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:

GEEA-SBS Biomass Treatment Project in Alegrete, Rio Grande do Sul, Brazil.
Version 3.1
Date: 22/08/2007

The changes made to this version of the PDD compared to the PDD version 3.0 dated 01/03/2007 refers to the substitution of ‘flow meter’ by ‘scale’ at section A.4.2, inclusion of a new item at the monitoring plan, and the insertion of the Annex 8.

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

Purpose and project description

The project is designed to produce silica of higher quality from the chemical and thermal treatment of rice husk. The project will avoid methane emissions due to the decay of unutilized rice husks.

Combustion of rice husks produces rice husk ash, which is rich in silica and can be used as a raw material in other processes such as cement. The process here described is optimized by inclusion of a chemical treatment prior to combustion. With the chemical treatment, the rice husk ash generated contains silica of higher quality which increases its applicability.

The GEEA-SBS Biomass Treatment Project is developed in Alegrete City, Rio Grande do Sul State, Brazil by Pilecco Rice Mill, which produces rice and invests in the agribusiness chain in the south of Brazil and Argentina.

The main agricultural activity in the region where the project will be located is rice production and processing. The rice mills generate huge amounts of rice husks. Brazilian and local state legislation prohibits the unlicensed displacement and/or the open air (uncontrolled) burning of that rice husks, as well as it restricts the landfilling of rice husks, allowing the displacement in previously licensed areas. As result, the rice mills have a huge amount of rice husk that is left to decay.

Like all large rice mills, Pilecco Rice Mill generates a substantial amount of rice husks that is currently disposed in lands located in a licensed landfill site. With this project, rice husks generated by Pilecco and other rice mills will be treated for silica production. Additionally, the plant could also process other biomass residues in case of not enough amounts of rice husks. Transport of rice husks from other rice mills and from the field to the project site will be done in special trucks specially developed for that in the first years of the project and later on, it will be done by train lines in containers specially developed for the project. Internal transportation in the plant site will be fully attended with electrical screws, conveyors and elevators.

The project activity will utilize approximately 55,440 tonnes annually of rice husks. Of this amount, around 25,000 tonnes are supplied by Pilecco Rice Mill and the remaining by external sources. The expected amount of greenhouse gases (GHGs) emissions reduction is approximately 19,223 tonnes of CO_2 equivalent per annum.

Contribution to sustainable development

The project will help the promotion of sustainable development through:

- Increasing employment opportunities in the area where the plant is located;
- Decreasing environmental impacts, such as the emissions due to irregular disposal of residues in open air as well as the desertification phenomena, which is intensified by the dispersal of rice husks in the camps due to the wind;
- Using clean and efficient technologies, and conserving natural resources;
- Acting as a clean technology demonstration project and capacity building, encouraging development of modern and efficient use of biomass throughout the Country;
- Optimizing the use of natural resources, avoid new uncontrolled waste disposal places, using a large amount of biomass residues from the region.

A.3. Project participants:

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)	**Geradora de Energia Elétrica Alegrete Ltda. (GEEA)** (Private entity)	No
Brazil	**Sílica Brasil Sul Ltda. (SBS)** (Private entity)	No
Japan	**Mitsubishi UFJ Securities Co. Ltd. (MUS)** (Private entity)	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.		

See contact information in the Annex 1 of this PDD.

Geradora de Energia Elétrica Alegrete Ltda. (GEEA)
GEEA is a new company formed by the directors of Pilecco Rice Mill Ltd. which is a solid and expressive company with 30 years of experience in the rice mill business.

Sílica Brasil Sul Ltda. (SBS)
SBS is a new company aiming at production, use, and commercialization of silica.

Mitsubishi UFJ Securities Co., Ltd. (MUS)
MUS through its Clean Energy Finance Committee acts as the CDM advisor for the project activity.

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

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

A.4.1.1. Host Party(ies):

Brazil

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

Rio Grande do Sul State

A.4.1.3. City/Town/Community etc:

Alegrete

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

The Project will be located adjacent to Pilecco Rice Mill, which is located at Brás Faraco Avenue, 4km Southwest off Alegrete City's downtown. Alegrete City is located on the Southwest side of Rio Grande do Sul State, close to the boarder with Argentina and Uruguay, approximately 487 km from the state's capital, Porto Alegre. Alegrete is located at latitude South 29º46'47" and longitude North 55º47'15". Its average altitude is 116 meters over the sea level. The average temperature is 18.6ºC and the yearly rainfall is 1574 mm with a hydro excess of 316 mm, thus characterizing a sub-temperate wet climate (Maluf, 2000)[1].

As seen in Figure 1, the site is well connected by roads and railroads. The external rice husk will be brought by road transport.

[1] MALUF, Jaime Ricardo Tavares (2000). Nova classificação climática do Estado do Rio Grande do Sul. *Revista Brasileira de Agrometereologia,* v. 8, n.1, p. 141-150.

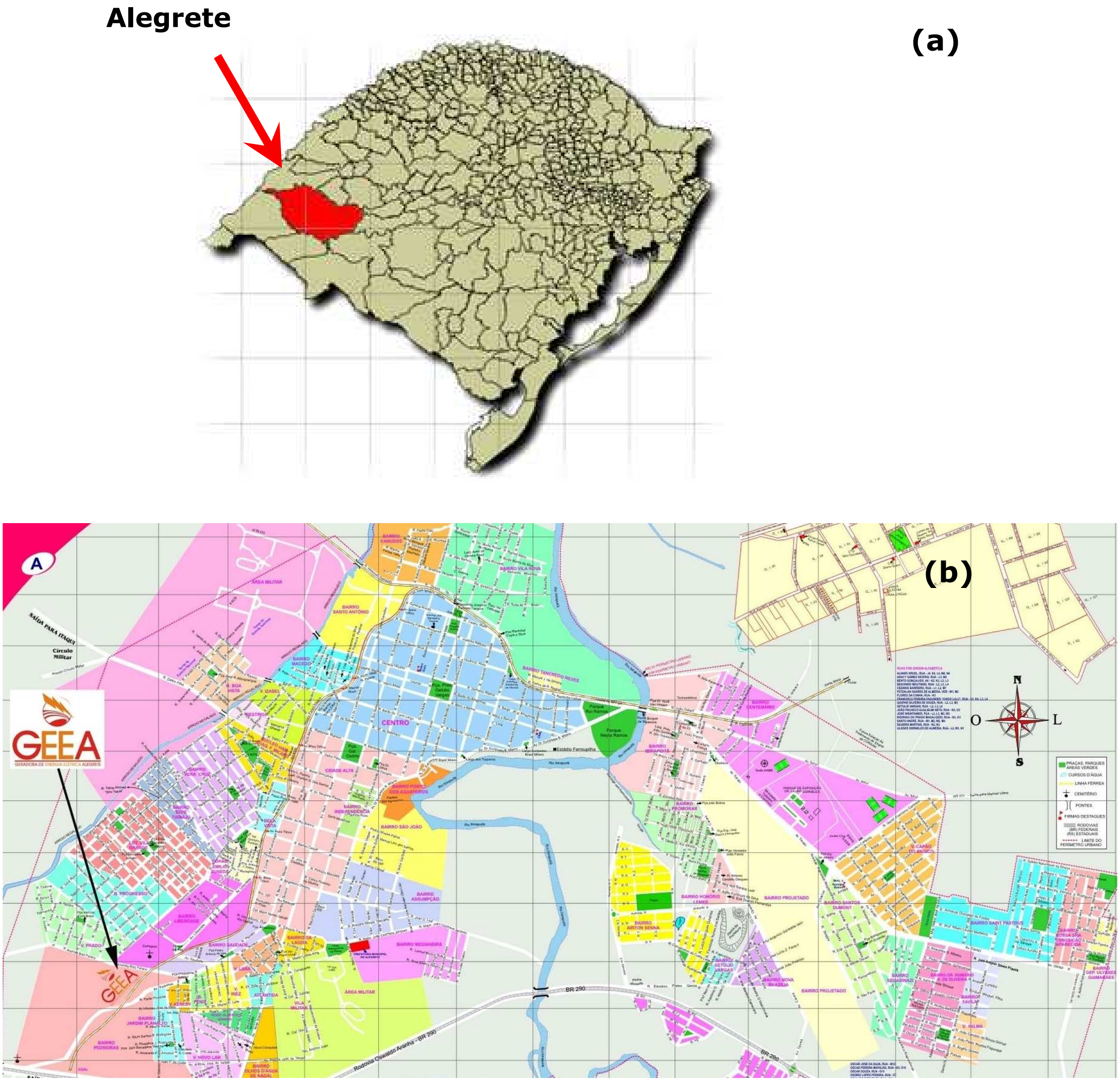

Figure 1. (a) Location of Alegrete in Rio Grande do Sul State; (b) Exact location of the GEEA and SBS project activity in Alegrete

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

As per *Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM Project Activities* (SSC M&P), the project activity falls under the following category:

Main Category: Type III

Sub-category: E. – Avoidance of methane production from biomass decay through controlled combustion.

The project avoids methane emissions from rice husks that otherwise would be left to decay anaerobically in a solid waste disposal site without methane recovery. The project activity consists of a controlled chemical and thermal treatment of the rice husk aiming to produce silica of higher quality.

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

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* includes the following, among other criteria:
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 anaerobically in a solid waste disposal site without methane recovery. Due to the project activity, decay is prevented through controlled combustion. The project activity does not recover or combust methane (unlike III.G). Measures are limited to those that result in emission reduction of less than or equal to 60 kt CO_2 equivalent annually.
2. If the combustion facility is used for heat and electricity generation the project can use a corresponding methodology under type I project activities.

Decay is prevented through controlled thermal treatment of rice husk, a residual biomass, and less methane is produced and emitted to the atmosphere. The project emissions are due to power consumption and rice husk transportation, which are estimated equal or lower than 438 tonnes of carbon dioxide equivalent annually. The project emission reductions are less than 60 kilotonnes of carbon dioxide equivalent annually.

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

Technology employed for project activity

The technology used in the project activity was developed by the PROBEM[2]. A scheme of the technology is shown in Figure 2.

The rice husk is supplied by Pilecco Rice Mill and by other external sources. A scale (load cell) will measure the amount of biomass treated. Part of the husk passes by a chemical reactor (90 ton/day) and the other part is directly fired in a boiler (66 ton/day) and in a hot air generator (12 ton/day).

[2] Technology PROBEM® – Programa de Biomassa – Energia - Materiais (Materials – Energy – Biomass Programs) which was developed by Dr. Daltro Garcia Pinatti and collaborators and it belongs to RM Materiais Refratários Ltda, Lorena, SP, Brazil. The Group Pilecco obtained exclusive rights to use PROBEM® Technology in Rio Grande do Sul State, Uruguay, and Argentina. RM Materiais Refratários Ltda. is a company of the Peixoto de Castro Group (GPC).

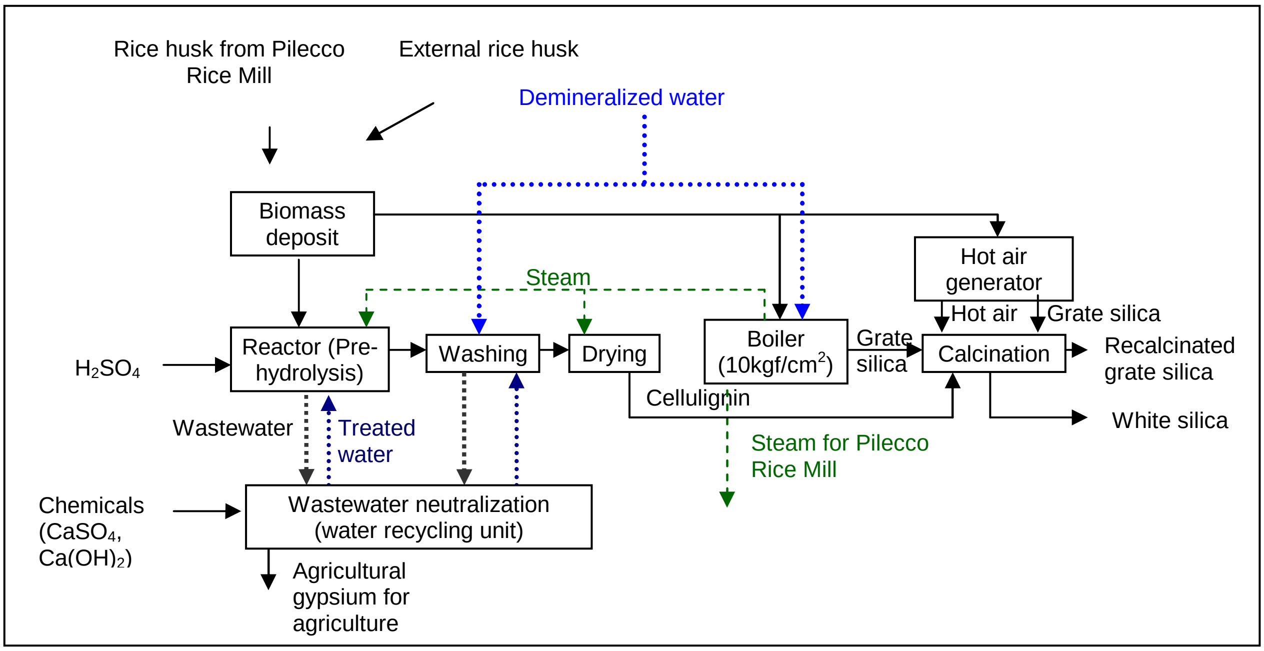

Figure 2. Scheme of the technology employed in the rice husk treatment plant

In the chemical reactor, the process of pre-hydrolysis takes place using sulfuric acid (H_2SO_4). Cellulignin (CL) is separated from the rice husk in the reactor, and then the cellulignin is washed and dried. The product obtained from the reaction, the cellulignin, is a porous solid fuel. The dried cellulignin is calcinated at 750 ºC generating white silica, which can be used as additive in the rubber and chemical industry. The calcinator has a length of 20 meters and 2.1 meter of diameter; and a maximum capacity of 6 ton per hour.

The hot air generator as the name says, generate hot gases at optimum amount and temperature in order to generate silica of good quality in the calcinator.

The other part of the rice husks is combusted in a horizontal boiler with a mix circuit of water-tube and fire-tube, model HBFS 12 manufactured by H. Bremmer & Filhos Ltd. Co., and with capacity to generate 12ton/h of vapor at the pressure of 10 kgf/cm^2. This boiler combusts raw rice husk using the gases from the calcinator and it generates grate silica.

The thermal treatment of the rice husk in the boiler and in the hot air generator produces grate silica. Grate silica is then treated in the calcinator at 750 ºC; the recalcinated grate silica can be used by the cement industry.

Further information about equipments used is provided in the Annex 7.

There are no combustion residues; all residues generated in boilers and calcinators are commercialized as products. Vapor at the pressure of 10 kgf/cm^2 generated in the boiler is used to run the process biomass treatment as well as running other processes in the Pilecco Rice Mill.

The amount of biomass supplied by external sources will be measured with a stationary balance at the entrance of the industry complex. The amount of biomass supplied by Pilecco Rice Mill will be measured by a scale~~flow meter~~ located at the conveyor. The sum of these two amounts is the total biomass supplied to the complex. Another balance at the entrance of GEEA measures the total amount of rice husks combusted by GEEA. The amount of rice husks used in this project will also be measured by a scale (load cell).

Figure 3 shows the equipments used and the flows in the project activity.

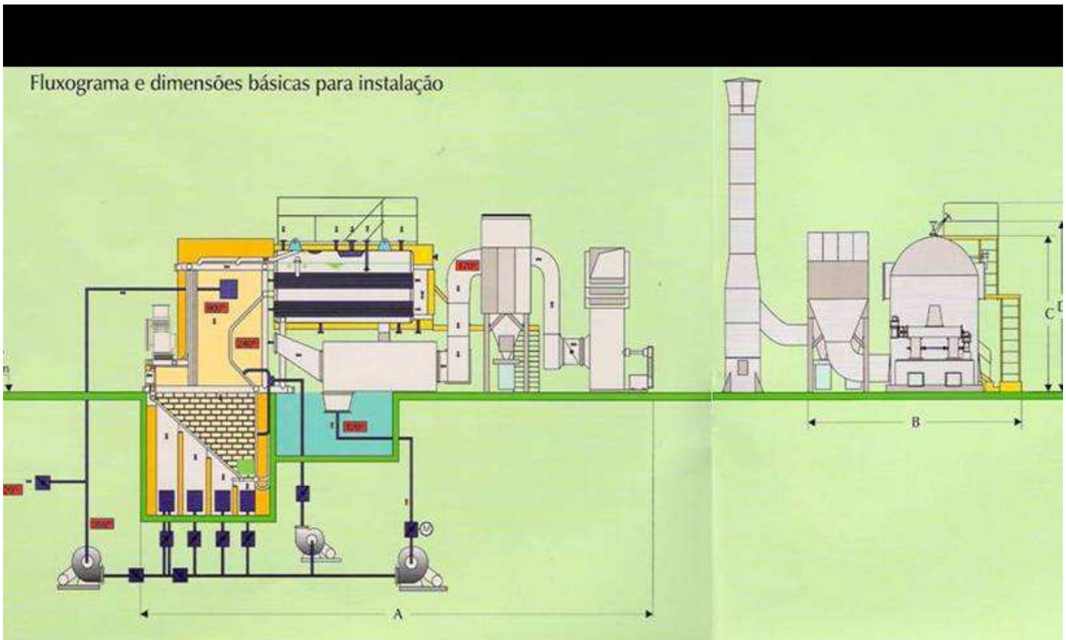

Figure 3. Design of the equipments

The wastewater generated in the process is neutralized by the addition of lime $Ca(OH)_2$ and calcium sulfate ($CaSO_4$). It is recirculated in the process, i.e. a water reuse process is adopted therefore no discharges to the river or water streams are done. Solid residues from this treatment such as gypsum, if any, are treated to be recycled in the agriculture. All the process is planned in a way that by-products are reused and there are few emissions to the environment. License to the use of by-products in the agriculture is being obtained.

Electricity consumption will be supplied by the grid in the first year of operation. From the second year, electricity will be supplied by the GEEA biomass power plant. The electricity supply plan is presented in Table 2 as well as in the Annex 4.

Table 2. Electricity plan

Source of energy	Power consumption (MWh / y)	Year of operation
Electricity from the grid	3,168	1
Electricity from biomass power plant	3,168	2-25

The amount of auxiliary fuels to start up the boilers is insignificant.

As part of the biomass used in the project activity will be transported from other localities, PROBEM developed a transport technology for the biomass, called *Disperse Biomass Transport*. Aiming to improve the transport efficiency, a biomass compactor is adapted to a truck. This compactor will compact the rice husk from 125 kg/m^3 to 315 kg/m^3, i.e. a maximum compacting factor of 2.5 can be obtained. According to tests, the compactor will consume 0.3 liters of diesel oil per ton of biomass compacted. The compactor can compact 40 tonnes of rice husk per hour. Also aiming to improve the transport efficiency and decrease the fuel consumption, the transportation trucks will carry two 40-feet containers in each trip. With this technology, it will be possible to carry at least 45 tonnes of biomass per truck per trip.

The ultimate and immediate analysis of rice husk and the cellulignin removed from rice husk are presented in Table 3 together with the calorific value.

Table 3. Chemical and thermal analysis of rice husk and cellulignin

Parameter	Unit	Rice husk	Cellulignin of rice husk
Carbon	%	34.71	32.31
Hydrogen	%	7.20	4.31
Nitrogen	%	0.15	Not determined
Sulfur	%	0.13	0.05
Oxygen	%	31.89	33.45
Ash	%	18.26	23.22
Moisture	%	7.66	6.66
Total	%	100.00	100.00
Higher heating value (HHV)	kJ/kg	13,871	13,832
Lower heating value (LHV)	kJ/kg	12,455	12,939

The project uses the above described environmentally safe and sound technology, which leads to utilization of rice husks that otherwise left for decay. The technology of biomass treatment by pre-hydrolyses is commercially known as PROBEM and it was developed by RM Materiais Refratários Ltda. in the host country.

The GEEA-SBS project is attracting the interest of many rice mill owners in the region. The technology of chemical treatment prior to thermal treatment will be transferred to other project developers that wish to obtain by-products of higher grade from the thermal treatment of biomass residues.

The training program for the workers will cover the following necessary issues:

- Basic plant operations, safety and engineering
- Fundamentals of biomass chemical and thermal treatment operations
- Environmental management and awareness
- Wastewater and water treatment operations
- Process engineering and control systems
- Fire safety and evacuation

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:

The proposed small-scale project activity reduces greenhouse gas emissions by preventing rice husks from being left to decay.

In absence of the project activity, the rice husks generated in the Southwest part of Rio Grande do Sul State would be left to decay. The production of rice in Rio Grande do Sul State is very large: 6.3 million tonnes in 2003/4 harvest (IRGA, 2006)[3]. Since 22% of the weight of the rice corresponds to husks, there was a generation of 1.39 million tonnes of rice husks in 2003/4 harvest. Rice fields occupy 45,000 hectares in Alegrete. Considering only Alegrete City, the rice production was 332 thousand tonnes in 2003/4 harvest (IRGA, 2006), generating an amount of 73 thousand tons of rice husks. More than half of the rice husk generated from not only the Pilecco Rice Mill, but also from other mills in Rio Grade do Sul State are currently being left to decay in open air and the practice will continue in absence of the Project.

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

The total estimated amount of emission reductions over the chosen crediting period of 10 years is 192,229 tonnes of CO_2 equivalent (average of 19,223 tonnes of CO_2 equivalent annually).

The total emission reduction is estimated as in Table 4.

Table 4. Net emission reduction by the project emissions (tonnes CO_2 equivalent per year)

Year	**Annual estimation of emission reductions in tonnes of CO_2e**
2007 (July-December)	1,454
2008	4,836
2009	8,541
2010	11,836
2011	15,033
2012	18,136
2013	21,147
2014	24,069
2015	26,905
2016	29,657
2017 (January-June)	30,616
Total estimated reductions (tonnes of CO_2e)	**192,229**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**19,223**

[3] IRGA – Instituto Rio Grandense do Arroz: Rice production ranking in different regions. Available online: http://www.irga.rs.gov.br/arquivos/ranking.pdf (retrieved on February 2006)

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

The Project does not involve public funding from Annex 1 countries.

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

According to the *Paragraph 2 of Appendix C to SSC M&P 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;
- Registered within the previous 2 years;
- 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 all the above mentioned criteria. Accordingly, the proposed project activity is not a debundled component of a larger project activity.

Although GEEA is planning another CDM project which is biomass power generation using rice husk as fuel, the project participants, project category and technology/measure are different.

Also, the project participants will not claim CERs from reduction of GHG emissions by using silica in cement manufacturing in this 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:

Type III.E – **Avoidance of methane production from biomass decay through controlled combustion** (Version 10: 23 December 2006).

AMS III.G – **Methane landfill recovery** (Version 4: 23 December 2006)

"Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)

Type I.D – **Renewable electricity generation for a grid** (Version 10: 23 December 2006)

ACM0002 – **Consolidated methodololgy for grid connected electricity generation from renewable sources** (Version 6: 19 May 2006)

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

As explained in Section A.4.2., the project activity is applicable to the project category of Type III.E – Avoidance of methane production from biomass decay through controlled combustion under *Appendix B of the SSC M&P* (Version 10: 23 December 2006).

The baseline calculation chosen for methane avoidance is given in Type III.E, ,wherein the Yearly Methane Generation Potential is calculated using the First Order Decay (FOD) model based on the discrete time estimate method of the IPCC Guidelines as described in category AMS III.G and the *"Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"*. Baseline emissions shall exclude methane emissions that would have to be removed or combusted to comply with national or local safety requirement or legal regulations.

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:

The Project faces the several barriers for implementation as described below.

The following options are available for rice husk disposal.

Scenario 1: Disposal in open air
Scenario 2: Open-air burning
Scenario 3: The Project without the CDM
Scenario 4: Biomass treatment (the Project)

The following sections elaborate on each of the scenarios.

Scenario 1: Disposal in open air

The practice of rice husk disposal in Rio Grande do Sul State, Brazil consists mostly of open-air disposal. Pilecco Rice Mill is presently disposing its rice husk in landfill sites until it is naturally decomposed. The landfill site is located 70 km far from the project activity site; however, as a conservative measure, the emissions due to the transport of the rice husk to the landfills in the baseline not are included. There are currently no national or local safety requirements or regulations against this method of disposal. Nor are new regulations likely during the crediting period to require Pilecco Rice Mill to change its current practice.

Scenario 2: Open-air burning

Disposal of rice husk by burning it in the open air is not an acceptable practice in Rio Grande do Sul State anymore. In the past, it was a common practice; however, this leads to air pollution and it is not accepted by communities. Therefore, it was completely forbidden by the State regulation and State environmental agencies. Therefore, open-air burning is not a likely scenario to be adopted by the project participants.

Scenario 3: The project activity without the CDM

There are no sufficient legal or economic incentives to install of a biomass treatment plant. Without the benefits of CERs to be generated from a CDM project, the Project will not be implemented.

Scenario 4: Biomass treatment (The proposed Project)

The project participants will install the biomass treatment plant and claim emissions reduction for avoidance of methane from decaying biomass through controlled combustion.

Based on the above analysis of each scenario, there are only two plausible scenarios, Scenario 1 (disposal in open air; continuation of current practice) and Scenario 4 (biomass treatment; the proposed Project).

Due to the following barriers associated with the introduction of this new technology in the country, the proposed Project's implementation would not be possible without the CDM:

- Barrier due to prevailing practice
- Technological barrier
- Investment barrier

Barrier due to prevailing practice

The continuation of current practices (Scenario 1) presents no particular obstacles. It is unlikely that new regulations are introduced during the crediting period to require Pilecco Rice Mill to change its current practice. 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 corresponds to the south region. 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 transport costs, will represent obstacles for taking the residues into consideration as a pressure to perform future projects.

Technological barrier

The project activity is the first project that will produce silica of higher grade from thermal treatment of biomass (rice husk). This technology of chemical and thermal treatment of the rice husk has never been implemented in Brazil. In addition, the production of silica of higher grade itself is a new industry in the region. The application of the new technology for the first time in the country will be too risky to implement without financial assistance through obtaining CERs.

Investment barrier

The construction of a plant to treat residues faces specific financial/economic barriers due to the fact that the capital costs related to construct the industry are very high. The capital costs involved in the project pose a barrier, especially considering the high interest rates prevalent in developing countries. Additionally, the equipment cost for such technology is high. It is worth noting that there are no direct subsides or promotional support for the implementation of residual biomass treatment plants currently.

Faced with the barrier due to prevailing practice, investment barrier as well as technological barrier outlined above, the Project will not be carried out in the course of regular business. Hence, it is additional.

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:

As stated in the methodology III.E (Version 10), the project boundary involves the physical, geographical sites:

a) where the solid waste would have been disposed and the avoided methane emission occurs in absence of the proposed project activity,
b) where the treatment of biomass through controlled combustion takes place,
c) and in the itineraries between them, where the transportation of wastes and combustion residues occurs.

Therefore, the project boundary includes the landfill site where the rice husk would be disposed, the plant where the chemical and thermal treatment of rice husk, and the itineraries of transportation.

As there are no combustion residues, but silica as product, the deposition of combustion residues is not accounted in this project activity.

The project boundary is indicated by a dotted line in the Figure 4.

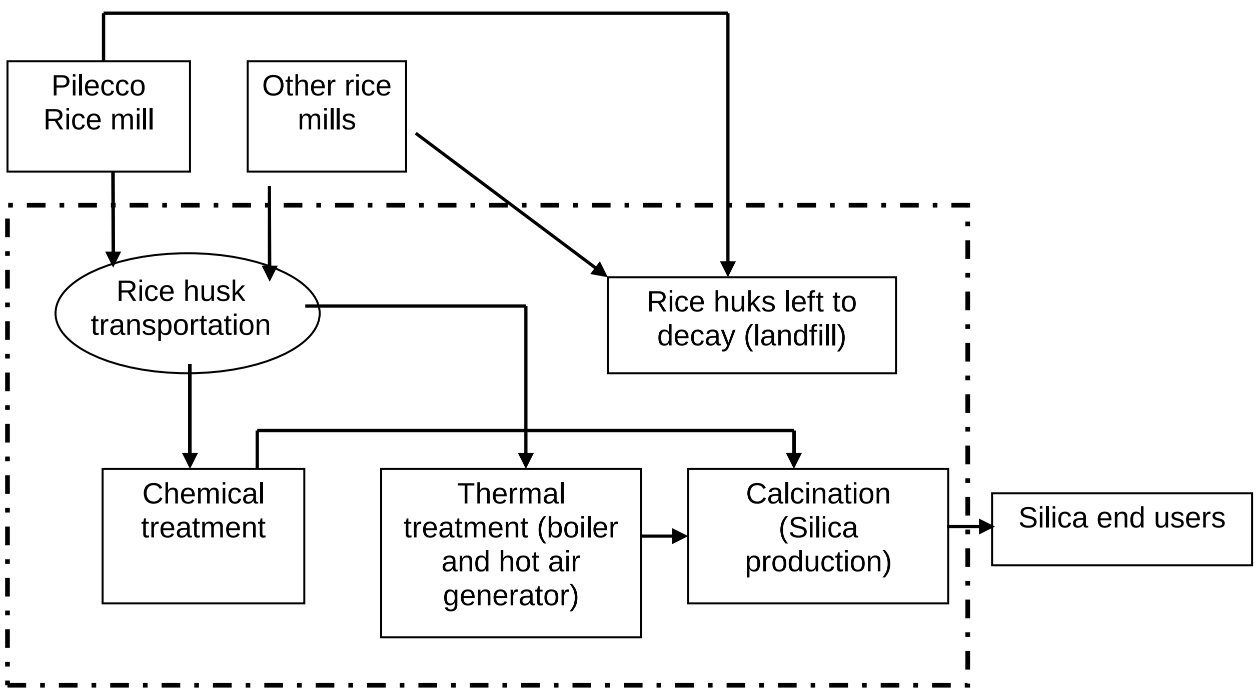

Figure 4. Project activity boundary

The project activity's direct emissions are as following:

a) CO_2 emissions from the combustion of auxiliary fuels in the combustion facilities. These emissions are very low since a small amount of auxiliary fuels is used. The chemical treatment is powered by the vapour generated in the boiler.
b) CO_2 emissions due to incremental distances between the collection points to the controlled combustion site and to the baseline disposal site. This process does not generate residues. The final products are supplied to SBS; therefore, no transportation is required.
c) CO_2 emissions related to the power used by the project activity facilities, including the equipments for air pollution control required by regulations. In case the project activity consumes grid –based electricity, the grid emission factor (kg CO_2e/kWh) is used, or it is assumed that diesel generators would have provided a similar amount of electric power, calculated as described in category I.D (Version 10: 23 December 2006).

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

The baseline for avoidance of methane production from biomass decay through controlled combustion is based on methodology AMS III.E of *Appendix B of the SSC M&P* (Version 10: 23 December 2006). The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter are left to decay within the project boundary and methane is emitted to the atmosphere. In this methodology, the yearly baseline emissions are the amount of methane that would have been emitted from the decay of the cumulative quantity of the waste diverted or removed from the disposal site, to date. The Yearly Methane Generation Potential is calculated using the First Order Decay model based on the discrete time estimate method of the IPCC Guidelines, described in category AMS III.G (Version 4: 23 December 2006) and the *"Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"*.

There is no regulation that requires the removal or combustion of methane generated by the decay of rice agricultural residues such as rice husks. Therefore, the amount of methane that would be destroyed is not accounted in the baseline. There is evidence that such regulation would not be enacted during the crediting period of the project activity.

The selected formula for calculation of the baseline emissions is provided in Section E.1.1.

Assumptions of the baseline

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 of the of the SSC M&P* (Version 10: 23 December 2006) are used.

The baseline emissions are the amount of methane from the decay of the biomass content of the waste treated in the project activity. The Yearly Methane Generation Potential is calculated according AMS III.G (Version 4, 23 December 2006) using the First Order Decay (FOD) model based on the discrete time estimate method of the IPCC Guidelines, as described in the *"Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"*(Annex 14, EB26). This tool presents the default value of the Degradable Organic Carbon (DOC) for wood and straw waste as 43% or 0.43. Therefore, in this project, it is applied the default value of DOC as 0.43.

The value of *k* applicable to any single solid waste is determined by a large number of factors associated with the composition of the waste and the conditions at the site. For slow degrading materials such as wood and straw waste, the default value is 0.030 per year in temperate wet places and 0.035 in tropical wet places. Alegrete presents a clime sub-temperate umid (Maluf, 2000), therefore the value of 0.030 is adopted in this project. The study presented in Maluf (2000) shows evidence that the mean annual precipitation is larger than the potential evapotranspiration in the region.

In the absence of this project activity, the rice husks would be deposited in a landfill site located in an old mine distant 70 km from the project site. The amount of rice husks has a height higher than 5 meters, therefore the Methane Correction Factor (MCF) used in the baseline emissions estimation is 0.8, which is the IPCC default value for unmanaged deep sites. Images of the baseline landfill site are presented in Annex 6. As the site does not receive soil as cover, the Oxidation factor (OX) is zero. The model correction factor (φ) is 0.90.

The default values for DOC, MCF, OX, φ, and *k* are given in the aforementioned tool.

Date of completing the final draft of this baseline section (*DD/MM/YYYY)*:
23/12/2006

Name of person/entity determining the baseline:
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Mitsubishi UFJ Securities is the CDM advisor to the Project and is also a project participant. The contact details of the above entities determining the baseline is 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:

05/05/2006

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

25y-0m

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

Fixed crediting period

C.2.1. Renewable crediting period:

n/a

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

n/a

C.2.1.2. Length of the first crediting period:

n/a

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2007

C.2.2.2. Length:

10y-0 m

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:

AMS Monitoring methodology Category III.E as described in *Appendix B of the of the SSC M&P CDM Project Activities* (Version 10: 23 December 2006).

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

The proposed project activity is eligible to apply the monitoring methodology Type III.E. since it consists in thermal treatment of biomass (rice husk) that would have otherwise been left to decay anaerobically in a solid waste disposal site without methane recovery thus avoiding methane emissions.

(1) **Avoidance of methane production** – The annual emissions reduction will be measured as the difference between the baseline emission and the sum of the project emission and leakage. The annual amount of biomass combusted by the project activity is to be measured and recorded. The distance for transporting the waste in the baseline and project scenario shall also be recorded.

D.3 Data to be monitored:

Table 5. Data to be monitored

ID Number	Data type	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.1	Activity level (Baseline and Project)	Amount of biomass treated (Q_y)	Determination	tonnes	m	Monthly (aggregate)	100%	Electronic	Scales will measure the total amount of biomass used by this project
D.2	Activity level (Baseline and Project)	Composition of biomass combusted in power plant	Sampling	Type	m	Quarterly	Representative	Electronic	Used for baseline emission, measured at least quarterly by sampling at Project site
D.3	Activity level (Project)	Amount of biomass transported (Qy,transp)	Determination	tonnes	m	Monthly (aggregate)	100%	Electronic	Scale at the gate of the company
D.4	Activity level (Project)	DAFy	Documentation on transportation transactions.	Km / truck	e	Monthly (aggregate)	100%	Electronic	
D.5	Activity level (Project)	Truck capacity for biomass transportation (CT_y)	Determination	tonne / truck	m	Monthly (aggregate)	100%	Electronic	
D.6	Activity level (Project)	Amount of fuel spent for compacting biomass (f_{comp})	Documentation on fuel purchase and number of hours of work	tonne / tonne of rice husk	e	Monthly	100%	Electronic	The number of operating hours and the amount of fuel used according the fuel purchase notes

									will be used to estimate the amount of fuel used by ton of biomass compacted
D.7	Activity level (Project)	Electricity consumption	Electricity ingress registered and electricity bills	kWh	m	Continuous and monthly	100%	Electronic	The electricity imported from the grid is monitored by an energy ingress register and by the electricity concessionary
D.8	Status (Baseline)	Fraction of methane captured ate the SWDS and flared, combusted or used (f)	Project developer	-	-	Yearly	100%	Electronic	Project developer will take info from SWDS operator or site visit
D.9	Status (Baseline)	Global Warming Potential (GWP_{CH4})	Decisions under the UNFCCC and Kyoto Protocol	-	-	Yearly	-	Electronic	GWP valid for the commitment period
D.10	Status (Baseline)	Surplus of biomass	Project developer	%	e	Yearly	-	Eletronic	Project developer will consult Rice Processing Associations or statistics to obtain the surplus amount of biomass (rice husk) and estimate the surplus percentage

Notes: All the data will be archived during the credit period and two years from the issuance of CERs.
As rice husks are highly inflammable, additional fuel for start-up will not be necessary. Therefore, the amount of fuel for start-up is not monitored.
Non-biomass carbon will not be used in the project activity; therefore it will not be monitored.

As described previously, the Project will neither lead to fuel diversion to carbon-intensive fuels or displacement of existing or planned rice husk plants. The demand for rice husk other than from the Project is very limited and will remain so in the future. Monitoring the possibility of leakage is unnecessary.

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

Quality control and assurance measures including performance review will be carried out. All monitoring equipment will be regularly calibrated.

All variables used to calculate project and baseline emissions are directly measured or are publicly available data (default values adopted by IPCC, for instance).

Table 6. Quality control and assurance of parameters

ID number	Uncertainty level of data (high / medium / low)	Explain QA /QC procedures planned for these data, or why such are not necessary.
D.1	Low	Scales will be calibrated. Maintenance and calibration of the equipments will be carried out according to the national standards.
D.3	Low	The amount of rice husk or residues transported by truck is monitored accurately, as all truck loads are registered. The truck loads will be monitored by measuring equipments/balances. Maintenance and calibration of the equipments will be carried out according to the national standards.
D.4	Low	Average incremental distance for rice husk will be consistently check by distance record by the truck and confirmed using other sources (e.g. maps)
D.5	Low	The amount of rice husk transported by truck is monitored accurately, as all truck loads are registered. The truck loads will be monitored by measuring equipments/balances. Maintenance and calibration of the equipments will be carried out according to the national standards.
D.6	Low	Documentation double check. The values obtained will be compared to the results of tests.
D.7	Low	The information read by the electricity ingress register will be double checked with the monthly electricity bill expedited monthly by the electricity concessionary. When the project starts receiving electricity from GEEA, the power supply will be measured by an electricity meter.

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:

Figure 5 outlines the operational and management structure that SBS will implement to monitor emission reductions generated by the project activity. SBS will form an operational and management team, which will be responsible for monitoring of all the parameters aforementioned. This team composes of a general manager and a group of operators. The general manager will be responsible for ensuring that all data is recorded accurately, and that measuring equipment is calibrated. Further, it will be an integral part of his duties to ensure that the plant is run as efficiently as possible. A group of operators, who are under the supervision of the general manager, will be trained and assigned for monitoring of different parameters on a timely basis as well as recording and archiving data in an orderly manner. Training will be done with classes and an instruction manual for operators will be organized. Monitoring reports will be forwarded to and reviewed by the general manager on a monthly basis in order to ensure the Project follows the requirements of the monitoring plan.

Data archived will also be verified regularly by the DOE. The performance of the Project will be reviewed and analyzed by the consultant on a regular basis.

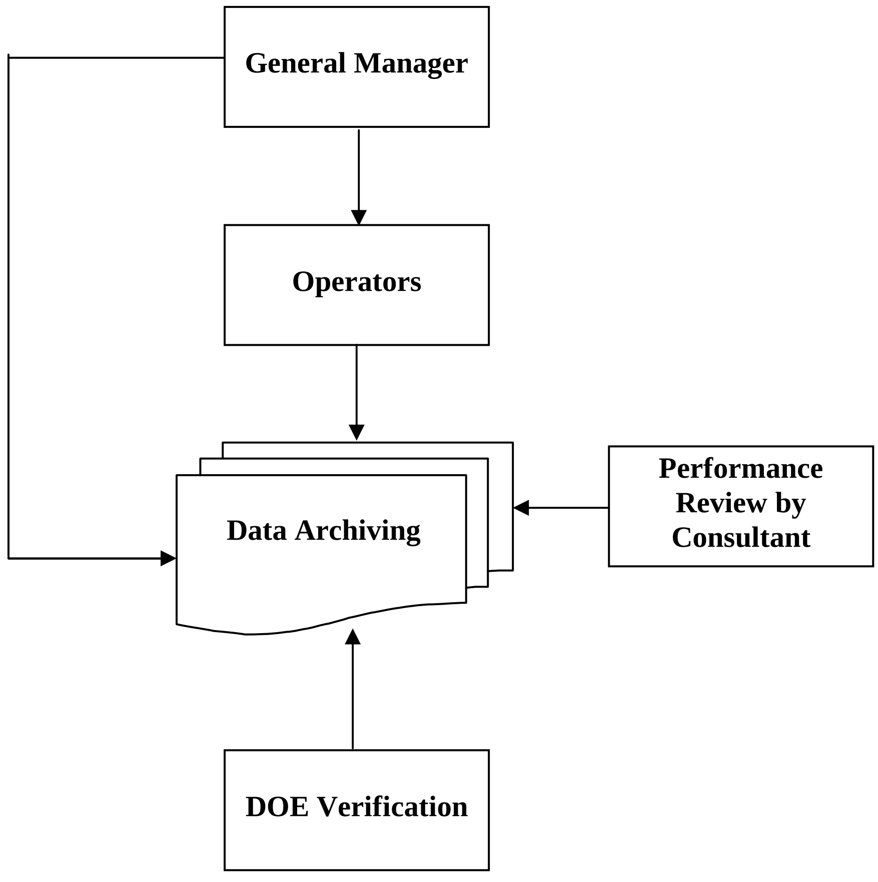

Figure 5. Operational and management structure for monitoring the project activity.

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

- Mitsubishi UFJ Securities
- Geradora de Energia Elétrica Alegrete (GEEA)

The monitoring methodology was prepared by Mitsubishi UFJ Securities Co.,Ltd.

The contact details of the above entity determining the baseline and monitoring plan are listed in Annex I.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

Baseline emissions:

In order to calculate the emission reductions arising from the project we have followed the formula of the amount of methane that would be generated in the absence of the project activity at the solid waste disposal site ($BE_{CH4,SWDS,y}$) described in the "*Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*" (Annex 14, EB26), according required by the AMS III.G (Version 4: 23 December 2006). The quantity of methane projected to be formed during a given year is estimated using a multi-phase model, based on a first order decay (FOD) model. The default values are given by the IPCC 2006 Guidelines.

The amount of methane produced in year y ($BE_{CH4,SWDS,y}$) is calculated as follows:

$$BE_{CH4,SWDS,y} = \varphi * (1 - f) * GWP_{CH4} * (1 - OX) * 16/12 * F * DOC_f * MCF * \sum_i \sum_j W_{jx} * DOC_j * e^{-k_j * (y-x)} * (1 - e^{-k_j})$$

where,

$BE_{CH4,SWDS,y}$	Methane emissions avoided during the year *y* from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year *y* (tonnes of CO_2e)
φ	Model correction factor to account for model uncertainties (default is 0.9)
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for the relevant commitment period (tonnes of CO_2 equivalent/tonne of CH_4)
16 / 12	Conversion from C to CH_4
F	Fraction of CH_4 in SWDS gas (default is 0.5)
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose (default is 0.5)
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type *j*
MCF	Methane correction factor (fraction) (default is 0.8 for deep unmanaged sites)
W_{jx}	Amount of organic waste type *j* prevented from disposal in the SWDS in the year x (tonnes/year) ($W_{jx} = Q_y$)
k_j	Decay rate for the waste stream type *j*
j	Waste type distinguished into the waste categories

x	Year during the crediting period: x runs from the first year of crediting period (x=1) to the year which avoided emissions are calculated (x=y)
y	Year for which methane emissions are calculated

$BE_y = BE_{CH4,SWDS,y} - MD_{reg,y}$

where,

BE_y	Baseline methane emissions from biomass decay at year "y" (tonnes of CO_2 equivalent)
$MD_{reg,y}$	methane that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the year "y" (tonnes of CO_2 equivalent)

The project combust freshly generated wastes.

Information about choice of parameters for baseline calculation is presented in B.5. As discussed in B.5, φ is 0.9, f is null, the MCF is 0.8, *k* is 0.030, OX is zero, and the DOC_j is 0.43.

<u>Project emissions:</u>

According to the AMS. III.E, the project activity emissions consist of:

a) CO_2 emissions related to the combustion of the non-biomass carbon content of the waste (plastics, rubber and fossil derived carbon) and auxiliary fuels used in the combustion facility,

b) Incremental CO_2 emissions due to incremental distances between the collection points to the controlled combustion site and to the baseline disposal site as well as transportation of combustion residues and final waste from controlled burning site to disposal site,

c) CO_2 emissions related to the power used by the project activity facilities, including the equipments for air pollution control required by regulations. In case the project activity consumes grid-based electricity, the grid emission factor ($kgCO_2e/kWh$) is used, or it is assumed that diesel generators would have provided a similar amount of electric power, calculated as described in category I.D.

PE_y = PEy,comb + PEy,transp + PEy,power

where,

PE_y	project activity direct emissions in the year "y" (tonnes of CO_2 equivalent)
PEy,comb	emissions through combustion of non-biomass carbon in the year "y"
PEy,transp	emissions through incremental transportation in the year "y"
PEy,power	emissions through electricity or diesel consumption in the year "y"

Combustion-related CO_2 emissions

IPCC guidelines[4] stipulate that biomass combustion is assumed to equal its regrowth. Based on this assumption, the amount of CO_2 produced by combusting rice husk in the project activity is considered equal to the amount of CO_2 absorbed by the rice plant and trees as they grow. Since only biomass will be combusted, CO_2 emission from combustion is zero.

$$PE_{y,comb} = Q_{y,,non\text{-}biomass} * 44/12 + Q_{y,fuel} * E_{y,fuel}$$

where,

$Q_{y,,non\text{-}biomass}$	Non-biomass carbon of the waste combusted in the year “y” (tonnes of Carbon)
$Q_{y,fuel}$	Quantity of auxiliary fuel used in the year “y” (tonnes)
$E_{y,fuel}$	CO_2 emission factor for the combustion of the auxiliary fuel (tonnes CO_2 per tonne fuel, according to IPCC Guidelines)

The quantity of fuel used for start up ($Q_{y,fuel}$) is considered null. The non-biomass waste amount ($Q_{y,,non\text{-}biomass}$) is null, since this treatment is meant just for biomass.

Transport-related emissions

Part of the biomass used in the project activity will be transported from other localities. Aiming to improve the transport efficiency of the biomass, PROBEM involves a technology to compact the biomass. Therefore, the transport-related emissions correspond to the transport itself and the compacting process as following:

$$PEy,_{transp\ total} = PEy,_{transp} + PEy,_{Comp}$$

In this project, project emissions due to road transportation will be estimating applying the equation below:

$$PEy,_{transp}= (Qy,_{transp}/CT) * DAF_w * EF_{CO2} + (Qy,_{ash}/CTy,_{ash}) * DAF_{ash} * EF_{CO2}$$

where,

$Qy,_{transp}$	quantity of biomass transported (tonnes)
CT	average truck capacity for biomass transportation (tonnes/truck)
DAF	average incremental distance for biomass transportation (km/truck)
EF_{CO2}	CO_2 emission factor from fuel use due to transportation (kg CO_2/km, IPCC default value is 0.001097)
$Qy,_{ash}$	quantity of combustion residues produced in the year “y” (tonnes)
$CTy,_{ash}$	average truck capacity for combustion residues transportation (tonnes/truck)
DAF_{ash}	average distance for combustion residues transportation (km/truck)

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[8] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual (Volume 3)

The products obtained from the combustion are destined to SBS, therefore there are no combustion residues ($Qy_{,ash}$).

The truck average capacity is higher than in common trucks because a compactor is used to accommodate the rice husks in the containers and because the trucks will carry two containers at once.

The incremental distance (DAF) corresponds to the difference between the average distance that the rice husk is transported from the source to the project site and the average distance between the source and landfill site. The DAF corresponds 140 km/truck, as presented in Annex 3.

In future, the rice husk transport might be changed to railroad. As a conservative measure, in this document, only emissions from road transport were considered.

Emissions related to the compacting process are described in Section E.1.2.

Power consumption-related emissions

In the first year of operation, the plant will consume electricity from the grid. From the second year of operation, all power requirements will be obtained from the GEEA biomass power plant. Considering electricity consumption from the biomass power plant, the CO_2 emissions will be null. The power consumption plan is shown in Annex 4.

Regarding heat requirements, the plant will produce its own heat and vapor to run the processes.

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

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

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

<u>Project emissions:</u>

Emissions due to fossil fuel use for compacting biomass

Additionally, fossil fuel will be spent to compact the biomass prior to transportation. The emissions are estimated as the equation below. As tests carried out by PROBEM, 0.3 liters of diesel oil (corresponding to 0.252 kg[5]) will be spent to compact each tonne of biomass. The amount of fuel used to compact the biomass will be monitored.

$$PEy_{,Comp} = Q_{y,transp} * f_{comp} * EF_{CO2,comp}$$

[5] Diesel oil density equals 840 kg/m^3 (BEN – Balanço Energético Nacional 2006, Ministério de Minas e Energia)

where,

$Q_{y,transp}$	Quantity of biomass transported (tonnes)
f_{comp}	Average consumption of diesel oil per tonne of biomass (kg/ton)
$EF_{CO2,comp}$	CO_2 emission factor from fuel use due to combustion in motor (kg CO_2/kg, IPCC default value is 0.00317)

Power consumption-related emissions

Project emissions related to the electricity consumption when it occurs will be calculated as following:

$$PEy,power = ECy * CEF_{CO2,elect}$$

where,

PEy,power	Project Emissions of electricity consumption (tonnes CO_2e)
ECy	Electricity consumption by project activity in year y (MWh)
$CEF_{CO2,elect}$	Grid Carbon Emission Factor (measured in tonnes CO_2e / MWh)

$CEF_{CO2,elect}$ is calculated as a combined margin (CM) of the Build Margin *(EF_BM)* and the Operating Margin. According the recommendations given in ACM0002 (Version 6), for Brazilian projects, the Operating Margin is calculated as the Simple Adjusted Operating Margin $(EF\_OM_{adjusted})$.

$$CEF_{CO2,elect} = (\omega OM * EF\_OM_{adjusted}) + (\omega BM * EF\_BM)$$

where,

$EF\_OM_{adjusted}$	Simple Adjusted Operating Margin emission factor[6]
EF_BM	Build Margin emission factor[7]
ωOM = ωBM	weights by default = 0.5

The Simple Adjusted Operating Margin ($EF\_OM_{adjusted}$) is calculated as below:

$$EF\_OM_{adjusted} = (1 - \lambda_y) * \frac{\sum F_{i,j,y} * COEF_{i,j}}{GEN_{j,y}} + \lambda_y * \frac{\sum F_{i,k,y} * COEF_{i,k}}{GEN_{k,y}}$$

where,

$F_{i,,y}$	the amount of fuel *i* (in GJ) consumed by power source *j* or *k* in year *y*;
k	set of low-cost or must-run plants delivering electricity to the grid
j	other plants;
$COEF_{i,y}$	carbon coefficient of fuel *i* (tCO_2e/GJ);
GEN_y	electricity (MWh) delivered to the grid by source *j* or *k*

[6] Simple Adjusted Operating Margin factor ($EF\_OM_{adjusted}$.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, where the power sources (including imports) are separated in low-cost/must-run power sources and other power sources.

[7] Build Margin factor (*EF_BM*) is the weighted average emissions (in kg CO_2e/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.

$$\lambda_y = \frac{\text{number of hours per year for which low-cost/must-run sources are on margin}}{\text{8760 hours per year}}$$

The CO_2 emission coefficient $COEF_i$ is obtained as following:

$$COEF_i = NCV_i * EFCO_{2,i} * OXID_i$$

where,
NCVi net calorific value (energy content) per mass or volume unit of a fuel *i*;
$OXID_i$ oxidation factor of the fuel (see page 1.29 in the 1996 Revised IPCC Guidelines for default values);
$EFCO_{2,i}$ CO_2 emission factor per unit of energy of the fuel *i*.

The plant will be connected to the Southeast-South-Midwest interconnected system. Load and values for Lambda (λ), Simple Adjusted Operating Margin and Build Margin emission factors are presented in Table 7.

Table 7. SSC Emission factors for the Brazilian South-Southeast-Midwest interconnected grid

Year	**OM (tCO_2e / MWh)**	**Load (MWh)**	**Lambda (λ)**
2003	0.9823	288,933,290	0.5312
2004	0.9163	302,906,198	0.5055
2005	0.8086	314,533,592	0.5130
Total generation	**-**	**906,533,592**	

Simple Adjusted OM (tCO_2e/MWh)	**0.4349**	
BM 2004 (tCO_2e/MWh)	**0.0872**	
$CEF_{CO2,elect}$ (OM*0.5+BM*0.5)	**0.2611**	

Note: Imports are included.
Source: Operador Nacional do Sistema Elétrico (ONS), Centro Nacional de Operação do Sistema, Acompanhamento Diário da Operação do SIN, (daily reports from Jan. 1, 2003 to Dec. 31, 2005).

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

The controlled combustion technology equipment is not transferred from another activity nor the existing equipment is transferred to another activity, therefore, leakage effects at the site of the other activity do not need to be considered. Therefore, no leakage calculation is required.

The production of rice and consequently the supply of rice husks in Rio Grande do Sul State are large. During the harvest of 2003/2004, Rio Grande do Sul produced around 6.3 millions tonnes of rice (IRGA, 2006)[8]. Every tonne of rice produced leads to the supply of 0.22 tonnes of rice husks (CIENTEC, 1986)[9].

[8] IRGA – Instituto Rio Grandense do Arroz: Rice production ranking in different regions. Available online: http://www.irga.rs.gov.br/arquivos/ranking.pdf (retrieved on February 2006)

Table 8 shows the proportions of rice husks used for different purposes. The information is based upon a survey done in 1986 by CIENTEC, taking in account almost one hundred mills, corresponding to 57 up to 60% of the rice production, in cities that presented productions up to 100,000 rice bags per year. The latest CIENTEC's data updates and publications still keep the same ratio between the use and sources of rice husks in the Rio Grande do Sul State. The rice husk surplus of 60% is considerable. This indicates that the project activity will not cause a diversion of biomass from another activity. The Annex 8 presents the total rice husk surplus generation within a radius of 300 km far from the project site; the surplus generation is over 400,000 ton per year of rice husk.

Table 8. Use of the rice husks in Rio Grande do Sul State

Application	Percentage (%)
1.Destined to grain drying	15.20
2.Destined to steam generation	14.00
3.Used as cement additive	7.00
4.Used for motor power generation	4.20
5.Rice husks Surplus	59.60
Total	100.00

Source: Rucatti and Kayser (2004) [10]

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

The total small scale project activity emissions are estimated as following:

$$PE_{Total} = PE_{y,comb} + PE_{transp} + PE_{y,Power}$$

where,

$PE_{y,comb}$ Emissions due to the combustion of auxiliary fossil fuels and non-biomass components and it is calculated as described in E.1.1

$PEy,_{transp}$ Emissions due to the transport and compacting process of residual biomass obtained from external sources as well as transport of residues and it is calculated as described in E.1.1

$PEy,_{power}$ Emissions due to the electricity use and it is calculated as described in E.1.1

The project activity total emissions are equal or lower than 438 tonnes of CO_2e/year.

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:

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

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

The formulae used to estimate baseline emissions are described in Section E.1.1 and the assumptions are presented in Section B.5. Total baseline emissions amount for the crediting period is 192,229 tonnes of CO_2e.

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:

Emission reductions consist on the difference between the baseline emissions and the project emissions. Emission reduction by avoidance of methane production from biomass decay through controlled combustion equals:

$ER = BE_y – PE_{Total}$

where,

ER	Emission reduction by the avoidance of methane production from biomass decay through controlled combustion (tonnes of CO_2 equivalent)
BE_y	Baseline methane emissions from biomass decay (tonnes of CO_2 equivalent)
PE_{Total}	Project activity total emissions (tonnes of CO_2 equivalent)

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

Emissions reductions due to the project activity are on average 19,223 tonnes CO_2e/year, 192,229 tonnes of CO_2 equivalent for the 10-year-crediting period.

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

Table 9. Table providing the values used and obtained when applying formulae above

Indicator	Abbreviation	Value	Unit
Methane correction factor	MCF	0.8	dimensionless fraction
Degradable organic carbon	DOC	0.43	dimensionless fraction
Fraction DOC dissimilated to landfill gas	DOC_f	0.5	dimensionless fraction
Fraction of CH_4 in landfill gas	F	0.5	dimensionless fraction
Decay rate	k	0.030	$year^{-1}$
Model correction factor to account model uncertainties	φ	0.9	dimensionless fraction
Oxidation factor	OX	0	dimensionless fraction
Fraction of methane captured at the SWDS site and flared, combusted or used in another manner	f	0	dimensionless fraction
Quantity biomass treated by the project activity	Q_y	55,440	tonnes / year

Indicator	Abbreviation	Value	Unit
Methane that would be destroyed or removed in the year "y" for safety or legal regulation	$MD_{reg,y}$	0	tonnes of CH_4 / year
GWP for CH_4	GWP_{CH4}	21	tonnes of CO_2e / tonne of CH_4
Non-biomass carbon of the waste combusted	$Q_{y,,non-biomass}$	0	tonnes C / year
Quantity of auxiliary fuel±	$Q_{y,fuel}$	0	tonnes of fuel / year
CO_2 emission factor for the combustion of the auxiliary fuel and non-biomass material	$E_{y,fuel}$	3.2	tonnes CO_2 / tonnes fuel
Project activity emissions from combustion of auxiliary fuel and non-biomass material	$PE_{y,comb}$	0	tonnes of CO_2e / year
Quantity of biomass transported*	$Qy,_{transp}$	30,440	tonnes / year
Quantity of ash transported#	$Qy,_{ash}$	0	tonnes / year
Average truck capacity	CT	45	tonnes / truck
Average incremental distance for biomass transportation	DAF	140	km / truck
Average distance for combustion residues transportation	DAF_{ash}	0	km / truck
Average truck capacity for transporting combustion residues	CT_{ash}	n/a	ton / truck
CO_2 emission factor from fuel use due to transportation	EF_{CO2}	0.001097	kg CO_2 / km
Project activity emissions from fossil fuel used in the transport*	PE_{Transp}	104	tonnes of CO_2e / year
Average consumption of diesel oil per tonne of biomass compacted	f_{comp}	0.252	kg of diesel oil / ton biomass
CO_2 emission factor from fuel use due to combustion in motor	$EF_{CO2,comp}$	0.00317	kg CO_2 / kg diesel
Project activity emissions from fossil fuel used for compacting the biomass	$PEy,_{Comp}$	29	tonnes of CO_2e / year
Total project activity emissions due transport	$PEy,_{transp\ total}$	128	tonnes of CO_2e / year
Electricity consumption+	ECy	2,376	MWh / y
Project activity emissions due to power consumption+	PE_{power}	310	tonnes of CO_2e / year

Notes: ± As rice husk is easily inflammable, there will be no need for auxiliary fuel for start up the process.

No residues are generated.

* See Annex 3; + See Annex 4

Table 10. Net emission reduction the project (tonnes CO_2 equivalent per calendar year)

Year	Baseline emissions (A)	Project emissions due combustion (B)	Project emissions due transportation and compacting (C)	Project emissions due power consumption (C)	Total project emissions (B + C + D)	Total net emission reductions (A - E)
2007 (July-Dec.)	1,775	0	11	310	322	1,454
2008	5,274	0	128	310	438	4,836
2009	8,669	0	128	0	128	8,541
2010	11,964	0	128	0	128	11,836
2011	15,161	0	128	0	128	15,033
2012	18,264	0	128	0	128	18,136
2013	21,275	0	128	0	128	21,147
2014	24,197	0	128	0	128	24,069
2015	27,033	0	128	0	128	26,905
2016	29,785	0	128	0	128	29,657
2017 (Jan.-June)	30,680	0	64	0	64	30,616
Total estimated	194,079	0	1,230	620	1,850	192,229
Total number of crediting years	10	10	10	10	10	10
Annual average	19,408	0	123	62	185	19,223

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 project obtained the Operating License of number 86/2006-DL, in February 9th, 2006. In order to obtain the license, the project developers showed evidence that no negative environmental impact is incurred by this activity.

In relation to the baseline scenario no negative environmental impacts will arise as a result of the project activity.

The project meets all national and local legislation. Some points noted for the plant are as following:

- The combustion of rice husk may present some concerns because of the low density of the husk and the high particulate in the flue gas. However, automation of the combustion control as well as a gas treatment system will reduce the particular emissions at the stack.

- SO_2 emissions from combusting rice husk will be minimal and be reduced compared to using fossil fuel. NO_x emissions will also be low and maintained within the prevailing emission standards.

- Wastewater will be treated at site and then recirculated to the plant. All by-products will be reused.

The positive environmental impacts arising from the project activity are:

- A reduction in dumping of rice husk that may potentially arise in the absence of the project activity.

- A reduction of methane that would be emitted in the absence of the project activity.

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), any CDM projects must send a letter with description of the project and an invitation for comments by local stakeholders.

Letters were sent to several stakeholders, including:
- City Hall of Alegrete;
- Chamber of Alegrete;
- Environment agencies;
- 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 associations, unions and others.

Local stakeholders, listed in Annex 5, 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. The invitation letters were sent in March 2006 and the copies of the letters and respective receipt notifications are available upon request. A total of 28 letters were sent.

G.2. Summary of the comments received:

Twelve letters of response were received. From those, ten were in total concordance with the project, and provided commendation and appraisal.

The Alegrete's District Attorney and the Brazilian Forum of NGOs made comments as bellow.

Entity	Comments
Alegrete's District Attorney	There will be necessary to obtain the license to make groundwater removal. The effluents and air emissions should be according the criteria obtained in the operating license.
Brazilian Forum of NGOs	Stated that the material sent as well as the resources available to the Brazilian Forum of NGOs were not enough for a comprehensive evaluation. Suggested using other criteria of sustainability, such as using the *"Gold Standard PDD"*

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

As stated above, most of the comments received were of appraisal and commendation.

Answers were sent to all stakeholders that sent letters addressing their comments.

Regarding water use, the project plans to use demineralized water and circulate it internally. If groundwater removal became necessary, all licenses will be obtained and removal will be done according to them (addressing the comment by the Alegrete's District Attorney).

The project has appropriate technology to generate effluent and air emissions lower than the maximum allowed in the operating license (addressing the comment by the Alegrete's District Attorney).

Regarding the comments by the Brazilian Forum of NGOs, a letter was sent explaining that the project contributes to the sustainable development due to:

- Job generation;
- Small rice mills, which are not able to set an advanced treatment to their residues, will not need to send their residues to landfill sites;
- Implementation of a new technology in the region;
- Value aggregation to a residue, i.e., the combustion residues will be applied in another industry;
- Avoidance of methane generation from rice husk landfilling;
- Low gaseous and water emissions;
- The project does not affect the fauna and flora.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project participants:

Organization:	GEEA – Geradora de Energia Elétrica Alegrete Ltda
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Represented by:	
Title:	President
Salutation:	Mr.
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Middle Name:	
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Project advisor:

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The financial plans for the Project do not involve public funding from Annex I countries.

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Annex 3

Biomass Transport Plan

The table below presents the biomass transportation plan. The project will use all the rice husks provided by Pilecco Rice Mill. The remaining amount will be supplied from external sources.

Year	Amount of rice husk provided by Pilecco rice mill (tonnes / year)	Amount of rice husk transported (tonnes / year)	Average incremental distance (DAF) (km / truck)	$PEy,_{transp\ total}$ (tCO_2e / y)
2007 (July-Dec)	25,000	2,720	140	11
2008	25,000	30,440	140	128
2009	25,000	30,440	140	128
2010	25,000	30,440	140	128
2011	25,000	30,440	140	128
2012	25,000	30,440	140	128
1013	25,000	30,440	140	128
2014	25,000	30,440	140	128
2015	25,000	30,440	140	128
2016	25,000	30,440	140	128
2017 (Jan-June)	12,500	15,520	140	64

The crediting period will start in 1st of July of 2007. From July to December, the amount of biomass necessary to run the project will be 27,720 ton, from which, 25,000 ton will be supplied internally by Pilecco Rice Mill (total amount of rice husk generated in one year). From 2008, the amount of externally supplied biomass will be 30,440 ton per year. In year 2017, the crediting period will last until the end of June. Half of the Pilecco yearly rice husk production will, i.e., 12,500 ton will be used in the project.

The rice husk will be supplied by producers from the region of Uruguaiana. Currently they deposit their rice husks at the Pedreira landfill site, which is the same used by Pilecco Rice Mill. This landfill site is located in the way between Uruguaiana and Alegrete, 70 km far from the project site.

Average distance from rice husk source and project site one way (km)	Average distance between source of external biomass and landfill (km)	Average incremental distance one way (km)
120	50	70

Annex 4

Power Requirement – Electricity Supply Plan

The table below presents the electricity supply plan for the biomass treatment project. In the first year of operation, the plant will consume energy from the South-Southeast-Midwest Grid of Brazil, of which the CEF corresponds to 0.2611. From the second year, the plant will use electricity generated by the GEEA biomass power plant; therefore the CEF is null.

Year	Source of energy	Energy consumption from grid (MWh / y)	$CEF_{CO2, elect}$ from the grid (t CO_2e / MWh)	Energy consumption from biomass power plant. (CEF is zero t CO_2e / y)	PE_{power} (tonnes of CO_2e / year)
2007 (July - Dec)	Grid	1,188	0.2611	0	310
2008	Grid till end of June. GEEA from July.	1,188	0.2611	1,188	310
2009	GEEA	0	0	2,376	0
2010	GEEA	0	0	2,376	0
2011	GEEA	0	0	2,376	0
2012	GEEA	0	0	2,376	0
1013	GEEA	0	0	2,376	0
2014	GEEA	0	0	2,376	0
2015	GEEA	0	0	2,376	0
2016	GEEA	0	0	2,376	0
2017 (Jan - June)	GEEA	0	0	1,188	0

Note: GEEA is a biomass power plant

Annex 5

List of Recipients Consulted

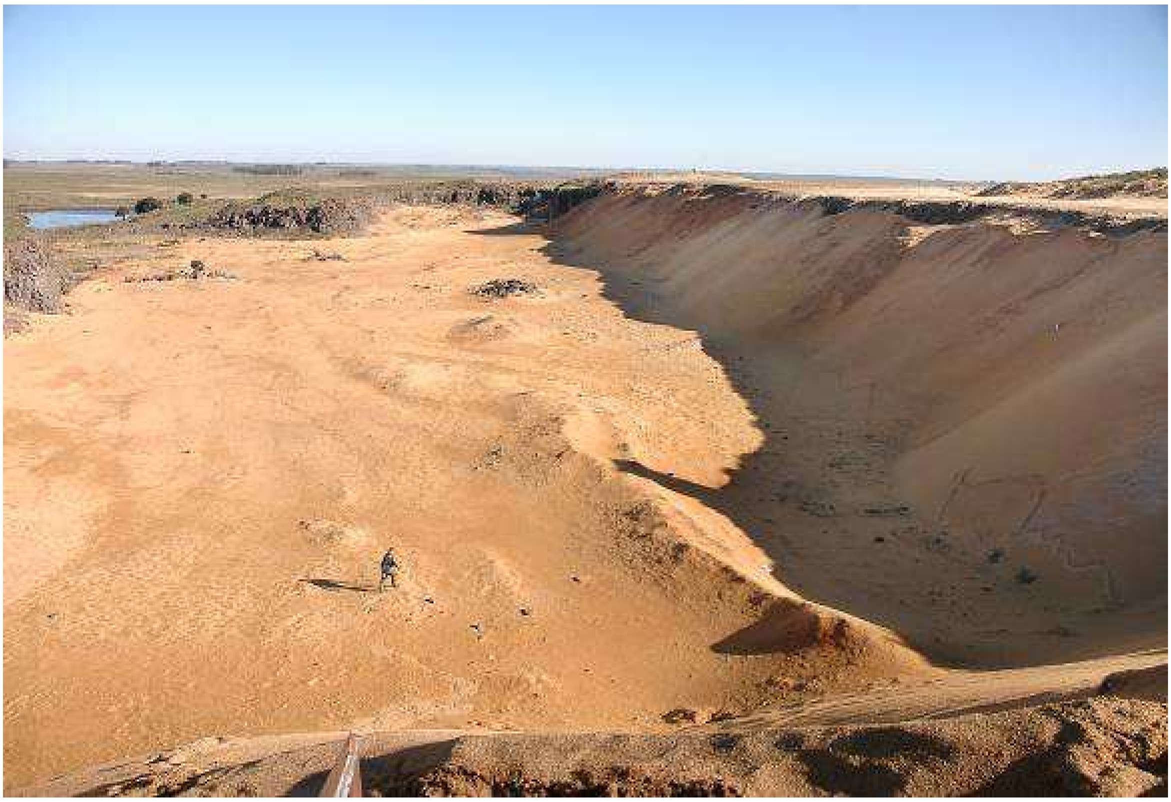
Institution's name in English	Institution's name in Portuguese	Person or Department in Charge
City Hall of Alegrete	Prefeitura Municipal de Alegrete	Mr. José Rubens Pillar
Chamber of Alegrete	Câmara de Vereadores	Mr. José Eduardo Aguiar
Environmental Secretary of Alegrete	Secretaria Meio Ambiente de Alegrete	Mr. Milton Araujo
Environmental Secretary of Rio Grande do Sul State	SEMA - Secretaria Meio Ambiente-RS	Mr. Mauro Sparta
State Foundation of Environmental Protection	FEPAM – Fundação Estatual de Proteção Ambiental	Ms. Cláudio Dilda
Alegrete's District Attorney	Ministério Publico Alegrete	Ms. Alessandra Moura
Rio Grande do Sul's State Attorney	Ministério Publico Estadual	Environmental Prosecuter's Office (Promotoria do Meio Ambiente)
Federal Attorney	Ministério Publico Federal	Environmental Prosecuter's Office (Promotoria do Meio Ambiente)
Federation of Rice Producers Association	Federação das Associações de Arrozeiros (Federarroz)	Mr. Valter José Pötter
Brazilian Institute of Environment and Natural Renewable Resources	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA)	Chemical Control and Evaluation Dept. (Coordenação de Avaliação e Controle de Subst. Químicas)
Rice Producers Union	Sindicato dos Produtores de Arroz (Sindarroz)	Mr. Élio Jorge Coradini
Uruguaiana Rice Industries Union	Associação das Indústrias de Arroz de Uruguaiana (Indarroz)	Mr. Cláudio Sizuo Sano
Brazilian Association of Parboiled Rice Industries	Associação Brasileira das Indústrias de Arroz Parboilizado (ABIAP)	Mr. Alfredo Albino Treichel
Pelotas Rice Industries Union	Sindicato das Indústrias de Arroz de Pelotas	Mr. Jairton Russo
Alegrete Rural Union	Sindicato Rural de Alegrete	Mr. Oscar Souza Parreira
Rice Producers Association	Associação dos Arrozeiros	Mr. Cleomar José Guerra Ereno
Rio Grande State Rice Institute	Instituto Rio Grandense de Arroz (IRGA)	Mr. Pery Francisco Sperotto Coelho
Rotary International - Alegrete	Rotary Alegrete	Ms. Laura Faraco
Rotary International - Sul	Rotary Sul	Mr. Nilton Carloto Martins
Rotary International - Norte	Rotary Norte	Mr. Ibraim da Silveira da Silva
Alegrete Empresarial Center	Centro Empresarial de Alegrete	Mr. Arnaldo da Costa Paz Filho
Lions Club Alegrete Ibirapuitã	Lions Clube Alegrete Ibirapuitã – Companheiro Leão	Mr. Aislan Barbosa Medeiros
DCS Comunicação Cia. Ltd.	DCS Comunicação Ltda.	Mr. Antonio D'Alessandro
Brazilian Forum of NGOs for the. Environment and the Development	Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento Sustentável (FBOMS)	Ms. Esther Neuhaus
Brazilian Association of NGOs	ABONG - Associação Brasileira de Organizações não governamentais	Mr. Francisco de Assis da Silva
Industry Federation of Rio Grande do Sul State	FIERGS – Federação das Indústrias do Rio Grande do Sul	Mr. Paulo Gilberto Fernandes Tigre

Institution's name in English	Institution's name in Portuguese	Person or Department in Charge
Municipal Council of Development	Conselho Municipal de Desenvolvimento	Mr. Milton Araújo
Retailer Companies Syndicate	Sindicato das Empresas do Comércio Varejista	Ms. Márcia Michels

Annex 6

The baseline landfill site
Pedreira Landfill

The Pedreira landfill, located around 70 km from the project site, was an old deep mine; it presents a height of rice husks deposited superior to 5 meters, reaching 12-15 meters in some areas.



Annex 7

Information about equipment

A description of the equipment used for the biomass treatment is given below.

	Reactor	Calcinator	Hot air generator	Heat exchanger	10 kgf/cm^2 Boiler
Function	Rice husk treatment by pre-hydrolysis; digestion of the hemicellulose and amorphous cellulose; reduction of alkaline metals (K, Na) which are funding agents	Calcination of the treated rice husk (cellulignin) to generate white silica (99.9%)	Hot gas generation at controlled volume and temperature to be used at the calcinator (in order to obtain high quality white silica)	Cooling of gases coming from the calcinator	Burning the calcination gases using raw rice husk or treated rice husk (cellulignin) and then generates 12 t/h vapor at 10 kgf/cm^2
Manufacturer	RM – Materiais Refratários Ltda – Lorena – SP – Brazil	Máquinas Furlan Ltda – Limeira – SP – Brazil	Irmãos Lippel & Cia Ltda – Agrolândia – SC – Brazil	H.Bremer & Filhos Ltda – Rio do Sul – SC – Brazil	H.Bremer & Filhos Ltda – Rio do Sul – SC – Brazil
Model	RPH – 30 m^3	CR 2051900 CD (special model)	Burner 1,850 kcal/h	Special (code 3172)	HBFS – 12
Specifications	Pressure: 8 kgf/cm^2 Temperature:180^{o}C Volume: 30 m^3 Load: 5,625kg Capacity: 90 ton/day	Lenght: 20m Diameter: 2.1m Max. temperature: 900^{o}C Max. capacity: 6ton/h Air flow: 14,000 m^3/h	~~Load~~Biomass capacity: 0.5 t/h (12 ton/day) Ventilator: 4,750 m^3/h with a 7,5 cv motor Furnace: 4.2 x 1.4 x 2.0 m	Thermal exchange area: 302 m^2 Max. gas flow: 14,000 m^3/h Gas temperature: 750^{o}C 350^{o}C (in and out) Vapor generation: 3 t/h Multi-cyclone filter HBT 120	Pressure: 10 kgf/cm^2 Saturated vapor temperature: 183.20^{o}C Vapor capacity: 12 t/h de vapor Fixed cooled grate Biomass capacity: 2.75 t/h (66 ton/day) Multi-cyclone filter HBT 196

Annex 8

Surplus biomass

The surplus generation of rice husk in Southwest and Mid-west regions of Rio Grande do Sul State is presented below.

Municipality	Rice processing (ton/y)	Rice husk generation (ton/y)
Alegrete	291,577	64,146
Uruguaiana	466,231	102,570
Quarai	66,039	14,528
Santa Maria	45,940	10,106
São Pedro do Sul	19,984	4,396
São Gabriel	138,242	30,413
São Sepé	107,856	23,728
Livramento	60,404	13,288
Rosario do Sul	110,072	24,215
São Francisco de Assis	18,591	4,090
São Vicente do Sul	52,750	11,605
Manoel Viana	17,263	3,797
São Borja	227,423	50,033
Itaqui	311,610	68,554
TOTAL	**1,933,982**	**425,469**

Notes: For Alegrete, only the amount generated by Pilecco Rice Mill is accounted above. As a conservative measure, the generation by other rice mills in Alegrete is not shown in this table.

For GEEA Power Plant project and the GEEA-SBS Biomass Treatment project, the total amount of rice husk used will be 122,670 ton per year for both projects. The total amount of rice husk available in a radius of 300 km far from the project site corresponds to 425,469 ton/y, which is an amount almost three times higher than the necessary to carry out both projects. Therefore, this project will not lead to biomass leakage or scarcity in the region.