Voluntary Carbon Standard
Project Description

19 November 2007
May 22nd, 2009

1 Description of Project:

1.1 Project title

Guaraí, Itabira and *Santa Izabel* Ceramics Fuel Switching Project

Version 03

PDD completed in: May 22nd, 2009

1.2 Type/Category of the project

This is a grouped project activity that encompasses three small ceramic industries: *Guaraí*, *Itabira* and *Santa Izabel* Ceramics. The voluntary project activity, although being applied at the voluntary market, encloses the following category of the simplified modalities and procedures, which is described in appendix B, for small scale type I CDM project activities.

- **Category AMS-I.C: Thermal energy for the user with or without electricity** – Version 13 from March 14th 2008.
- This is a grouped project.

This category comprises renewable energy technologies that supply individual households or users with thermal energy that displace fossil fuels such as the three grouped ceramics.

1.3 Estimated amount of emission reductions over the crediting period including project size:

The amount of emission reductions are greater than 5,000 tonnes of CO2 equivalent and less than 1,000,000 tonnes of CO2 equivalent, thus classifying as a *project* under the VCS 2007 size groups (micro project, project, mega project).

Table 1. Emission reductions estimate during the crediting period

Year	Total Emission Reductions
April to December 2006	31,728
2007	42,304
2008	42,304
2009	42,304
2010	42,304
2011	42,304
2012	42,304
2013	42,304
2014	42,304
2015	42,304
January to March 2016	10,576
Total Emission Reductions (tonnes of CO2e)	**423,036**
Number of years of the crediting period	10
Annual average of estimated emissions reductions for the 10 years of crediting period (tonnes of CO2e)	**42,304**

1.4 A brief description of the project:

The project activity is the grouping project of *Guaraí*, *Itabira* and *Santa Izabel* Ceramics, which are three small and prototypical ceramic industries that produce structural ceramic devices like bricks destined for the regional market. The grouped project activity is located at *Itaboraí* Municipal District, State of *Rio de Janeiro*. In accordance to an IBGE[1] research realized in 2007, *Itaboraí* has 215,792 inhabitants occupying an area of 424 Km², and was founded in 1672. The economy of the city is sustained mostly for Ceramic industries, horticulture, subsistence agriculture, and others.

The activity of this grouping consists on utilizing wood from afforestation and woody residues (such as wood chips), which are renewable biomasses, to feed the kilns rather than using a non-renewable fuel like heavy oil. Such a switch was a pioneer practice in the region.

Usually the environmental aspects are not concerning issues in the ceramic sector; however this is not the case with these three ceramics, which worked hard to create a good working system and are perfectly within the boundaries of the regulations imposed by the Brazilian Government.

This fuel switching project will reduce the greenhouse gases (GHG) emissions through the substitution of heavy oil for renewable biomasses to generate thermal energy.

By diverging significantly from the identified baseline scenario, the ceramics will minimize the damages caused by the use of fossil fuels. Thus, this project activity also contributes to reducing fossil fuel consumption and preserving its reserves.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

The ceramics are located in *Brazil*, in the state of *Rio de Janeiro*, in the southeast region of the country. The geographic location is illustrated in Figure 1.

Table 2. Localization of the ceramics

Ceramic	City	State
Guaraí	*Itaboraí*	*Rio de Janeiro*
Itabira	*Itaboraí*	*Rio de Janeiro*
Santa Izabel	*Itaboraí*	*Rio de Janeiro*

The project sites have the postal addresses:

- *Guaraí* Ceramic

  Address: Rua Cinco, 180, Lote 693, Itambi – *Itaboraí, RJ* - Postal Code: 24.850-000;

- *Itabira* Ceramic:

  Address: Rua 31 de Março, nº02, Centro – *Itaboraí – RJ* - Postal Code: 24.800-000;

- *Santa Izabel* Ceramic

  Address: Estrada Porto das Caxias, nº1134 – *Itaboraí* – RJ - Postal Code: 24.800-000.

[1] IBGE- Brazilian Institute of Geography and Statistics

Figure 1. Geographic location of the cities of the project activity that has the following coordinates *Rio de Janeiro* State: *Itaboraí*: 22º44'51" S, 42º51'21" W.

Figure 2. *Guaraí* Ceramic's boundaries: A: 22º43'48" S, 42º56'52" W; B: 22º43'47" S, 42º56'50" W; C: 22º43'56" S, 42º56'43" W; D: 22º43'57" S, 42º56'45" W.

Figure 3. *Itabira* Ceramic's boundaries: A: 22°44'33" S, 42°51'16" W; B: 22°44'33" S, 42°51'12" W; C: 22°44'37" S, 42°51'10" W; D: 22°44'38" S, 42°51'14" W.

Figure 4. *Santa Izabel* Ceramic's boundaries: A: 22°43'54" S, 42°50'35" W; B: 42°43'50" S, 42°50'52" W; C: 22°43'58" S, 42°50'49" W; D: 22°43'59" S, 42°50'52" W.

1.6 Duration of the project activity/crediting period:

- Project start date[2]:

[2] *Date on which the project began reducing or removing GHG emissions, i.e. when the project developer began employing renewable biomass.*

Table 3. Ceramics' project start date

Ceramic	Project Start Date
Guaraí	January 1st, 2003
Itabira	October 1st, 2004
Santa Izabel	March 1st, 2004

- Date of initiating project activities: 01/04/2006
- Date of terminating the project[3]: 31/03/2016
- VCS project crediting period: 10 years renewable

1.7 Conditions prior to project initiation:

The oil supply was stable and the ceramics had a reliable logistic program which did not present high risks for the ceramics. Heavy oil was utilized as fuel in the ceramic's kiln for many years.

The use of heavy oil as fuel was a prevalent practice among the ceramics. The use of fossil fuels brings forward serious environmental problems such as global warming. There are also raising concerns about the security of oil transportation that can result in huge environmental impacts, chiefly when this transportation is overseas. The baseline identified for this project activity is the utilization of a total of 13,833,000 liters of heavy oil per year to provide thermal energy to the ceramics' kilns, according to historical experience of the ceramics. The project activity aims at the use of renewable biomass for energy supply from afforestation wood and its residues.

However, elephant grass, which is one possible biomass utilized in this project, is not considered a residue, since it would be cultivated in order to supply the ceramic fuel needs.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The emission reductions will be achieved by displacing the use of heavy oil, which is a fossil fuel, to provide thermal energy in the ceramic companies. Therefore, the emissions launched during the combustion of heavy oil are not compensated by carbon absorbance methods since fossil fuels had been stored for millions of years prior to their consumption. An opposite scenario occurs with the renewable biomasses employed in this project activity since they are provided from areas with sustainable forest management.

1.9 Project technologies, products, services and the expected level of activity:

The three ceramic industries produce structural ceramic devices like bricks, which are mainly used in the construction sector. *Guaraí* Ceramic utilizes a "Hoffman[4]" kiln and five "Round[5]" kilns, *Itabira* Ceramic utilizes a "Hoffman" kiln and *Santa Izabel* Ceramic utilizes a "Hoffman" kiln and three "Round" kilns. These kilns are commonly utilized in *Brazil* to burn bricks and roof tiles. The following table shows the technical parameters of the kilns in each ceramic:

Table 4. Technical parameters of the kilns utilized in *Guaraí* Ceramic

Technical Parameters	"Hoffman" Kiln	Technical Parameters	"Round" Kilns
Features	Continuous, with two lines and rectangular	Features	Closed circular kiln, with 8 fuel entrances distributed

[3] *Date on which the project completes 10 years after the date on which the project proponent completed the fuel switch.*

[4] *"Hoffman" is a very old type of kiln, which has parallel chambers where the heat from one chamber is used in the next, therefore recycling the generated heat in the previous chambers.*

[5] *"Round" Kiln is a closed circular kiln, where the mechanic burners are distributed along its perimeter.*

	shape with 28 chambers (each chamber has 5 lines with three fuel entrances). The furnaces are in the upper part of the kiln		along its perimeter. There are 24 mechanic burners distributed for five "Round" kilns[6].
Maximum Temperature	900°	Maximum Temperature	900°
Time of loading	6 hours	Time of loading	5 hours
Burning Cycle[7]	60 hours	Warming	20 hours
		Burning Cycle	12 hours
		Cooling	25 hours[8]
Time of unloading[9]	6 hours	Time of unloading	5 hours
Number of 'Hoffman' kilns operating	1	Number of 'Round' kilns operating	5
Average production per burning cycle (thousand of ceramic pieces)[10]	168,000	Average production per burning cycle (thousand of ceramic pieces)	20,000 to 30,000[11]

Table 5. Technical parameters of the kilns utilized in *Itabira* Ceramic

Technical Parameters	"Hoffman" Kiln
Features	Continuous, with two lines and rectangular shape with 27 chambers (each chamber has 5 lines with three fuel entrances). The furnaces are in the upper part of the kiln
Maximum Temperature	900°
Time of loading	6 hours
Burning Cycle[12]	60 hours
Time of unloading[13]	6 hours

[6] *While 3 "Round" kilns are in the warming and burning stages, the other 2 "Round" kilns are in the cooling, loading or unloading stages. Therefore, the 24 mechanic burners are moved to the 3 kilns that are operating (8 mechanic burners per kiln).*

[7] *The burning cycle in a "Hoffman" kiln is the number of hours it takes to burn a chamber inside the kiln. The average time spent with warming, burning and cooling are around 27 hours, 6 hours and 27 hours respectively.*

[8] *The heat accumulated is reused in the mass for drying the ceramic devices.*

[9] *The cleaning of the "Hoffman" Kiln is performed while the kiln is loaded again with other pieces to be burnt. It is not necessary to clean the "Tunnel" Kiln due to the high efficiency of this kiln, which almost does not generate ashes.*

[10] *It was not considered the loading and unloading time of the kilns in order to calculate this value, as while these processes are done, the kiln is burning (continuous kiln).*

[11] *It varies according to the type of ceramic blocks and the size of the kilns.*

[12] *The burning cycle in a "Hoffman" kiln is the number of hours it takes to burn a chamber inside the kiln. The average time spent with warming, burning and cooling are around 27 hours, 6 hours and 27 hours respectively.*

[13] *The cleaning of the "Hoffman" Kiln is performed while the kiln is loaded again with other pieces to be burnt. It is not necessary to clean the "Tunnel" Kiln due to the high efficiency of this kiln, which almost does not generate ashes.*

Number of 'Hoffman' kilns operating	1
Average production per burning cycle (thousand of ceramic pieces)[14]	194,000

Table 6. Technical parameters of the kilns utilized in *Santa Izabel* Ceramic

Technical Parameters	"Hoffman" Kiln	Technical Parameters	"Round" Kilns
Features	Continuous, rectangular shape with 32 chambers (each chamber has 5 lines with three fuel entrances). The furnaces are in the upper part of the kiln	Features	Closed circular kiln, with 4 fuel entrances distributed along its perimeter
Maximum Temperature	900°	Maximum Temperature	900°
Time of loading	6 hours	Time of loading	5 hours
Burning Cycle[15]	60 hours	Warming	20 hours
		Burning Cycle	12 hours
		Cooling	25 hours[16]
Time of unloading[17]	6 hours	Time of unloading	5 hours
Number of 'Hoffman' kilns operating	1	Number of 'Round' kilns operating	3
Average production per burning cycle (thousand of ceramic pieces)[18]	200,000	Average production per burning cycle (thousand of ceramic pieces)	20,000 to 30,000[19]

Nowadays, with the project activity implemented in the ceramics, the average production in *Guaraí* Ceramic is 2,800,000 ceramic devices per month with an average biomass consumption of 1,770 tonnes/month of biomass. *Itabira* Ceramic utilizes 1,050 tonnes of biomass per month in order to produce 1,500,000 ceramic devices and *Santa Izabel* Ceramic produces about 1,700,000 with an average monthly consumption of 1,320 tonnes of biomass.

The following table shows the scenario of each of the ceramics.

[14] *It was not considered the loading and unloading time of the kilns in order to calculate this value, as while these processes are done, the kiln is burning (continuous kiln).*

[15] *The burning cycle in a "Hoffman" kiln is the number of hours it takes to burn a chamber inside the kiln. The average time spent with warming, burning and cooling are around 27 hours, 6 hours and 27 hours respectively.*

[16] *The heat accumulated is reused in the mass for drying the ceramic devices.*

[17] *The cleaning of the "Hoffman" Kiln is performed while the kiln is loaded again with other pieces to be burnt. It is not necessary to clean the "Tunnel" Kiln due to the high efficiency of this kiln, which almost does not generate ashes.*

[18] *It was not considered the loading and unloading time of the kilns in order to calculate this value, as while these processes are done, the kiln is burning (continuous kiln).*

[19] *It varies according to the type of ceramic blocks and the size of the kilns.*

Table 7. Scenario of each ceramic

	Guaraí	***Itabira***	***Santa Izabel***
Actual production (devices per month)	2,800,000	1,500,000	1,700,000
Biomass Consumption (tonne/month)	1,770	1,050	1,320

The project activity aims at the use of renewable biomass for energy supply from afforestation wood and its residues. In case of lack of these kinds of biomasses, the project proponents can use elephant grass.

The area destined for afforestation in *Brazil* corresponds to 5.6 millions of hectares, where the *Eucalyptus* corresponds to 3.5 millions of this area, and can generate 23 to 25 tonnes of biomass per hectare[20].

The afforestation residues (sawdust and wood chips) are resulted from wood manufacturing, considering that around 22% of the wood produced will generate sawdust/wood chips[21].

The construction residues wood corresponds around 85% of the total construction residues. The deficiency of a correct destination for this wood constitutes a huge problem[22]. Furthermore, pallets that are either broken or worn-out could be consumed by the ceramics, measure that would attenuate the landfills final disposal problem. These pallets would be acquired from large industries in the region of the state of *Rio de Janeiro*.

The ceramics owners also showed interest in elephant grass. Currently, elephant grass has been acquiring national importance as biomass to generate thermal energy due to its high productiveness and easy adaptation in almost all climate and soil Brazilian conditions[23].

In order to implement the project activity, all the ceramics made a series of adaptations that were required and new equipments had to be purchased due to the employment of the new fuel. The ceramics passed through reforms to adapt the kiln to the firewood use with the adaptation of the interior and superior parts of the kiln, thus the entire pipeline and the injectors of oil became useless, although this system is still installed in the ceramics. For the purpose of burning the biomass with high energy efficiency, new machineries were necessary to be installed.

Beyond these alterations, all the ceramics, due to the fuel switch, had to make some changes in the whole system, and each ceramic developed their particular system.

The ceramics production has been increasing in order to attend the market demand. The Brazilian building construction sector is also increasing[24] mainly due to the Brazilian Government program called Growth Acceleration Program (PAC)[25]. This way, it has been required more and more ceramic devices to attend the developing building construction sector. The biomass providers listed at the table below are only a few of those that work for each ceramic; nevertheless, it does not exclude the possibility of buying biomass from others.

Table 8. Main biomass providers

Ceramic	**Biomass**	**Provider**	**City**
Guaraí	Wood Chips	*3 J. I. Indústria e Comércio de Madeiras*	*Bananal – SP*
		Indústria e Comércio de Madeira FAMS	*Arapeí - SP*
	Afforestation wood	*Helio Maturano*	*Teresópolis - RJ*

[20] *Brazilian Society of Forestry. Source: Available at: <http://www.sbs.org.br/atualidades.php>. Last visit on January 19th, 2009.*

[21] *BRITO EO. Estimativa da produção de Resíduos na Indústria Brasileira de Serraria e Laminação de Madeira.* ***Rev. da Madeira****. v.4. n.26. 1995, pp. 34-39.*

[22] *MANCINI, S. D. et al.* ***Potencial de Reciclagem dos Resíduos da Construção Civil de Sorocaba-SP.*** *Available at: <http://www.saneamento.poli.ufrj.br/documentos/24CBES/III-024.pdf>. Last visit on January 27th, 2009.*

[23] According to EMBRAPA (Brazilian Agricultural Research Corporation's). Source: <http://www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>. Visited on March 27th, 2009.

[24] *Source: Infomoney. Available at: <http://web.infomoney.com.br/templates/news/view.asp?codigo=1145289&path=/suasfinancas/imoveis/compra/>. Last visit on January 26th, 2009.*

[25] *More information available at: <http://www.brasil.gov.br/pac/>. Last visit on January 26th, 2009.*

		Maria Edineia de Lima Maturano	*Teresópolis - RJ*
		Maria Eni Ramos Maturana	*Teresópolis - RJ*
		Marcelo Maturano	*Teresópolis - RJ*
Itabira	Afforestation wood	*Hélio Maturano*	*Teresópolis - RJ*
		Manuel Chelson K. Munhões	*Nova Friburgo - RJ*
		Maria Eni Ramos Maturana	*Teresópolis - RJ*
		Fazenda Campo Grande Tirol	*Trajano de Morais - RJ*
Santa Izabel	Afforestation wood	*REMAC Serviços Florestais LTDA*	*Mucuri – BA*
		Companhia Agropecuária São Pedro do Una	*São Pedro da Aldeia - RJ*

***Guaraí* Ceramic**

Guaraí Ceramic used to operate with a two chambers "Hoffman" kiln using oil as fuel. The opportunity of this project made the project developer deactivate one of the chambers of the "Hoffman" kiln, and to install three "Round" kilns, completely substituting the use of oil for biomass. Afterwards, in September 2006, two more "Round" kilns were installed, both using renewable biomass as fuel. Presently, the ceramic uses wood from afforestation in the one chamber "Hoffman" kiln, and wood chips in the five "Round" kilns.

Twenty-four mechanic burners were installed in order to automatically inject the biomass with air inside the "Round" kilns. Operators must manually feed these mechanic burners. The project developer also aims to install three new "Round" kilns, and to deactivate the "Hoffman" kiln. Furthermore, to control the temperature and burning in the kiln, the ceramic had to install thermo couples, due to the lack of experience with the biomass.

Furthermore, the new fuel that is used to burn and maintain the ideal temperature for the ceramic firing process must be dry to not interfere in the burning efficiency. For this purpose, the project proponent of the ceramic had to construct a shed to stock the biomass.

Before the crediting period, some tests were made by the entrepreneur, and this ceramic had installed a wood shredder in order to transform the wood residues from wood industries, pallets and city garden residues, into wood chips. However, due to the high cost of its sustenance, this shredder was uninstalled and sold. Currently, there is no more use of these woody residues. The project developer intends to acquire a new wood shredder.

The ceramic utilizes wood chips and afforestation wood, in the proportion of about 80% and 20%, respectively. The "Round" Kilns are responsible for around 70% of the production, while the "Hoffman" Kiln is responsible for the 30% left.

***Itabira* Ceramic**

Itabira Ceramic, as the other ceramics, is no longer using oil as fuel; therefore, all the equipments used to maintain the use of oil had to be deactivated. With the reform, the entire pipeline and the injectors became useless. With the fuel-switch, the ceramic uses nowadays 100% of afforestation wood.

Due to the firewood processing, where the wood must have it diameter reduced in order to be able its insertion in the kiln's entrances, it was necessary the acquisition of some equipments like hydraulic axes. Also, due to the fuel switch and consequently combustion gas expelling, it was necessary the purchase of chimney exhausters. The ceramic had its kiln reconstructed, internally and superficially, in order to work with firewood. The company also aims at installing a plant in order to process wood residues into sawdust to use the final product as fuel.

***Santa Izabel* Ceramic**

Santa Izabel ceramic uses nowadays 100% of afforestation wood. The "Hoffman" Kiln is responsible for 90% of the ceramic's production, while the "Round" kilns are responsible for the 10% left.

This ceramic had to acquire hydraulic axes in order to cut the wood into smaller pieces to permit their entrance into the kilns, which is manually fed by operators.

Beyond the necessary alterations in the kilns due to the fuel-switch, the ceramic had to install a chimney exhauster in order to diminish the particulate material emissions to the atmosphere. Furthermore, to control the temperature and burning in the kiln, the ceramic had to install thermo couples, due to the lack of experience with the biomass.

The ceramic aims to construct four "Paulista" kilns in order to substitute the three current "Round" kilns that are operating in the ceramic industry.

All of these changes were made counting on this project approval in order for the ceramics to become able to receive the biomass to be used. The following figures show some of the changes at the ceramic industries.

Figure 5. One of the five "Round" kilns in *Guaraí* Ceramic with the mechanical burners.

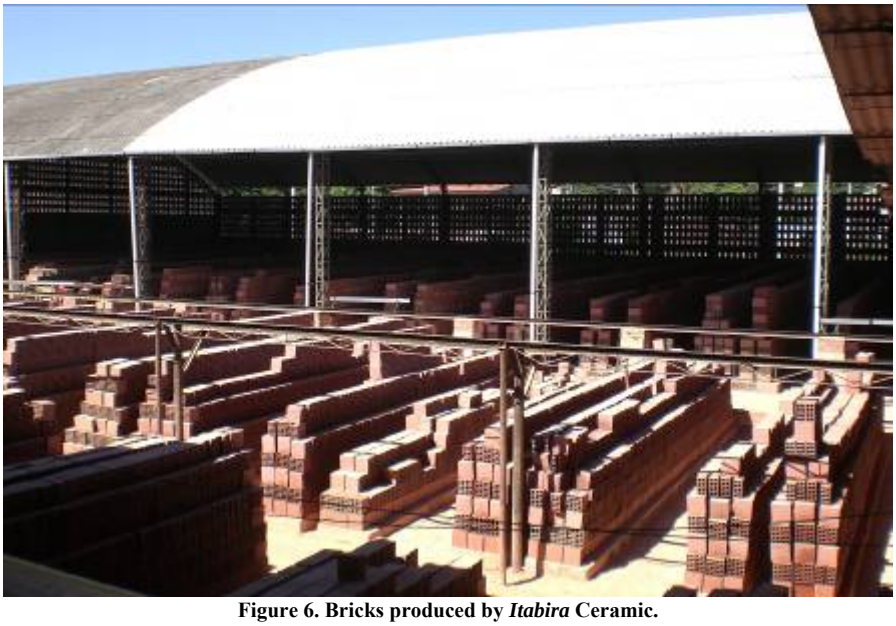

Figure 6. Bricks produced by *Itabira* Ceramic.

Figure 7. Top of the Hoffman kiln of *Santa Izabel* Ceramic.

1.10 Compliance with relevant local laws and regulations related to the project:

This project is in accordance to the CONAMA[26] Resolution, no. 237/97 that establishes that clay extraction activities and ceramic production must be supported by specific licenses, such as operational license, clay extraction license, environmental licenses and the permission of the Environmental Secretary of *Rio de Janeiro (FEEMA)*[27], which must run under the valid time.

The project is also in accordance to Federal Constitution, Article 20, which establishes the payment of a Financial Compensation by the Mineral Resources Exploitation. This financial compensation is annually performed to DNPM (National Department of Mineral Production[28]).

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

- Availability and price of the renewable biomasses

The thermal energy generation through the combustion of biomasses is an innovation in the ceramic industries. The future demand of this alternative fuel (e.g. by other consumers) is not easy to foresee. There is currently a great amount of these types of biomasses available regionally, however, a demand and price increase has already been reported. If non-foreseeable reasons affect the availability of the biomasses, the ceramic owner will search for other type of renewable biomasses. Hence, it follows that the project approval will make the continue use of renewable biomasses feasible.

- Difficulty related to the common practice

The ceramics utilized heavy oil in its kilns for several years. The sudden change claimed a lot of effort from each ceramic to make the adaptation successfully. Acquiring new equipments and switching the fuel represented a risk

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[26] *CONAMA (National Environmental Council), created in 1981 by Law 6.938/81, is the* Brazilians*' department responsible for deliberation and consultation of the whole national environmental policy and it is chaired by the Minister of Environment. It is responsible for the establishment of standards and criteria relating to licensing of potentially polluting companies. More information is available at <http://www.mma.gov.br/port/conama/estr.cfm>. Last visit on: May 21st, 2009.*

[27] *State Foundation of Environmental Engineering is responsible to issue the environmental licenses according to CONAMA resolution 237/97. More information at: <http://www.feema.rj.gov.br/>. Last visit on: May 21st, 2009.*

[28] *The objectives of the National Department of Mineral Production are: to foster the planning and promotion of exploration and mining of mineral resources, to supervise geological and mineral exploration and the development of mineral technology, as well as to ensure, control and monitor the exercise of mining activities throughout the national territory, in accordance with the Mining Code, the Mineral Water Code and respective legislation and regulations that complement them. Source: <http://www.dnpm.gov.br/enportal/conteudo.asp?IDSecao=168&IDPagina=222>. Last visit on: May 21st, 2009.*

to the project developer since the original practice had shown good results for many years. Furthermore, the employees' resistance to the new situation was another difficulty faced by the ceramics.

- Closing of the ceramic business

If the ceramic companies close, it may substantially affect the project's GHG emission reductions, once other ceramic would probably supply the products consuming heavy oil, which is the common practice of the region. However, there are currently good perspectives in the ceramic market and in the organization of the administrations, avoiding this possibility.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The fact that the three ceramics have historically operated using oil as fuel, clearly confirms the project was not implemented to create GHG emissions for the purpose of its subsequent removal or destruction.

The ceramics had used non-renewable fuels to produce its pieces since the beginning of its operation. This is evidence that guarantees the integrity of this project activity.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

This grouped project is not creating any other form of environmental credit under any specific program.

Social Carbon Methodology is being applied only as a Sustainability tool in association with VCS 2007 standard.

1.14 Project rejected under other GHG programs (if applicable):

This grouped project was not rejected under any formal GHG reduction or removal program. The project report was produced to make the project public and available to voluntary measures or other opportunities of the carbon market.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

Project Proponents

The project proponent contributed to the current report by assigning the following roles and responsibilities to:

Cerâmica Guaraí LTDA:

Mr. *Carlos Renato Scotelaro Boccaletti*, Director and monitoring data responsible: Information and visit of the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramic devices market challenges, detailed information and numbers on sales and how output data is handled and how data is stored and kept by the *Guaraí*'s office.

Other information on the project's proponent:

Address: Rua Cinco, 180, Lote 693, Itambi – *Itaboraí, RJ* - Postal Code: 24.850-000.

Phone number: +55 (21) 2736-4141

***Cil Cerâmica Itabira LTDA*:**

Mr. *Valmir Carneiro da Silva*, Monitoring data responsible: General data and information on inputs and outputs of the ceramic, detailed information and numbers on sales and how output data is handled and how data is stored and kept by the *Itabira*'s office.

Mr. *Oswaldo Filho*, Director: Information and visit of the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramic devices market challenges.

Other information on the project's proponent:

Address: Rua 31 de Março, nº02, Centro - *Itaboraí – RJ* - Postal Code: 24.800-000.

Phone number: +55 (21) 2635-2669

***Cerâmica Santa Izabel LTDA*:**

Mr. *Bruno Menon*, Monitoring data responsible: General data and information on inputs and outputs of the ceramic, detailed information and numbers on sales and how output data is handled and how data is stored and kept by the *Santa Izabel*'s office.

Mr. *Edézio Menon*, Director: Information and visit of the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramic devices market challenges.

Other information on the project's proponent:

Address: Estrada Porto das Caxias, nº1134 – *Itaboraí* – RJ – Postal Code: 24.800-000.

Phone number: +55 (21) 2635-7089

Project Developer

Carbono Social Serviços Ambientais LTDA.: Project developer, Project participant and Project idealizer.

As the project authorized contact, *Carbono Social Serviços Ambientais LTDA* was given the responsibility of preparing the present project report and to accompany the proponent until the end of the crediting period. The assessors directly involved are:

João Paulo Mello Amaral, Marcelo Hector Sabbagh Haddad and *Rafael Kupper Bonizio Oliva*, Technical Analysts: Project Design Document writers, elaboration of GHGs Emissions' Inventory, direct contact between *Carbono Social Serviços Ambientais LTDA.* and the ceramics, and responsible for collecting the necessary information.

Coordinated by:

Flávia Yumi Takeuchi and *Rafael Ribeiro Borgheresi*, Technical Coordinators.

Other information on the project's developer's contact:

Address:
R. Borges Lagoa, 1065 – Conj. 146 – Vila Clementino
Postal Code: 04038 032
São Paulo – SP, *Brazil*
Phone number: +55 11 5083 3252
Web site: http://www.socialcarbon.com
Email: joaopaulo@socialcarbon.com
marcelo@socialcarbon.com
kupper@socialcarbon.com
flavia@socialcarbon.com
rafael@socialcarbon.com

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

The project is eligible according to:

- Legislative: the project attends all legal requirements;
- Technical: alterations/adaptations required are technically feasible;
- Economic: carbon credits will compensate the high investments that were necessary to achieve the fuel-switch;
- Sectoral: incentive of good practices to the sector;
- Social: social carbon methodology will be applied which will improve long term sustainability. The culture of burning oil as fuel will be slowly mitigated;
- Environmental: the project attends all legal requirements and no environmental impacts are predicted;
- Geographic /site specific: the plant can be uniquely geographically identified with no barriers regarding logistic;
- Temporal information: the project will not double count the GHG emissions during the ten years renewable of the crediting period.

However there is no information relevant for its eligibility which is not already described in this VCS PD.

1.17 List of commercially sensitive information (if applicable):

None of the information disclosed to the validator was withheld from the public version of the report.

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

Category AMS-I.C.: Thermal energy for the user with or without electricity – Version 13 from March 14th 2008. This category comprises renewable energy technologies that supply individual households or users with thermal energy that displace fossil fuels.

This project activity is a grouping of three small ceramics.

This methodology is applicable for project activities that avoid greenhouse gases emissions by using renewable biomass instead of fossil fuels, in order to generate thermal energy.

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The methodology applied is Category AMS-I.C.: Thermal energy for the user with or without electricity – Version 13 from March 14th 2008, which is applicable for project activities that avoid greenhouse gases emissions by using renewable biomass instead of fossil fuels, in order to generate thermal energy.

Furthermore, the project activity will annually generate less than 45 MWthermal, which is the limit for Type I small scale project activities.

There are no similar registered small-scale CDM project activities in the region of the project activity once *Carbono Social Serviços Ambientais LTDA.* made a research and did not find any registered small–scale CDM Project activity in the region. The sources of registered small-scale CDM project activity consulted were the United Nations Framework Convention on Climate Change (UNFCC)[29] and Brazilian's Technology and Science Ministry[30]. Therefore, the proposed project activity is not saving the non-renewable biomass accounted for by the other registered project activities.

The utilization of fossil fuel interferes in the carbon pools, and emits to the atmosphere the carbon that was once stored, turning greenhouse effect even worse. Moreover, the renewable biomasses utilized in this project activity fit the options of UNFCCC definition of renewable biomass in Annex 18, EB 23:

The afforestation wood is considered renewable according to option I, as soon as it fits all the assumptions below:

"The biomass is originating from land areas that are forests[31] where:

(a) The land area remains a forest; and

(b) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(c) Any national or regional forestry and nature conservation regulations are complied with."

The afforestation wood consumed by this project activity is consisted of *Eucalyptus* and *Pinus* genuses. The area destined for afforestation in Brazil corresponds to 5.6 millions of hectares, where the *Eucalyptus* genus corresponds to 3.5 millions of this area, and can generate 23 to 25 tons of biomass per hectare[32]. The grand major of these cultivations were established in the middle of 1970 to 1980. The *Eucalyptus* and *Pinus* genuses correspond to 80% of the afforestation in Brazil. Furthermore, these genuses are mainly cultivated in the southeast region of the country, where the climate is more favorable for their growing[33]. Moreover, these genuses of trees are the only utilized by the ceramic companies due mainly to the local availability.

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[29] *CDM activities registered by CDM Executive board are Available at: <http://cdm.unfccc.int/Projects/registered.htm>. Last visit on: May 21st, 2009.*

[30] Brazilian*'s Technology and Science Ministry is responsible for registry and approval of all CDM activities within* Brazilian *boundaries. CDM activities submitted to the* Brazilian *Inter-Ministerial Commission of CDM Activities are available at: <http://www.mct.gov.br/index.php/content/view/47952.html>. Last visit on: May 21st, 2009.*

[31] *The forest definitions as established by the country in accordance with the decisions 11/CP.7 and 19/CP.9 should apply.*

[32] *Brazilian Society of Forestry. Source: <http://www.sbs.org.br/atualidades.php.>. Accessed at: January 19th, 2009.*

[33] *JUVENAL, T. L.; MATTOS, R. L. G.* ***O setor florestal no Brasil e a importância do reflorestamento.*** *BNDES Setorial, Rio de Janeiro, n. 16, p. 3-30, set. 2002. Available at: <http://www.bndes.gov.br/conhecimento/bnset/set1601.pdf>. Last visit on: January 22nd, 2009.*

The afforestation wood fits all the three options above since just wood from land areas that are forests are utilized, i.e. the area remains a forest (this assertion is supported by reports sent in annex) with the use of the biomass. Moreover, the afforestation supplies the society demands and avoids the pressure on the remnants of natural forests[34].

In addition, sustainable management practices of the afforestation in Brazil (as the techniques of preparation, fertilization, control of weeds, improved seeds, cloning and reform) were introduced and constantly improved in order to increase its productivity[35].

The afforestation in Brazil is complied with the ABRAF[36], which represents, promotes and defends the collective interests of the forestry companies that engage in sustainable development based on planted forests.

The elephant grass is considered renewable according to option 3, as soon as it fit all the assumptions below:

"The biomass is non-woody biomass and originates from croplands and/or grasslands where:

(a) The land area remains cropland and/or grasslands or is reverted to forest; and

(b) Sustainable management practices are undertaken on these land areas to ensure in particular that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(c) Any national or regional forestry, agriculture and nature conservation regulations are complied with."

Currently, elephant grass has been acquiring national importance as biomass to generate thermal energy due to its high productiveness and easy adaptation in almost all climate and soil Brazilian conditions[37]. The elephant grass is cultivated in pasture or degraded areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area.

The woody residues (wood chips, sawdust and wood industries residues, among others) are industries residues, so they are considered renewable according to option 5 of UNFCCC definition of renewable biomass: "The biomass is the non-fossil fraction of an industrial or municipal waste", as the woody residues are resulted from wood manufacturing or municipal waste.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

According to the applied methodology, the project boundaries for the grouped project are the physical, geographical areas of the renewable energy generation, thus, the ceramics limits.

In the baseline scenario, the emissions launched during the combustion of heavy oil were not compensated by carbon absorbance methods, because the fossil fuel had been stored for millions of years prior to its consumption. An opposite scenario occurs with the renewable biomasses employed in this project activity, once they are provided from areas with sustainable forest management.

Table 9. Gases included in the project boundary and brief explanation

	Gas	Source	Included?	Justification/ Explanation
Baseline	CO_2	Emission from the combustion of non- renewable fuel	Yes	The major source of emissions in the baseline
	CH_4	-	No	Renewable biomasses could be left to decay. Excluded for simplification. This is conservative.

[34] *FOLKEL. C.* ***Silvicultura e Meio Ambiente.*** *Source: <http://www.celso-foelkel.com.br/artigos/Palestras/Silvicultura%20&%20Meio%20Ambiente.%20Vers%E3o%20final.pdf>.*

[35] *MCT/IPEF.* ***Silvicultura e Manejo.*** *Source: <http://www.ipef.br/mct/MCT_03.htm>.*

[36] Brazilian *Association of producers of cultivated forests. Source: <http://www.abraflor.org.br/estrutura.asp>.*

[37] *According to EMBRAPA (Brazilian Agricultural Research Corporation's). Source: <http://www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>. Last visit on: May 21st, 2009.*

	N_20	-	No	Possibly emissions from wood burning will be excluded for simplification. This is conservative.
Project Activity	CO_2	-	No	Excluded for simplification. This emission source is assumed to be very small.
	CH_4	-	No	Excluded for simplification. This emission source is assumed to be very small.
	N_20	-	No	Excluded for simplification. This emission source is assumed to be very small.

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

Observing table below, the common fuels employed and therefore, the baseline candidates are: natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others non-specified.

Table 10. Distribution of fuel employed on the ceramic sector in Brazil in percentage

BRAZILIAN ENERGY BALANCE 2008 - CERAMIC SECTOR EVALUATION			
FUEL	**2005**	**2006**	**2007**
Natural Gas	24%	26%	25%
Charcoal	2%	1%	1%
Wood	50%	50%	49%
Other recuperations	1%	1%	1%
Diesel Oil	0%	0%	0%
Fuel Oil	**8%**	**8%**	**8%**
Liquified Petroleum Gas	4%	4%	4%
Others from Petroleum	2%	2%	4%
Piped gas	0%	0%	0%
Electricity	8%	8%	7%
Others non specified	0%	0%	0%

(Brazilian Energy Balance, Available at: <http://www.mme.gov.br/download.do?attachmentId=16555&download>. Last visit on: May 21st, 2009)

The most probably scenario would be the use of wood as the Brazilian ceramic sector's common practice states, which would be the wood from the Atlantic forest without sustainable management. This biome is extremely

reduced into few fragments[38] due to the historical of high deforestation, which made the majority of the remaining areas to become preserved. The UNESCO delimited 350,000 km² of the Atlantic Forest as Biosphere Reserve, which is the biggest of the world. From the primitive Atlantic forest, nowadays remains only 7.6% (99,466 km²) of its original area, where is currently dwelled by 120 million people (70% of the Brazilian population)[39]. Therefore, this wood can be considered non-renewable; nevertheless, this baseline is not viable considering the inaccessibility of this Biome and its unavailability in the region.

Another plausible baseline scenario would be the use of Natural Gas. Although there is distribution/gas pipe in the region[40], the inconstant distribution of natural gas made the project developers not to trust in this fuel, as 40% of the natural gas consumed in *Brazil* proceeds from *Bolivia*[41], therefore excluding this possibility.

This way, the identified baseline for this project activity is the use of heavy oil which was used by the ceramics for a long time and has a consolidated delivery system and long term supply assurance. The overall characteristics of the ceramics production are used to obtain the real amount of fossil fuel used in the baseline scenario.

According to historical experience of the ceramics, the oil consumption before this project activity in *Guaraí* Ceramic was 3,516,000 liters of heavy oil to produce 19,200,000 ceramic devices per year; *Itabira* Ceramic consumed an average quantity of 2,400,000 liters of heavy oil per year to feed the kilns to produce around 12,000,000 ceramic devices per year; *Santa Izabel* Ceramic consumed an average of 2,880,000 liters to maintain the production of 14,400,000 ceramic devices per year.

The calculations regarding the quantity of oil required in the burning process were done according to the efficiency of the kilns employed in the ceramics, which would require 183.125 liters to produce 1,000 ceramic devices in *Guaraí* Ceramic, 200 liters of oil in *Itabira* Ceramic and 200 liters of oil in *Santa Izabel* Ceramic. These values are higher than the reference[42] because it considers advanced equipments of oil insertion, which did not represented the ceramics' baseline scenario.

In the absence of this project activity, the identified baseline scenario would be: *Guaraí* Ceramic would consume 6,153,000 liters per year of heavy oil to feed their kilns to sustain an annual production of 33,600,000 ceramic devices. *Itabira* Ceramic would use 3,600,000 liters per year to produce 18,000,000 ceramic pieces annually. Eventually, *Santa Izabel* Ceramic would consume 4,080,000 liters per year to maintain the actual production on the level of 20,400,000 ceramic pieces.

As stated before, in order to attend the market demand made the production increase in the ceramics, as the developing building construction sector is the main cause for this increase. If afterwards, the production in the ceramics rises, it will be reported in the monitoring report.

Table 11. General description of the ceramics

	Guaraí	***Itabira***	***Santa Izabel***	***Total***
Production at baseline (devices per year)	19,200,000	12,000,000	14,400,000	45,600,000
Oil consumption at baseline (liters per year)	3,516,000	2,400,000	2,880,000	8,796,000
Actual production (devices per year)	33,600,000	18,000,000	20,400,000	72,000,000
Oil consumption without the project activity (liters per year)	6,153,000	3,600,000	4,080,000	13,833,000

[38] *Available at: <http://mapas.sosma.org.br/site_media/download/mapas_a3/uf_rio_de_janeiro_A3.pdf>. Last visit on: May 21st, 2009.*

[39] *Available at: Source: <http://www.rbma.org.br/anuario/mata_01_mataconhecemos.asp>. Last visit on: May 21st, 2009.*

[40] *Source: <http://www.ctgas.com.br/template02.asp?parametro=2547>. Last visit on: May 21st, 2009.*

[41] *Source: <http://ecen.com/eee51/eee51p/gn_bolivia.htm>. Last visit on: May 21st, 2009.*

[42] *Source: TAPIA, R. E. C. et al.* ***Manual para a indústria de cerâmica vermelha****. Rio de Janeiro: SEBRAE/RJ, 2000. (Série Uso Eficiente de Energia).*

BFy (liters of oil per thousand of devices)	183.125	200	200

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

The methodology applied is Category AMS-I.C.: Thermal energy for the user with or without electricity – Version 13 from March 14th 2008 onwards, which is applicable for project activities that avoid greenhouse gases emissions by using renewable biomass instead of fossil fuels, in order to generate thermal energy.

Furthermore, the project activity will annually generate less than 45 MWthermal, which is the limit for Type I small scale project activities.

The oil consumption before this project activity for the group would be around 8,796,000 liters of heavy oil per year to feed their kilns in order to produce 45,600,000 ceramic devices. Without the project activity, as the group of ceramics increased their production to 72,000,000 ceramic devices per year to attend the market demand, which means that the consumption of heavy oil would be around 13,833,000 liters.

Brazil has a great availability of heavy oil, which in 2007 was an excess of 6.5 billions of liters[43]. Therefore, assuming that this availability maintains constant, this fossil fuel would be enough to ensure the increase in Ceramics production for at least the next 15 years, which is over the project activity life-time.

Project additionality is explained according to section 5.8 of the Voluntary Carbon Standard - Specification for the project-level quantification, monitoring and reporting as well as validation and verification of greenhouse gas emission reductions or removals. To demonstrate that the project is additional it will be used the test 1:

Test 1 – The project test

Step 1: Regulatory Surplus

The project is not mandated by any enforced law, statute or other regulatory framework in Federal, State and Municipal levels in the survey performed.

Step 2: Implementation Barriers

The project shall face at least one distinct barrier compared with barriers faced by alternative projects.

- **Technological Barrier**

In the grouped small project activity, the ceramics found some technological barriers. In the baseline scenario, using the oil, the kilns were fed with the use of pipes fixed on the side of the kilns, and a machine was used to pump the oil into the pipes. Those machines had to be deactivated when applied to the new biomasses.

The renewable biomasses require a specific attention once the humidity degree of the biomasses affects directly on the burning process. Thus, as soon as the biomass arrives at the ceramic, it passes through a logistic system until its insertion in the kiln. Beyond these alterations, all the ceramics, had to make some changes in the whole system, and each ceramic developed their particular system.

The main technological barriers were the non-availability of human knowledge to operate and maintain the new technology, the internal logistic modification and the employee's resistance to the new technology.

As a consequence of this barrier, there were variations in the color of the final ceramic devices, affecting the quality of the products; cracks on the ceramic devices; the explosion of some of them and cracks along the kilns; adding a significant amount of insecurity to the production process.

The operators did not have knowledge of the ideal amount of renewable biomasses that was necessary to achieve the ideal temperature for the ceramic devices cooking, to acquire the final product with same quality and to maintain the optimal process as they did when using heavy oil.

[43] *Source: Brasil Energia. Available at: <http://www.energiahoje.com/index.php?ver=mat&mid=29380>. Last visit on January 22nd, 2009.*

As a result of this difficulty, some training courses were required for the staffs of the three ceramics in order to clarify new measures linked to the machinery, sustaining the quality of the final product and find a burn cycle standard.

***Guaraí* Ceramic**

As mentioned above, *Guaraí* Ceramic used to operate with a two chambers "Hoffman" kiln using oil. When the project developer first thought about changing for the use of the biomass aiming at a cleaner mechanism, he deactivated one chamber of the "Hoffman" kiln and made some alterations on the other so that it could work with wood from afforestation. In addition to this, three "Round" kilns were installed. Afterwards, two more "Round" kilns were constructed.

Nowadays, the ceramic operates with twenty-four mechanic burners and the operators manually inject the biomass into them. As the lack of experience to achieve the ideal temperature of the kiln with the biomass was an intricacy, thermo couples were installed to monitor the burning in each kiln.

Moreover, the project proponent constructed a shed in order to stock and keep the biomass dry with the aim of improving the kiln's efficiency.

The wood chips are not homogeneous and the maintenances in the mechanic burners and in the entrances of the kilns are constants.

The woody residues mentioned (such as worn-out pallets, municipality garden waste and other industries residues) were a test made before the crediting period by *Guaraí* Ceramic. It was acquired and installed a wood shredder in order to transform this biomass into wood chips. However, the difficulties regarding to the use of the equipment and the management of this biomass, as well as the high cost of its sustenance, made the project proponent to uninstall the shredder and sell it. These biomasses are currently not used anymore.

With this project activity, the ceramic intends to install a pollution controller to reduce their particle material emissions. They want to deactivate the "Hoffman" kiln, which has a great consumption of biomass, and build three more "Round" kilns, increasing their production. They are aiming to buy a new wood shredder and to acquire all the necessary equipments.

***Itabira* Ceramic**

Presently, with afforestation tree's branches being employed as fuel in *Itabira*, this biomass that will be introduced inside the kiln must have smaller diameters than those that the branch originally has, according to the kiln's fuel entrances. So, the project developer needed two hydraulic axes destined to cut the firewood. Furthermore, a chimney exhauster was necessary to be installed in order to control the expelling out of the combustion gases from the kiln. In addition, when using oil, the fire was easily passed from a burning line to the next one in the "Hoffman" kiln. With the renewable biomasses, it is needed a chimney exhauster in order to draw the fire from a burning line to the next one.

The biomass injection is manually executed by operators. Differently from the oil, the wood is thrown inside the kiln and can spoil the ceramic devices that are burning inside the kiln as well as damage the kiln's entrances.

As the ceramic industry is located in the middle of the city and the project developer was worried about the health and safety of the population, the kiln chimney was increased in more 16 meters, reaching 62 meters. Also, the interior of the kiln needed to be reconstructed in order to improve the burning with a better air circulation and extraction of the combusted gas, as well as the superior part of the kiln in order to adequate the diameter of the entrances due to the large-sized branches.

During the reform period, the enterprise faced some problems, since there was no other kiln to operate whereas the Hoffman was under reconstruction. At this period (end of 2004 and beginning of 2005), the burning was done with heavy oil in the non-reformed side, and with biomass, in the reformed side, which means that the Ceramic had to operate with only 80% of its capacity. Afterwards the reform period, the ceramic returned to operate with the normal production, utilizing only renewable biomass.

Moreover, the ceramic also had problems with biomass' storage logistic, since there was nowhere to put it considering that normally the branches are kept in stock over the kiln, where it is located the fuel entrances; and with the reform, it was not possible to store them. All these problems have resulted in loss of production.

***Santa Izabel* Ceramic**

In order to reduce the size of the afforestation tree's branches, *Santa Izabel* Ceramic acquired a hydraulic axe, once the kiln entrances have smaller diameter than the original diameter of the branches. Moreover, a pyrometric system was installed in order to obtain a better burning control (thermocouples).

As in *Itabira* ceramic, in order to support the combustion gases expelling, the ceramic also needed a chimney exhauster. Furthermore, this equipment improves the passage of the fire from one burning line to the next one in the "Hoffman" kiln, because when using heavy oil, this process was easily done without the necessity of an equipment to draw the fire.

Santa Izabel Ceramic had also its kiln reconstructed, internally and superficially. During the reform period, the enterprise has faced some problems, such as the inactivity of the "Hoffman" kiln. By the time, the ceramic used only the "Round" kilns in order to continue producing, operating with about 80% of its capacity, number considered quite low due to an arduous work done for the burn handling and burn logistic with the laborers. This has contributed to the loss of production, since the knowledge had been acquired slowly.

As the biomass injection into the kilns is done manually by operators, the wood manage requires more laborers, since the wood must be cut with a hydraulic axe and moved along the ceramic. In addition, the wood splinters damage the kiln entrances and in some cases break the bricks while falling into the kiln.

Moreover, the three ceramics must have its kilns cleaned more often than before the project activity implementation, since the use of renewable firewood generates ashes, which did not happen in the baseline scenario when employing heavy oil; and the frequency of kilns maintenance has also raised due to the firewood irregularity that causes impacts in the "Hoffman" kilns structure when introduced.

Thus, the project developers had to find the best procedure to handle with the new biomass, which is far different when compared with the use of oil.

Besides these changes, there have been some new openings due to the fuel-change operation in the ceramics. These openings are necessary once the biomass requires more labor, like wood cut, feeding of the mechanic burners and transport from the shed to the kilns. The new openings were specifically for the burning section, cleaning and maintenance of the ceramics.

The ceramic sector is very resistant to changes and improvements in its work process. The modifications required for the fuel switch are an innovation in the region and represent a first step in the sector to revert this situation. This way, it will also stimulate regional development.

- **Financial barrier**

With the project implementation, the ceramics had to withstand more costs than if they had continued utilizing oil as fuel. Furthermore, there is spending with electrical energy and with the equipment maintenance, so the mechanic burners, driers and other equipments can operate.

New equipments were acquired as mechanic burners, thermocouples and wood shredders, as well, new labor was demanded to operate these new equipment, and these labor needed some training, once it was not a common practice these kind of service. These investments added an additional cost for the ceramics.

As the production rose in the ceramics in order to attend the market demand, and the cost's comparison of transportation and fuel price have the need of identical scenarios, it was considered the same production in order to have the right assessment.

Table 12. Costs due to the fuel switch in the project activity scenario of *Guaraí* ceramic

***Guarai* Ceramic**					
Scenario	***Non Renewable Biomass***		**Renewable Biomass**		
	Oil		**(Hoffman Kiln)**	**(Round Kilns)**	**Unity**
Production	2,800,000	pieces/month	1,250,000	1,550,000	pieces/month
Cost with fuel	0.17	BRL/L of oil	40	39	BRL/m3
	512,750	L of oil/month	694.12	2,968.55	m3 of biomass/month
Total Costs	87,168	BRL/month	27,765	115,774	BRL/month
Employee costs	0	BRL/month	7,388		BRL/month
Electricity costs	8,451	BRL/month	38,839		BRL/month
Total fixed costs	**95,619**	**BRL/month**	**189,765**		**BRL/month**

Table 13. Investments due the project activity at *Guarai* Ceramics

Investment Costs		
Costs with Kiln adaptation	233,600	BRL
Costs with equipment acquisition	27,416	BRL
Loss of revenues - period for adaptation of the kiln for biomass	33,600	BRL
Waste of products in the testing period (3 months)	84,000	BRL
Waste of Biomass in the testing period (BRL)	107,653	BRL
Consultancy from Processos & Sistemas	30,000	BRL
Total Costs	**516,269**	**BRL**

Table 14. Comparison between costs due to the fuel switch in the baseline scenario and the project activity scenario of *Itabira* ceramic

***Itabira* Ceramic**				
Scenario	**Oil**		**Renewable Biomass**	
Production	1,500,000	pieces/month	1,500,000	pieces/month
Cost with Biomass	0.17	BRL/L of oil	27.5	BRL/m3
	300,000	L of oil/month	2,058.82	m3 of biomass/month
Total costs	**51,000**	**BRL/month**	**56,618**	**BRL/month**

Table 15. Costs due to the fuel switch in the project activity scenario of *São Santa Izabel* ceramic

***Santa Izabel* Ceramic**				
Scenario	**Oil**		**Renewable Biomass**	
Production	1,700,000	pieces/month	1,700,000	pieces/month
Cost with Biomass	0.17	BRL/L of oil	40	BRL/m3
	340,000	L of oil/month	2,588	m3 of biomass/month
Total costs	**57,800**	**BRL/month**	**103,520**	**BRL/month**

With the project activity's implementation, the total spending has increased, as can be verified in the tables above. The income from the commercialization of the carbon credits is essential to maintain the fuel switch, as this change needs more resources than previously to maintain operations. This disparity obviously puts the ceramics in a less competitive situation, which would make the fuel switching and the continued use of the needed machinery unfeasible without the existence of the carbon markets.

- **Institutional barriers**

- **Risks of the project**

Since the use of heavy oil is an established and well-known process, the project activity implementation presents a risk to the project proponents because the use of a new biomass and its machines adds a significant amount of insecurity to the production process. This change translates into an extensive period of fiscal vulnerability for all ceramics, since during the reconstruction of the kilns, the production of the ceramics was low. In addition, there was the transition period where the ceramics lost production due to the adaptation to the use of biomass and to the new machineries.

Furthermore, the ceramics can go through a period in which there is a possibility that there is lack of biomass, representing another risk period.

Since there is no direct subsidy or support from the government for this project, without the income from the commercialization of the carbon credits, the fuel switch at the ceramics would not be feasible or attractive to the project developer.

- **Barrier due to the price of the biomass**

The combustion of afforestation wood and woody residues (such as wood chips, industries residues wood, among others) to generate thermal energy is an innovation in the ceramic industry. The future demand of this alternative fuel (e.g. by other consumers) is not predictable. Moreover, there is a possibility that the prices will increase when the biomasses disposal problem is attenuated.

The ceramics are facing some difficulties in obtaining the renewable biomasses, which are becoming harder to find. These ceramics need to get them from others cities of the state of *Rio de Janeiro*, and also from the bordering states of *Minas Gerais* and *São Paulo*. Furthermore, the cost of these biomasses has also increased. On the other hand, the oil providers have been trying to lure the ceramic companies to return to using fossil fuels, which are economically attractive.

Even if the price of the biomass increases, the ceramic can not repass it, once it would not have competitive prices in relation to other ceramics which did not made the fuel switch. These circumstances make the commercialization of the carbon credits essential to the maintenance of the fuel switch.

Step 3: Common Practice

According to the GHG Protocol for Project Accounting, common practice analysis shall be carried out following:

1. Define the product or service provided by the project activity.

The product of the grouped project activity is ceramic blocks.

2. Identify possible types of baseline candidates.

Observing table below, the common fuels employed and therefore, the baseline candidates are: natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others non-specified.

Table 16. Distribution of fuel employed on the ceramic sector in Brazil in percentage

BRAZILIAN ENERGY BALANCE 2008 - CERAMIC SECTOR EVALUATION			
FUEL	**2005**	**2006**	**2007**
Natural Gas	24%	26%	25%
Charcoal	2%	1%	1%
Wood	50%	50%	49%
Other recuperations	1%	1%	1%
Diesel Oil	0%	0%	0%

Fuel Oil	8%	8%	8%
Liquified Petroleum Gas	4%	4%	4%
Others from Petroleum	2%	2%	4%
Piped gas	0%	0%	0%
Electricity	8%	8%	7%
Others non specified	0%	0%	0%

(Brazilian Energy Balance, source: <http://www.mme.gov.br>. Last visit on: May 21st, 2009)

3. Define and justify the geographic area and the temporal range used to identify baseline candidates.

Brazil was identified as the geographic area of the baseline candidates because *Energy Research Company*[44] Mines and Energy Ministry of Brazil is the most representative and reliable source of information about the ceramic sector and its fuel employed.

Therefore, data from table above were provided by a reliable source and it was considered 3 years of its historical data, including the most recent available data and the period when the ceramics have done their fuel switch.

4. Define and justify any other criteria used to identify baseline candidates.

The other types of criteria used to identify baseline candidates were the common practice, the costs of fuel and the local availability of fuel.

The criteria common practice was used to identify baseline candidates because if a kind of fuel has already been employed with success in the ceramic sector it is an obvious baseline candidate.

Besides, the fuel cost was criteria once if a kind of fuel has high costs it will discourage the scenario of investing in this type of fuel, for example.

Equally important, the local availability of fuel was criteria as the lack of fuel in the region excludes it as baseline candidates. An example may be the lack of natural gas distribution in some regions.

5. Identify a final list of baseline candidates.

Table 13 provides the percentage of the level of penetration of each fuel utilized in the ceramic sector during the average of the three last years available (2005, 2006 and 2007). Baseline candidates are the use of:

a) Wood: The fuel most used in the ceramic sector, which would be the scenario of highest GHG emissions, once its emission factor is the highest according to IPCC 2006[45]. As the Brazilian ceramic sector's common practice states, the wood is from the *Atlantic forest* biome without sustainable management. This biome is extremely reduced due to the historical of high deforestation, which made the remaining areas to become preserved[46]. This fuel is not viable considering the inaccessibility of this Biome and its unavailability in the region.

b) Natural gas: it is restricted by the inconstant distribution of natural gas which made the project developers not to trust in this fuel, therefore excluding this possibility. The risk of lack of offering[47] and high costs

[44] *Energy Research Company is a national entity which intended to provide services and researches to subsidize the energy sector planning, in areas as electric Power; oil, natural gas and their derivatives; coal; wood; renewable energy sources and energy efficiency; among others.*

[45] *IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Source: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf. Page 2.18. Table 2.3.>. Last visit on: May 21st, 2009.*

[46] *Source: <http://www.rbma.org.br/anuario/mata_01_mataconhecemos.asp>. Last visit on: May 21st, 2009.*

[47] *Source: <http://ecen.com/eee51/eee51p/gn_bolivia.htm>. Last visit on: May 21st, 2009.*

depending on the region of the country[48] discourages the scenario of investing in this type of fuel even in local with piped gas. The distribution of gas is preferentially performed to thermal power plants, increasing the risk of blackout of natural gas.

c) Fuel oil: This fuel is more expensive than wood, however it is more plausible to use it than natural gas or wood. The risks involving natural gas distribution are so considerable that PETROBRÁS[49] was offering subsidy to the consumption of fuel oil in spite of natural gas in the state of *São Paulo*. In addition, the use of oil as fuel by the industries was a common practice in the region of the state of *Rio de Janeiro*[50], due to the fact that the biggest oil company in Brazil, PETROBRAS, produces around 84% of the oil production in Brazil in this region[51].

d) Renewable biomass: despite the high biomasses availability, the main problems concerning the use of renewable biomass are related to the high investments, technological and institutional barriers, and chiefly the risk of changing for a biomass not consolidated as fuel for ceramic industries[52].

6. Identify baseline candidates that are representative of common practice (for the project-specific baseline procedure).

Therefore, the common practice is the use of oil, which is the fuel most utilized in the region of the project activity, with fewer risks associated and high availability. Using heavy oil as fuel to provide thermal energy is efficient and had shown good results. The Brazilian technology for ceramic industry is not much modernized with the existing global technologies and using oil is a procedure well known by the kiln operators in the state of *Rio de Janeiro*.

Guaraí, *Itabira* and *Santa Izabel* ceramics are three ceramic industries that had used heavy oil successfully for several years. Acquiring new equipments and switching the fuel represented a risk to the project developer since the first practice was showing good results for many years.

In order to clarify new procedures related to the implantation of machineries that maintain the final product quality, the fuel switch required capacitating courses for the staff in all three ceramics. Furthermore, the ceramics faced arduous resistance from the employees who were very used to the standard situation of managing the oil insertion, without any technical restriction.

Thus, the project activity is not a common practice.

Impact of projects approval

Presently, the ceramic industrial segment of the state of *Rio de Janeiro* is comprised mostly by small industrial units that still use varying technological models. The grand majority of ceramic industries in *Itaboraí (RJ)* use heavy oil as fuel. These industries have some technological restrictions such as the energy exploitation and the efficiency of the machinery, so the project approval can improve the development of this sector.

Brazil is the third major contributor[53] to the carbon dioxide emissions in the year of 2003, due mainly to deforestation. Contemporary studies generally place Brazil fourth in the ranking of the countries that emit the most GHGs.

Renewable sources are relatively less prejudicial to the environment, in terms of local emissions (particle material, sulphur and lead) and greenhouse gases.

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[48] *Source: <http://www.dep.fem.unicamp.br/boletim/BE31/artigo.htm>. Last visit on: May 21st, 2009.*

[49] *PETROBRÁS performs in oil and oil by product exploration, production, refining, marketing, and transportation, both in Brazil and abroad. More information available at: <http://www2.petrobras.com.br/ingles/ads/ads_Petrobras.html>. Last visit on: May 21st, 2009.*

[50] *PELLEGRIN, I; ARAÚJO, R. S. B.* ***Caracterização do Arranjo Produtivo do Petróleo da Bacia de Campos e a Estruturação de uma Rede de Empresas - A Rede Petro-BC.*** *SEBRAE, Rio de Janeiro, 2004. Available at: <http://www.redetec.org.br/publique/media/S%C3%A9rie%20Estudos%20-%20APL%20Petr%C3%B3leo.pdf>. Last visit on: May 22nd, 2009.*

[51] *Available at: <http://www2.petrobras.com.br/Petrobras/portugues/plataforma/pla_bacia_campos.htm>. Last visit on: May 22nd, 2009.*

[52] *The use of renewable biomass was not included in table 14 which shows the fuel most employed in the ceramic sector according to Brazilian Energy Balance.*

[53] *Source: Goldemberg & Moreira.* ***Política Energética no Brasil****. Estudos Avançados 19 (55), 2005. Available in: <http://www.scielo.br/pdf/ea/v19n55/14.pdf>. Last visit on May 21st, 2009.*

The use of fossil fuels brings forward serious environmental problems such as global warming. There are also raising concerns about the security of the oil transportation that can result in huge environmental impacts, chiefly when this transportation is overseas.

The party will also implement the social carbon methodology, which was developed by *Instituto Ecológica*, and focuses on a sustainable development and better social conditions for the communities where it is implemented.

Brazil occupies a top position between the emitters of carbon dioxide, therefore any kind of efforts to change this scenario and take Brazil out of this uncomfortable top position, is willingly received. In addition, the project activity will contribute to the sustainable development of the host country.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

The methodology applied is Category AMS-I.C.: Thermal energy for the user with or without electricity – Version 13 from March 14th 2008, which is applicable for project activities that avoid greenhouse gases emissions by using renewable biomass instead of fossil fuels, in order to generate thermal energy.

The project activity will annually generate less than 45 MWthermal as described for Type I small scale project activities.

Source data used in this report is based on real outputs from each ceramic. This section will focus on information management related to production.

The biomasses receipts will be monitored to represent the amount of each biomass in fact consumed, which means the amount of biomasses consumed through the ceramic devices production. Consequently, this data will be digitally stored in each ceramic.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

The monitoring will be done with the aim of determining the most approximate quantity of heavy oil that, in the absence of the project, would be used in the ceramics' kilns and consequently the amount of GHG that would be emitted in tonnes of CO2e. The following table shows the frequency of the monitoring of each parameter.

Table 17. Data reported in monitoring estimation

Parameters	Description	Units	Origin	Frequency
Qrenbiomass	Amount of renewable biomass	Tonnes per month	Measured by the project developer	Monthly
Origin of renewable biomass	Renewable origin of the biomass	Not applicable	Controlled by the project developer	Each crediting period
PRy	Production of ceramic pieces	Unity of ceramic devices	Controlled by the project developer	Monthly
Renewable Biomass Surplus	Amount of the biomasses available	Tonnes or m³	Monitored by articles and database	Annually
Leakage of Fossil Fuel	Leakage resulted from the fossil fuel	tCO2e	Monitored by articles and database	Annually
EF_{CO2}	CO2 Emission factor of residual fuel oil	tCO2/TJ	Bibliography	Not monitored
NCVoil	Net Calorific Value of fossil fuel	TJ/Tonnes of oil	Bibliography	Not monitored
ρ oil	Specific gravity of fossil fuel	tonne/L	Bibliography	Not monitored
BFy	Consumption of fossil fuel per thousand of ceramic devices produced per year	L/thousand of ceramic devices	Data from project developer	Function of PRy
ηth	The efficiency of the ceramics using fossil fuel in the absence of the project activity	Percentage	Data from project developer	Not monitored

As stated before, the calculations regarding the quantity of oil required in the burning process were done according to the efficiency of the kilns utilized in the ceramics, which would require around 183.125 liters to produce 1,000 ceramic devices in *Guaraí* Ceramic and around 200 liters of oil in *Itabira* as well as in *Santa Izabel* ceramics.

Nowadays, *Guaraí* ceramic sustains a production of around 2,800,000 ceramic devices per month; *Itabira* ceramic sustains a production of 1,500,000 ceramic devices per month; and *Santa Izabel* ceramic sustains a production of 1,700,000 ceramic devices per month.

The quantity of heavy oil that would be used in the ceramics will be calculated through the multiplication of the ceramics' monthly production by the consumption of fossil fuel per thousand of ceramic devices, as the following example:

Qoil = (Monthly production / 1000) x Consumption of fossil fuel per thousand of ceramic devices (BFy)

Guaraí ceramic

Qoil = 2,800 x 183.125 = 512,750 L oil / month

Itabira ceramic

Qoil = 1,500 x 200 = 300,000 L oil / month

Santa Izabel ceramic

Qoil = 1,700 x 200 = 340,000 L oil / month

The responsible to monitor data provided in Table 17 will be: Mr. *Carlos Renato Scotelaro Boccaletti* from *Guaraí* Ceramic; Mr. *Valmir Carneiro da Silva* from *Itabira* ceramic; and Mr. *Bruno Menon* from *Santa Izabel* ceramic. Internal audit will guarantee data quality.

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Monitored Parameters

<table>
<tr><td>Data / Parameter:</td><td>Q renbiomass</td></tr>
<tr><td>Data unit:</td><td>Tonnes per month</td></tr>
<tr><td>Description:</td><td>Amount of renewable biomasses</td></tr>
<tr><td>Source of data to be used:</td><td>Measured by the project developers</td></tr>
<tr><td>Value of data</td><td>
<table>
<tr><td></td><td>Guaraí</td><td>Itabira</td><td>Santa Izabel</td></tr>
<tr><td>Biomasses (tonnes per month)</td><td>1,770</td><td>1,050</td><td>1,320</td></tr>
</table>
</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>The amount of biomasses will be monitored in accordance to the weight described in the receipts from the providers and the number of trucks which arrives in the ceramic companies. The values in the receipts are described in m³, therefore it is necessary the conversion to tonnes through the specific gravity of each biomass. The specific gravity values of the renewable biomasses utilized in this project are:</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>Biomass</td><td>Wood from afforestation</td><td>Woody residues (described below)</td></tr>
<tr><td>Specific gravity (tonnes/m³)</td><td>0.510</td><td>0.477</td></tr>
</table>

The sources of these data are:

Wood from afforestation

IPCC: Intergovernmental Pannel on Climate Change. Orientación del IPCC sobre las buenas prácticas para UTCUTS. Capítulo 3: Orientación sobre las buenas prácticas en el sector de CUTS. Cuadro 3A.1.9-2: Densidade de maderas básicas (D) de troncos (toneladas de materia seca/m³ de volumen recién talado) para especies arbóreas tropicales. Page: 184. It was utilized the specific gravity of Eucalyptus robusta at the América Tropical column.

Woody Residues (wood chips, industries residues wood, among others)

SOUZA, M. C. H. et al. Variação da densidade a granel de cavacos de Eucalyptus saligna em função das suas dimensões e da umidade.
Source: <http://www.celso-foelkel.com.br/artigos/ABTCP/abtcp.%20para%20site%202002c.pdf>. Last visit on: February 12th, 2009.

It was utilized the normal type value for wood chips.</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>Amount of biomass will be checked according to receipts of purchase. The energy balance will be verified according to the amount of biomass applied.</td></tr>
<tr><td>Any comment:</td><td></td></tr>
</table>

<table>
<tr><td>Data / Parameter:</td><td>PRy</td></tr>
<tr><td>Data unit:</td><td>Unity of ceramic devices</td></tr>
<tr><td>Description:</td><td>Production of ceramic devices per month</td></tr>
<tr><td>Source of data to be used:</td><td>Controlled by the project developer.</td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions</td><td>
<table>
<tr><td>Production (approximated)</td><td>Guaraí</td><td>Itabira</td><td>Santa Izabel</td></tr>
<tr><td>Ceramic Devices</td><td>2,800,000</td><td>1,500,000</td><td>1,700,000</td></tr>
</table>
</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>The measurement will be done by an internal control sheet monitored by the project developers, which will be fed daily.</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>As the ceramic must have an internal control of the production and sale at the end of every month, the PRy value cannot be manipulated.</td></tr>
<tr><td>Any comment:</td><td>The production stated above is referent to the year of 2008.</td></tr>
</table>

Data / Parameter:	**Leakage of fossil fuel**
Data unit:	tCO2e
Description:	Leakage resulted from fossil fuel
Source of data to be used:	Monitored
Value of data	0
Description of measurement methods and procedures to be applied:	The source of leakage predicted in the methodology will be monitored.
QA/QC procedures to be applied :	Receipts and invoices will be used to prove that the equipments were acquired. The old equipments of oil are still in the ceramics, proving that no equipments were transferred.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	**Renewable biomass surplus**
Data unit:	tonnes or m³
Description:	Amount of renewable biomass available
Source of data to be used:	Monitored
Value of data	<table><tr><th>Biomass surplus</th><th>Surplus</th><th>Year</th></tr><tr><td>Wood from afforestation in m³</td><td>7,776,095</td><td>2007</td></tr><tr><td>Woody Residues (sawdust/wood chips) in m³</td><td>5,737,174.08</td><td>2007</td></tr><tr><td>Industrial wood residues in tonnes</td><td>749,839</td><td>2006</td></tr><tr><td>Elephant Grass</td><td>Not measured</td><td>-</td></tr></table> Detailed information in section 4.1 – LEAKAGE.
Description of measurement methods and procedures to be applied:	It will be used to calculate the leakage of renewable biomass. The sources of leakages predicted in “General guidance on leakage in biomass project activities” of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, will be monitored. The measurement of the leakage will be based in national and international articles and database every monitoring period. The sources will provide information about the biomass availability in the project activity’s region.
QA/QC procedures to be applied :	Data available regarding the ceramic industries fuel consumption will be employed to monitor the leakage.

Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	**Origin of renewable biomass**
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be used:	Controlled by the project developers
Value of data	Renewable biomass
Description of measurement methods and procedures to be applied:	This information will be given by the biomasses providers. The guarantee of acquiring sawdust, wood chips and wood from afforestation from renewable sources will be achieved by invoices from the providers, as well as their tracking until their afforestation origin. As stated in the section 2.2, the biomasses (Wood from afforestation, woody residues and sawdust) are considered renewable as fulfilling the options described in the Annex 18, EB 23.
QA/QC procedures to be applied:	The biomass will be considered as renewable if it is according to the definition given by the Annex 18, EB 23.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Fixed Parameters

Data / Parameter:	**ρ oil**
Data unit:	tonne/L
Description:	Specific gravity of fossil fuel
Source of data used:	Value average checked at: BIZZO, W. A. **Geração, Distribuição e Utilização do Vapor.** Faculdade de Engenharia Mecânica UNICAMP. Cap. 2. Available at: <http://www.fem.unicamp.br/~em672/GERVAP2.pdf>. Last visit on: May 21st, 2009.
Value applied:	0.000978 tonne/L
Justification of the choice of data or description of measurement methods and procedures actually applied :	The amount of oil used in the baseline was measured by volume units.
Any comment:	

Data / Parameter:	**NCVoil**
Data unit:	TJ/tonne of oil

Description:	Net Calorific Value
Source of data used:	Value average checked at: IPCC : Intergovernmental Pannel on Climate Change: Source: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf>, table 1.2. Last visit on: May 21st, 2009.
Value applied:	0.0404 TJ/Tonne
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value will provide the energy generated by the amount of heavy oil that would be used in the absence of the project.
Any comment:	IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of the Executive Board, paragraph 59).

Data / Parameter:	**BFy**
Data unit:	L of oil per thousand of devices
Description:	Consumption of fossil fuel per thousand of ceramic devices produced per year
Source of data used:	Historical data from project developer
Value of applied:	<table><tr><th>**Ceramic**</th><th>*Guaraí*</th><th>*Itabira*</th><th>*Santa Izabel*</th></tr><tr><td>**BFy**</td><td>183.125</td><td>200</td><td>200</td></tr></table>
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value was acquired through the average consumption and production of ceramic devices during the years when the ceramics used to consume heavy oil. This value is in accordance with the data acquired in other ceramics that employ the same type of kilns. The value is employed to calculate the real amount of heavy oil displaced to maintain the ceramic production in the baseline scenario.
Any comment:	

Data / Parameter:	**EF_{CO2}**
Data unit:	tCO2/TJ
Description:	CO2 Emission factor of residual fuel oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Available at: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf>. Page 2.18. Table 2.3. Last visit on: May 21st, 2009.

Value applied:	77.4 tCO2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	The fuel that would have been used in the baseline scenario for this project activity would be heavy oil. The non-renewable wood would be provided from the *Atlantic Forest* biome. However, this fuel is not viable considering the inaccessibility of this Biome and its unavailability in the region. The natural gas has an inconstant distribution, bringing forward a lot of risks associated.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter:	**ηth**
Data unit:	Percentage
Description:	The efficiency of the ceramics using fossil fuel that would have been used in the absence of the project activity
Source of data used:	Historical data from project developer
Value applied:	
Any comment:	

Ceramic	*Guaraí*	*Itabira*	*Santa Izabel*
ηth	100%	100%	100%

3.4 Description of the monitoring plan

The party responsible for implementing the monitoring plan shall be the owners of the companies. The project developer will also be responsible for developing the forms and registration formats for data collection and further classification. Data monitored will be kept during the crediting period and 2 years after.

For this purpose, the authorities for the registration, monitoring, measurements and reporting are: Mr. *Carlos Renato Scotelaro Boccaletti* from *Guaraí* Ceramic; Mr. *Valmir Carneiro da Silva* from *Itabira* ceramic; and Mr. *Bruno Menon* from *Santa Izabel* ceramic.

The management structure will rely on the local technicians with a periodical operation schedule during the project. The technical team will manage the monitoring, the quality control and quality assessment procedures and the different auditory will be responsible to carry the project premises.

With the carbon credits income, in order to complement the monitoring of the production of ceramic devices, equipments from *Alutal* will monitor each burning cycle of the ceramics' kilns through graphics of the temperature reached in the kilns versus time.

Carbono Social Serviços Ambientais LTDA. will also implement a report following the Social Carbon methodology, which was developed by *Instituto Ecológica* and focus on sustainable development and better social conditions for the communities where it is implemented. This Social Carbon Reports will be available at TZ1 registry (http://www.tz1market.com/socialpublic.php) once the project is registered.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

Category AMS-I.C.: Thermal energy for the user with or without electricity – Version 13 from March 14th 2008. This category comprises renewable energy technologies that supply individual households or users with thermal energy that displace fossil fuels such as the three grouped ceramics.

The project activity will generate less than the limit of 45 MWthermal for Type I small scale project activities.

Baseline

$$BEy = HGy * EF\ CO2 / \eta th \qquad \text{(Equation 01)}$$

Where:

BEy: The baseline emissions from steam/heat displaced by the project activity during the year y in tCO2e.

HGy: The net quantity of heat supplied by the project activity during the year y in TJ.

EFCO2: The CO2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2/TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

ηth: The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.

The ceramic facilities did not use to monitor the energy generated by the fossil fuel consumed. However, it is well known the amount of fossil fuel consumed as well as the amount of fuel required to burn a thousand of pieces. Therefore, this project will estimate the baseline emissions through the energy generated by the real consumption of fuel oil and assuming that ηth is 100%.

The thermal energy generated by the fossil fuel is estimated as follows:

$$HGy = Qoil \times NCV \times \rho \qquad \text{(Equation 02)}$$

Where:

Qoil: Amount of oil (L)

NCV: Net calorific value of oil (TJ/Tonne)

ρ: Specific gravity of oil (ton/L)

Leakage (LE)

The leakage predicted in the methodology employed is not applicable for this project activity as there is no transference of equipment in spite of new equipments had to be acquired. Furthermore, the old oil equipments are still in the ceramics, proving that these equipments were not transferred.

The leakage from biomass projects, like the project activity, shall also be estimated according to the "General guidance on leakage in biomass project activities" of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on type of biomass being considered.

Table 18. Sources of leakage according to the type of the biomass

Biomass Type	*Activity/ Source*	*Shift of pre project activities*	*Emissions from biomass generation/*	*Competing use of biomass*

			cultivation	
Biomass from forests	*Existing forests*	-	-	*X*
	New forests	*X*	*X*	-
Biomass from croplands or grasslands (woody or non-woody)	*In the absence of the project the land would be used as a cropland/wetland*	*X*	*X*	-
	In the absence of the project the land will be abandoned	-	*X*	-
Biomass residues or waste	*Biomass residues or wastes are collected and use.*	-	-	*X*

Observing the table above, the source of leakage of the present project is the competing use of wood from afforestation and its residues. All the ceramics utilize some kind of wood or wood residues and the providers are mainly wood industries. There are plenty of this kind of industries in the states of *Rio de Janeiro*, *São Paulo* and *Minas Gerais*, which means that the project activity will not disturb in any aspects the wood market once there is plenty of this kind of biomass available. The source of leakage of the present project is showed below according to each type of biomass:

Wood from Afforestation

The area destined for afforestation in *Brazil* corresponds to 5.6 millions of hectares, where the *Eucalyptus* genus corresponds to 3.5 millions of this area, and can generate 23 to 25 tonnes of biomass per hectare[54]. The grand major of these cultivations were established in the middle of 1970 to 1980. The *Eucalyptus* and *Pinus* genuses correspond to 80% of the afforestation in *Brazil*. Furthermore, these genuses are mainly cultivated in the southeast region of the country, where the climate is more favorable for their growing[55].

In addition, sustainable management practices of the afforestation in *Brazil* (as the techniques of preparation, fertilization, control of weeds, improved seeds, cloning and reform) were introduced and constantly improved in order to increase its productivity[56]. As a consequence, *Brazil* withholds the best productivity taxes (in m³/ha/year) over the world due to the adaptation of these species to the Brazilian territory and the success of the experiments of genetic improvement[57].

The production of wood from afforestation in the state of *Rio de Janeiro* was of 368,710 m³[58] and in *São Paulo*, which is a bordering state, was of 7,407,385 m³[59] in 2007. As the consumption of this kind of fuel is around 64,100 m³ per year for the project activity, it represents around 0.8% of the total of wood from afforestation produced in the region.

[54] Brazilian *Society of Forestry. Source: <http://www.sbs.org.br/atualidades.php.>. Last visit on January 19th, 2009.*

[55] *JUVENAL, T. L.; MATTOS, R. L. G.* ***O setor florestal no Brasil e a importância do reflorestamento.*** *BNDES Setorial, Rio de Janeiro, n. 16, p. 3-30, set. 2002. Available at: <http://www.bndes.gov.br/conhecimento/bnset/set1601.pdf>. Last visit on January 22nd, 2009.*

[56] *MCT/IPEF.* ***Silvicultura e Manejo.*** *Source: <http://www.ipef.br/mct/MCT_03.htm>. Last visit on: May 21st, 2009.*

[57] *JUVENAL, T. L.; MATTOS, R. L. G.* ***O setor florestal no Brasil e a importância do reflorestamento.*** *BNDES Setorial, Rio de Janeiro, n. 16, p. 3-30, set. 2002. Available at: <http://www.bndes.gov.br/conhecimento/bnset/set1601.pdf>. Last visit on January 22nd, 2009.*

[58] *According to IBGE (Geographic and Statistic Brazilian Institute) available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=rj&tema=extracaovegetal2007>. Last visit on: May 21st, 2009.*

[59] *According to IBGE (Geographic and Statistic Brazilian Institute) available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=sp&tema=extracaovegetal2007>. Last visit on: May 21st, 2009.*

Woody Residues (Sawdust/ Wood Chips)

The production of wood generates a large amount of residues, which can be reused to generate thermal energy, considering that around 22% of the wood produced will generate sawdust/wood chips[60]. The production of wood log in the state of *Rio de Janeiro* was of 111,600 m³[61] and in *São Paulo*, which is a bordering state, was of 25,966,464 m³[62] in 2007. Thus, the production of sawdust/wood chips in the region was around 5,737,174.08 m³ per year. The woody residues consumption of this project activity is around 35,625 m³ per year, value that represents around 0.6% of the total of woody residues produced in the region.

Industrial and construction residues

In order to calculate the availability of these biomasses, and considering the lack of studies regarding the inventory of residues in the state of *Rio de Janeiro*, it was utilized other similar cities in order to obtain the inventory of both construction and industrial residues.

The construction residues wood corresponds around 85% of the total construction residues in *Sorocaba*, city of the state of *São Paulo*. The deficiency of a correct destination for this wood constitutes a huge problem[63].

The percentage of the wood residues (such as pallets) contained within the industrial solid residues in the region of *Curitiba*, which is the capital of the state of *Paraná*, is around of 5%. Furthermore, the city garden residues correspond around 3.2% of the total of industrial solid residues[64].

It was utilized this estimative to calculate the percentage of consumption of these residues in the project activity. Moreover, it was only considered the availability of industrial wood residues, which is 749,839 tonnes per year (around 5% of the total of industrial solid residues). Considering that these biomasses would be the only consumed by the ceramics, the consumption of this project activity would be around 49,680 tonnes per year, corresponding around 6.6% of the total. Initiatives like these could attenuate the problem with solid residues final disposal in cities.

Elephant grass

This biomass is from grassland in abandoned areas, therefore the leakage that would be applicable is the shift of pre project activity and emissions from biomass generation/cultivation. Currently, elephant grass has been acquiring national importance as biomass[65] to generate thermal energy due to its high productiveness and easy adaptation in almost all climate and soil Brazilian conditions; it also dismisses the use of fertilizers (NPK)[66]. In case of employing this kind of biomass, the project developer will cultivate, by himself, elephant grass in pasture or degraded areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area, i.e. this leakage will not exist.

This way, this renewable biomass does not have potential to generate leakage emissions due to its high availability.

In spite of the fact that the ceramic industries do not represent the main share of fossil fuel consumption, the project activity contributes to petrol reserves conservation since it will switch the use of non renewable fuel to renewable biomass. The implementation of this project in the ceramics is breaking the culture of fossil fuel burning in the state of *Rio de Janeiro* and consequently, several ceramics are becoming interested in implementing this project, given the possibility of income derived from the sale of carbon credits. The opportunity of spreading the use of renewable biomass to other ceramics presents huge possibilities for sustainable development in the region.

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[60] *BRITO EO. Estimativa da produção de Resíduos na Indústria Brasileira de Serraria e Laminação de Madeira.* ***Rev. da Madeira****. v.4. n.26. 1995, pp. 34-39.*

[61] *According to IBGE (Geographic and Statistic* Brazilian *Institute) available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=rj&tema=extracaovegetal2007>. Last visit on: May 21st, 2009.*

[62] *According to IBGE (Geographic and Statistic* Brazilian *Institute) available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=rj&tema=extracaovegetal2007>. Last visit on: May 21st, 2009.*

[63] *MANCINI, S. D. et al.* ***Potencial de Reciclagem dos Resíduos da Construção Civil de Sorocaba-SP.*** *Available at: http://www.saneamento.poli.ufrj.br/documentos/24CBES/III-024.pdf. Last visit on January 27th, 2009.*

[64] *Statewide inventory of industrial solid residues. Available at: <http://folio.mp.pr.gov.br/downloads/Meio_Ambiente/ri_iriap.pdf>. Last visit on February 3rd, 2009.*

[65] *Source: <www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>. Last visit on: May 21st, 2009.*

[66] *Source: <www.cnpgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf>. Last visit on: May 21st, 2009.*

With the implementation of the project activity, the project participants will avoid the consumption of about 13,833,000 liters per year of heavy oil helping the conservation of petrol reserves, which are decreasing rapidly.

Emissions Reductions

$$ERy = BEy - Leakagey \quad \text{(Equation 03)}$$

Where:

ERy: Emission reduction in the year "y" (tonnes of CO2 eq.)

BEy: Baseline emissions of CO2 that would be generated through heavy oil burning (tonnes of CO2 eq.)

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

Emission Reductions

Guaraí Ceramic – Year of 2007

The baseline emissions can be obtained by Equation 01 and 02, as follows:

HGy = 6,153,000 L of oil x 0.000978 ton/L x 0.04040 TJ/ton = 243.11 TJ

BEy = (77.4 tCO2/TJ x 243.11 TJ) / 1 = 18,816.9 tCO2

Table 19. Emission reductions without considering the leakage

Year	*Guaraí* Total Baseline Emissions(tonnes of CO2e)	*Itabira* Total Baseline Emissions (tonnes of CO2e)	*Santa Izabel* Total Baseline Emissions (tonnes of CO2e)
April to December - 2006	14,113	8,257	9,358
2007	18,817	11,009	12,477
2008	18,817	11,009	12,477
2009	18,817	11,009	12,477
2010	18,817	11,009	12,477
2011	18,817	11,009	12,477
2012	18,817	11,009	12,477
2013	18,817	11,009	12,477
2014	18,817	11,009	12,477
2015	18,817	11,009	12,477
January to March - 2016	4,704	2,752	3,119
Total Baseline Emissions (tonnes of CO2e)	**188,169**	**110,094**	**124,773**
Number of years of the crediting period	10	10	10

Annual average of estimated baseline emissions for the 10 years of crediting period (tonnes of CO2e)	**18,817**	**11,009**	**12,477**
Total Baseline Emissions (tonnes of CO2e)	**423,036**		

4.3 Quantifying GHG emissions and/or removals for the project:

The applied methodology does not predict project emissions and leakage was considered to be zero.

4.4 Quantifying GHG emission reductions and removal enhancement for the GHG project:

Table 20. Estimation of overall emission reductions

Year	Baseline Emissions (tonnes of CO2e)	Leakage (tonnes of CO2e)	Emission Reductions (tonnes of CO2e)
April to December - 2006	31,728	0	31,728
2007	42,304	0	42,304
2008	42,304	0	42,304
2009	42,304	0	42,304
2010	42,304	0	42,304
2011	42,304	0	42,304
2012	42,304	0	42,304
2013	42,304	0	42,304
2014	42,304	0	42,304
2015	42,304	0	42,304
January to March - 2016	10,576	0	10,576
Total			**423,036**
Average			42,304

Table 21. Estimation of overall emission reductions

Year	*Guaraí* Total Emission Reduction (tonnes of CO2e)	*Itabira* Total Emission Reduction (tonnes of CO2e)	*Santa Izabel* Total Emission Reduction (tonnes of CO2e)	Total Emission Reductions (tonnes of CO2e)

April to December - 2006	14,113	8,257	9,358	31,728
2007	18,817	11,009	12,477	42,304
2008	18,817	11,009	12,477	42,304
2009	18,817	11,009	12,477	42,304
2010	18,817	11,009	12,477	42,304
2011	18,817	11,009	12,477	42,304
2012	18,817	11,009	12,477	42,304
2013	18,817	11,009	12,477	42,304
2014	18,817	11,009	12,477	42,304
2015	18,817	11,009	12,477	42,304
January to March - 2016	4,704	2,752	3,119	10,576
Total Emission Reductions (tonnes of CO2e)	**188,169**	**110,094**	**124,773**	**423,036**
Number of years of the crediting period	10	10	10	10
Annual average of estimated emissions reductions for the 10 years of crediting period (tonnes of CO2e)	**18,817**	**11,009**	**12,477**	**42,304**
Total Emission Reductions (tonnes of CO2e)	**423,036**			

5 Environmental Impact:

The Environmental National Policy, *Política Nacional do Meio Ambiente* - PNMA, instituted by the Brazilian Law 6.938/81, establishes that the construction, installation, amplification and operation of any enterprise or activity which may exploit natural resources, and are considered potentially pollutant, or capable of degrading the environment, will be possible only if they obtain a previous environmental permission; according to the Brazilian Constitution of 1988. One of the tools settled by the PNMA, in order to monitor and study the potential impacts generated by these kinds of enterprises, is the Environmental Impact Assessment (EIA).

An EIA was not required due to the project activity.

The project activity contributes to the level reduction of greenhouse gas (GHG) emissions by avoiding the incentive of fossil fuels utilization. In addition, the project activity will contribute to the sustainable development of the host country, such as:

- The use of clean and efficient technologies through the use of biomass waste as fuel. By these means, the project is in accordance to Agenda 21 and with Brazilian Sustainable Development Criteria;

- A pioneer initiative that encourages throughout the country the development of new technologies that substitutes the use of usual fuels for renewable biomass which presents an efficient thermal energy generation potential as shown in the project demonstration.

As can be observed in Table 22, the only negative impact identified is that the project activity will generate ashes due to the burning of the biomass, but this impact will be mitigated by incorporating the ashes into the clay used as thermal insulator in the kilns entrance.

The burning of the new biomasses also emits particulate material and CO2, as well as when using heavy oil. However, the emission reductions of GEE will improve since they are renewable biomasses.

This way the project does not cause any additional negative impacts as all generated energy is a result of the best and unique exploitation of the natural resources available. On the contrary, the project will improve the local environmental conditions by establishing proper treatment for the renewable biomasses and also by contributing to the reduction on the use of fossil fuels.

Table 22. Summary of the environmental impacts

Environmental Factor	Environmental Impact	Classification
Air	Production of ash.	Negative
Air	Avoidance of nitrogen oxides, sulfur dioxide, volatile organic compounds and heavy metals emissions.	Positive
Climate	GHG emission reduction	Positive
Water/hydric resources	Preservation of the water, avoiding the risk of accidents during petrol transportation	Positive
Energy	No more use of a polluting residues as fuel for energy production	Positive
Fauna	Biodiversity preservation avoiding the risk of accidents	Positive
Flora	Biodiversity preservation avoiding the risk of accidents	Positive

6 Stakeholders Comments

The main stakeholders considered in this project are the ceramic sector national association (ANICER)[67] and the ceramic company employees. A letter was sent to the stakeholders informing about the project. In the ceramic's facilities, the letter was posted on the employees' board which is a visible place with high circulation of employees. The letter was available during 7 days and the comments were expected for a period of 7 days after the letter has been posted.

ANICER sent three letters (one for each ceramic) stating their support to the present project activity[68].

In addition, having the ceramic sector association being aware of the project, other local stakeholders will be able to be informed about the proposed project activities, because the ceramic sector association has great visibility trough different parts of the community, public entities on different levels, like Municipality, State and Federal organizations.

The ceramic sector association keeps relationships to local developing agencies, like SEBRAE (Brazilian Service to support Micro and Small size companies), SENAI (Brazilian Service to support technically Manufacturing Companies), among others so it will help in the diffusion of project results and practices.

Till validation time, positive answers were received and the outcomes are available and arrived within the validation of the project.

[67] *This institution is focused in the quality and sustainable management, offering opportunities for the ceramists, their business and employees as a result of its services, researches, events and associations. More information is available at: <http://www.anicer.com.br>. Last visit on: May 21st, 2009.*

[68] *The letter from ANICER was evidenced to the DOE.*

7 Schedule:

- Project start date: Date on which the project began reducing or removing GHG emissions, i.e. when the project developers began employing renewable biomass.

Table 23. Ceramics' project start date

Ceramic	***Project Start Date***
Guaraí	January 1st, 2003
Itabira	October 1st, 2004
Santa Izabel	March 1st, 2004

- Date of initiating the project activity: 01/04/2006;
- Validation Report predicted to: 28/02/2009;
- First Verification Report predicted to 28/02/2009;
- VCS project crediting period: 10 years renewable;
- Monitoring and reporting frequency: preferentially from 6 to 12 months, since the beginning of the crediting period;
- Date of terminating the project: 31/03/2016.

After the project start date, the ceramic owners made adaptations due to the use of new biomasses and its technology encompassing, for example, tests using the new biomasses, the ideal mix of renewable biomasses (different percentages of each biomass) and technological adaptations.

8 Ownership:

8.1 Proof of Title:

Ceramic's article of incorporation and the contract between *Carbono Social Serviços Ambientais* LTDA. - project developer – and each Ceramic of the project activity will proof the title, demonstrating the rights to the GHG emissions reductions and the ownership of the project. These proofs of title will be checked by DOE and are in power of each Ceramic and available to consultation.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not applicable.