and paper	
D. 3.7	Amount of biomass consumed by the project	D 3.5 D 3.6	tonne / month	c	Monthly	100%	Electronic and paper	Value calculated as generated rice husks (D 3.5) minus removed rice husks (D. 3.6)

D 3.8	Amount of biomass that would have been consumed in baseline scenario	Rice production and documentation on transportation transactions	tonne/ month	m	Monthly	100%	Electronic and paper	Value calculated as generated rice husks (D 3.5) minus removed rice husks (D. 3.6) from the year before the project implementation.
D 3.9	Net amount of biomass prevented from being left to decay	D.3.7 D.3.8	tonne/ month	c	Monthly	100%	Electronic and paper	D.3.7 - D.3.8. This value equals $Q_{biomass}$ in the formulae in section E
D 3.10	MC: Moisture content of the biomass	Determination of moisture content	wt % (wet basis)	m	Yearly	Sample	Paper	The moisture content of rice husks does practically not vary. Therefore a literature value is used.
D 3.11	Edry: Energy content of the biomass (dry basis)	Literature	GJ/tonne dry	M	Once	Sample	Paper	The energy content of rice husks on dry basis, does practically not vary. Therefore a literature value is used.
D 3.12	$E_{biomass}$: Energy content of the biomass (as received)	D. 3.10 and D 3.11	GJ/tonne	C	Yearly	n.a.	Paper	The energy content is determined by the following equation: $E_{biomass}$ = Edry* (1-MC)
D.3.13	CH_4bio_comb	Most recent IPPC 1996 default value		E	Once	n.a.	Paper	
D. 3.14	CH_4_GWP	Most recent IPPC 1996 default value		E	Once	n.a	Paper	
D. 3.15	N_2Obio_comb	Most recent IPPC 1996 default value		E	Once	n.a	Paper	
D 3.16	N_2O_GWP	Most recent IPPC 1996 default value		E	Once	n.a	Paper	

D. 3.17	PEy	D. 3.9 D. 3.12 D. 3.13 D. 3.14 D. 3.15 D. 3.16	ktonnes of CO_2 equi-valent	C	Monthly	n.a.	Electronic and paper	Using the formula are indicated in the monitoring methodology of category III.E. of the simplified modalities and procedures for small-scale CDM project activities.

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>

Table 8: D. 4.1 Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored, related to category I.D.		
ID number	*Uncertainty level of data (High/Medium/Low)*	*Explain QA/QC procedures planned for these data, or why such procedures are not necessary.*
D.3.1	Low	The information read by the electricity ingress register will be double checked with the monthly electricity bill expedited monthly by the electricity concessionary.
D.3.2	Low	The electric measurement equipment will comply with Standards for Electricity NBR 5410, Grid proceedings from Brazilian ONS. Standards for connection are established by grid companies during licensing. According to the Brazilian Regulations on electrical Grid, additional measurements are demanded by the ANEEL (National Electric Energy Agency) and the company that owns the rights of grid distribution, in such a way at least two supplementary conventional electronic measurers should be installed at the outlet cabin. The 3 systems will be checked in a monthly basis.
D.3.3	Low	See D.3.1.
D.3.4	Low	Values based on info provided by ONS , Eletrobrás and ANEEL. All calculations are internally double-checked.

Table 9: D. 4.2 Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored, related to category III.E.		
ID number	*Uncertainty level of data (High/Medium/Low)*	*Explain QA/QC procedures planned for these data, or why such procedures are not necessary.*
D.3.5	Low	Rice is the main product of the factory and its production volumes known in detail. Production of rice husks is directly related to the production of rice and can be derived from rice production numbers.
D. 3.6	Low	The amount of rice husks removed by truck is monitored accurately, as all truck loads are registered.
D. 3.7	Low	All produced rice husks that do not leave the factory site, are combusted in the CHP plant. This data can be double-checked by comparison with the net electricity production of the rice husk plant, taking average numbers of the electric efficiency and the energy density of the rice husks.
D. 3.8	Low	See D.3.5 and D.3.6
D.3.9	Low	It is a calculated value based on D 3.7-D 3.8, so no additional QC and QA procedures will be applied.
D. 3.10	Low	The moisture content of the rice, and consequently of the husks is monitored on a daily base. The moisture content of the husks is fairly constant, once the rice (and husks) are conditioned and stored at well known conditions, according to the health procedures for storage of grains. The daily data on the moisture content of rice and rice husks will therefore be analysed on a yearly base. In case of substantial changes in the process that could have an effect on the moisture content of the husks, additional analyses of moisture content will be performed. The moisture content is determined according to Brazilian Standard NBR 8289.
D. 3.11	Low	The HHV of rice husks hardly varies. No additional QC and QA procedures are necessary.
D. 3.12	Low	It is a calculated value based on D.3.10 and D.3.11, so no additional QC and QA procedures will be applied.
D. 3.13	Low	Most recent IPPC default values will be used as appropriate for small scale projects
D. 3.14	Low	Most recent IPPC default values will be used as appropriate for small scale projects
D. 3.15	Low	Most recent IPPC default values will be used as appropriate for small scale projects
D. 3.16	Low	Most recent IPPC default values will be used as appropriate for small scale projects
D. 3.17	Low	It is a calculated value based on D.3.9, D.3.12, D.3.13, D.3.14, D.15 and D.3.16 so besides QC and QA of these separate values (as described elsewhere in this table), no additional QC and QA procedures need to be applied.

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:

>>

CAMIL Alimentos S/A (CAMIL), PTZ Bioenergy Ltda (fully and exclusively authorized to act on the behalf of CAMIL regarding this CDM project) and BioHeat International (exclusively authorized to sell the carbon credits from the CAMIL project) are all project participants.

CAMIL operates the plant that is part of the project and will measure the required monitoring data related to the project and is qualified to do so. PTZ is responsible for interpretation of the monitoring data, and leakage effects, preparation of the monitoring reports and quality assurance. If required, PTZ will provide instructions and training to operators of CAMIL.

Additional information regarding project management planning i.e. Project organization, communication, data processing & quality management, calibration of monitoring equipment and troubleshooting procedures are provided to the DOE.

D.6. Name of person/entity determining the monitoring methodology:

>>

- PTZ Bioenergy Ltd. and;
- BTG biomass technology group B.V.

The monitoring methodology was prepared by Ricardo Pretz and Ronaldo Hoffmann, from PTZ, as well as René Venendaal and Martijn Vis from BTG.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

>>

Category I.D.

No formula is provided to quantify the emission reduction of electricity generation in the Baseline of category I.D. of appendix B. In words it is described that:

Baseline emissions

(…) the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh) calculated in a transparent and conservative manner as:

(a) The average of the “approximate operating margin” and the “build margin”, where:

(i) The “approximate operating margin” is the weighted average emissions (in kg CO_2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

(ii) The "build margin" is the weighted average emissions (in kg CO2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants.";

OR,

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

Category III.E.

Baseline emissions

CH_4_IPCCdecay = (MCF * DOC * DOC_F * F * 16/12)

where,

$CH_4\_IPCC_{decay}$	IPCC CH_4 emission factor for decaying biomass in the region of the 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) (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)

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

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)

Project emissions

According to the same guidelines for type IIE., the project emissions are calculated using the following formula:

$PE_y = Q_{biomass} * E_{biomass} (CH_4bio\_comb * CH_4\_GWP + N_2Obio\_comb * N_2O\ \_GWP)/10\text{^}6$

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 NO_2)

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

>>

Formulae not provided in appendix B, related to the methodology described in category I.D.

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

$$BEy = EGy * EFy$$

The baseline emissions factor (*EFy)* is a weighted average of the *EF_OMy* and *EF_BMy:*

$$EFy = (\omega_{OM} * EF\_OMy) + (\omega_{BM} * EF\_BMy)$$

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

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

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

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 mustrun 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:

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

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

Formulae to supplement equations presented in category III.E of annex B.
The energy content of the used rice husks -needed to estimate the project emissions- is determined in the following way:

$E_{biomass}$ = Edry * (1-MC)*10^-3

where,
$E_{biomass}$ = Energy content of biomass in TJ/tonne
E_{dry} = Energy content of dry biomass (HHV dry) in GJ/tonne
MC = moisture content of rice husks weight % wet basis.

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:

>>

Category I.D.

Except methane and nitrous oxide emissions because of combustion of biomass (to be determined under category III.E. project activity), the project emissions are negligible.

Category III.E.

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

where,

PE_y	Project activity emissions (ktonnes 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 NO_2)

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

>>
Category I.D.
No leakage calculation is required, as the renewable energy technology used is not equipment transferred from another activity.

Category III.E.
No leakage calculation is required.

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

>>
Category I.D.
The small scale project activities are zero.

Category III.E.
The total small scale project activity emissions consists of PE_y: the methane emissions and nitrous oxide emissions due to the combustion of rice husks, and is calculated as described in E. 1.2.1.

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:

>>

Category I.D.
The baseline emissions for grid connected electricity generation are described as follows:

BEy = EGy * EFy

where,
BEy = Baseline Emissions of electricity generation (tonnes CO_{2equ})
EGy = Electricity production by project activity (MWh)
EFy = Emission Coefficient (measured in tonnes CO_2equ/MWh)

Category III.E.
Baseline emissions
CH_4_IPCCdecay = (MCF * DOC * DOC_F * F * 16/12)

where,

$CH_4\_IPCC_{decay}$	IPCC CH_4 emission factor for decaying biomass in the region of the 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)

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

where,

BE_{el}	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)

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:

>>

Category I.D.
Emission reduction by grid connected renewable electricity production during a given period equals:

$ER_{ID} = BE_{el}$

where,
ER_{ID} = emission reduction due to grid connected renewable electricity production (tonnes CO_{2equ})
BE_{el} = Baseline Emissions of electricity generation (tonnes CO_{2equ})

Category III.E.
Emission reduction by avoidance of methane production from biomass decay through controlled combustion equals:

$ER_{IIIE} = BE_y - (PE_y / 10^3)$

where,
ER_{IIIE} Emission reduction by the avoidance of methane production from biomass decay through controlled combustion (tonnes of CO2 equivalent)
PE_y Project activity emissions (kilotonnes of CO_2 equivalent)
BE_y Baseline methane emissions from biomass decay (tonnes of CO_2 equivalent)

Total
The total combined emission reduction of the bundle of project activities of type I.D. and III.E are:
$ER_{total} = ER_{ID} + ER_{IIIE}$

ER_{total} Total net emission reduction by the bundle of project activities (tonnes CO2 equivalent)
ER_{ID} Emission reduction due to grid connected renewable electricity production (tonnes CO_{2equ})
ER_{IIIE} Emission reduction by the avoidance of methane production from biomass decay through controlled combustion (tonnes of CO2 equivalent)

Remark: formulae can be used for any given time period. It should be stated clearly what time period is meant.

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

>>

Table 10: Emission reduction by grid connected electricity generation

Indicator	Abbreviation	Value	Unit
Operating margin emission factor	EF_OMy	0.847	tonnes CO_2/MWh
Build margin emission factor	EF_BM_y	0.079	tonnes CO_2/MWh
Baseline emission factor	EFy	0.463	tonnes CO_2/MWh
Annual net electricity generated by the Project	EGy	26,124	MWh
Baseline emissions	BE_{el}	12,095	tonnes CO_2/year
Project emissions	n.a.	0	tonnes CO_2/year
Emission reduction from electricity generation	ER_{ID}	12,095	tonnes CO_2/year

Table 11: Emission reduction by avoidance of methane production from biomass decay through controlled combustion

Indicator	Abbreviation	Value	Unit
methane correction factor	MCF	0.4	dimensionless fraction
degradable organic carbon	DOC	0.3	dimensionless fraction
fraction DOC dissimilated to landfill gas	DOC_F	0.77	dimensionless fraction
fraction of CH_4 in landfill gas	F	0.5	dimensionless fraction
IPCC CH_4 emission factor for decaying biomass in the region of the project activity	CH_4_IPCCdecay	0.0616	tonnes of CH_4/tonne of biomass or organic waste
Quantity of biomass treated under the project activity	$Q_{biomass}$	14,412	tonnes/year
GWP for CH_4	CH_4_GWP	21	tonnes of CO_2 equivalent/tonne of CH_4
Baseline methane emissions from biomass decay	BE_y	18,643	tonnes of CO_2 equivalent/year
Energy content of dry biomass (HHV dry)	E_{dry}	15.49[a)]	GJ/tonne
Moisture content of the biomass	MC	12	weight % wet basis
Energy content of biomass	$E_{biomass}$	0.013376	TJ/tonne
CH_4 emission factor for biomass and waste	CH_4bio_comb	300	kg of CH_4/TJ
N_2O emission factor for biomass and waste	N_2Obio_comb	4	kg/TJ
GWP for N_2O	N_2O_GWP	310	tonnes of CO_2 equivalent/tonne of NO_2
Project activity emissions	PE_y	1,454	ktonnes of CO_2 equivalent/year
Emission reduction by avoidance of methane production from biomass decay	ER_{IIIE}	17,190	tonnes of CO_2 equivalent/year

[a)] CIENTEC, 1986. Programa Energia: Aproveitamento Energético da Casca de Arroz. Relatório do Projeto de Pesquisa. Porto Alegre, Fundação de Ciência e Tecnologia.

Table 12: Net emission reduction by the bundle of projects (tonnes CO_2 equivalent per year)

	Type I.D grid connected electricity generation			**Type III.E Avoidance of methane production**			**Total net emission reduction**
Year	Baseline emissions (A)	Project emissions (B)	Net emission reduction (A-B)	Baseline emissions (C)	Project emissions (D)	Net emission reduction (C-D)	(A-B) + (C-D)
1 Aug - 31 Dec 2007	**5,040**	**0**	**5,040**	**7,768**	**606**	**7,162**	**12,202**
2008	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2009	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2010	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2011	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2012	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
2013	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**
1 Jan - 31 Jul 2014	**7,055**	**0**	**7,055**	**10,875**	**848**	**10,027**	**17,082**
Total estimated reductions	**84,668**	**0**	**84,668**	**130,504**	**10,175**	**120,329**	**204,997**
Total number of crediting years	**7**	**7**	**7**	**7**	**7**	**7**	**7**
Annual average over the first crediting period of estimated reductions (tonnes of CO_2 e)	**12,095**	**0**	**12,095**	**18,643**	**1,454**	**17,190**	**29,285**

SECTION F.: Environmental impacts:

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

>>

Renewable electricity production
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

Rice husks
The project will improve the local environmental condition due to the adequate treatment of rice husks 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 Camaquã;
- Chamber of Camaquã;
- 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. PTZ Bioenergy 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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project participants

Organization:	CAMIL Alimentos
Street/P.O.Box:	BR 116, km 388
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Represented by:	
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Salutation:	Mr.
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Middle Name:	Poppe
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Department:	
Mobile:	
Direct FAX:	
Direct tel:	
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Project developer and fully authorized representative of the project participant CAMIL Alimentos S/A regarding this CDM-project activity

Organization:	PTZ BioEnergy Ltd.
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Project advisor / developer

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Title:	Director
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Middle Name:	
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Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funds.

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Annex 3

BASELINE INFORMATION

The grid factor calculation was conduced with the following databases:

- Electricity Generated at 2003 (MWh):

Operador Nacional do Sistema Elétrico. Centro Nacional de Operação do Sistema. Acompanhamento Diário da Operação do SIN (www.ons.org.br)

- Efficiency for thermal power plants:

Thermal Power Plant	Efficiency calculation sources
Jorge Lacerda A	Eletrobrás[1] and CIMGC[2]
Jorge Lacerda B	Eletrobrás and CIMGC
Jorge Lacerda C	Eletrobrás and CIMC
Charqueadas	Eletrobrás and CIMGC
P.Medice A	Eletrobrás and CIMGC
P. Medice B	Eletrobrás and CIMGC
P. Medice (A+B)	Eletrobrás and CIMGC
São Jeronimo	Eletrobrás and CIMGC
Figueira	Eletrobrás and CIMGC
Santa Cruz	Eletrobrás and CIMGC
Igarapé	Eletrobrás and CIMGC
Piratininga	Eletrobrás and CIMGC
Nova Piratininga	Eletrobrás and CIMGC

For the other efficiency inputs the Executive Board recommended values were used just for the Build Margin calculation. For the Operating Margin the values adopted were the average as described in the OECD information paper (Bosi, 2002)[3].

The spreadsheets containing the efficiency and the grid factor calculations are confidential files and are available only for authorized persons.

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[1] Eletrobrás – http://www.eletrobras.gov.br/EM_atuacao_ccc/default.asp

[2] Comissão Interministerial de Mudança Global do Clima – CIMGC; Análise sobre o Setor Energético na Região Sul: www.mct.gov.br/clima/comunic_old/energi41.htm#index

[3] Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A.F. Simoes, H. Winkler and J.M. Lukamba. Road testing baselines for GHG mitigation projects in the electric power sector. OECD/IEA information paper, October 2002.

Biomass and electricity aspects in the CAMIL Biomass Co-Generation Project

Year	Electricity generated/year (MWh)	Amount of rice husks produced (kg/year)	Amount of rice husks consumed (kg/year)	Effective rice husk consume by the project activity (kg/year)	Amount of rice husks to the landfill (kg/year)	% Consumed
2006	-	40,667,000	26,255,000	0	14,412,000	65%
2007	10,885	40,667,000	32,260,000	6,005,000	8,407,000	79%
2008	26,124	40,667,000	40,667,000	14,412,000	0	100%
2009	26,124	40,667,000	40,667,000	14,412,000	0	100%
2010	26,124	40,667,000	40,667,000	14,412,000	0	100%
2011	26,124	40,667,000	40,667,000	14,412,000	0	100%
2012	26,124	40,667,000	40,667,000	14,412,000	0	100%
2013	26,124	40,667,000	40,667,000	14,412,000	0	100%
2014	26,124	40,667,000	40,667,000	14,412,000	0	100%
2015	26,124	40,667,000	40,667,000	14,412,000	0	100%
2016	26,124	40,667,000	40,667,000	14,412,000	0	100%
2017	26,124	40,667,000	40,667,000	14,412,000	0	100%
2018	26,124	40,667,000	40,667,000	14,412,000	0	100%