CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

"Eliane Natural Gas fuel switch project" – Version n°02, 07 March 2006

A.2. Description of the project activity:

Eliane is a porcelain industry, which operates in a wet milling system, where the clay is mixed with water and triturated by ceramic spheres of high density, resulting in a liquid called slip. The slip is dried out (atomised) by spray dryers resulting in round particles of equal granulometry.
Eliane operates in 6 units in Brazil: Camaçari (Bahia), Serra (Espirito Santo), Varsea de Palma (Minas Gerais), Londrina (Paraná), Criciuma (Santa Catarina) and Cocal do Sul (Santa Catarina). The project is restricted to Criciuma (here after referred as Elinane IV) and Cocal do Sul units, (here after referred as Eliane I, II and V) the largest porcelain site in Brazil. Cocal do Sul and Criciuma started operation in 1960, and its core business is the production of ceramic. It has been using fuel oil, and cooking coal as the main energy sources in all the spray dryers and one refratary tunnel kiln up to the year 2001.

Excluído: III

The natural gas pipeline arrived in Cocal do Sul in may of 2000, but only during 2001, considering the additional carbon credits revenues; Eliane started the fuel switch process from fuel oil to natural gas. Given the high prices of natural gas, and the investment required to conversion, the CERs brought the benefits necessary to implement the project (details in section B.3).

The project activity consists in the investments to adapt the existing equipment to the use of natural gas instead of fuel oil, (equipment listed in section A.4.3). The extra income and other non-measurable benefits derived from the sale of carbon credits and participation of Kyoto Protocol are enough to make the conversion viable.

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

- Diminishes the atmospheric emissions of pollutants and improves the air quality of the region;
- Brings social benefits related to improvement of labour conditions;
- Creates new employment for installation of equipment;
- Act as a clean technology demonstration project which could be replicated across Brazil;
- Is an important capacity building activity, demonstrating the use of a new mechanism for funding environmentally friendly technologies, which reduces emissions of greenhouse gases.

A.3. Project participants:

Name of party involved (indicates a host country)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicates if the party involved wish to be considered a project participant (yes/no)
Brazil (host country)	Eliane (Maximiliano Gaidzinki S.A.)	No
United Kingdom of Great Britain and Northern Ireland	Ecosecurities Ltd.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Excluído: UK

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

South- region – Santa Catarina State

A.4.1.3. City/Town/Community etc:

- Eliane I, II and V: Cocal do Sul city
- Eliane IV: Criciúma city

Excluído: III

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

- Eliane I, II and V: Rua Maximiliano Gaidzinki, 245 ZIP: 88845-000
- Eliane IV: Rod. Luis Rosso Km 4 Morro Estevão ZIP: 88803-470

Excluído: III

A.4.2. Category(ies) of project activity:

Sectoral Scope Category: 4 (Manufacturing industries)

A.4.3. Technology to be employed by the project activity:

The project activity is a fuel switch program that is based on the conversion of 9 spray dryers and one refratary tunnel kiln. The conversion is related to adaptations and modifications, allowing the consumption of natural gas instead of fuel oil,. This process will not increase the lifetime of equipment, neither the production capacity significantly. The equipment included in the project activity is:

Table 1: List of equipments involved in the project activity

Eliane Code	Location	Name	Manufacturer	Model	Nominal capacity (litter of water vaporised/hour)	Nominal Production Capacity (Kg of powder atomised/hour)	Energy Source	Fuel Switch date	Remaining Lifetime
ATM-1	Eliane I	Spray Dryer	SACMI	ATM 15	1750	3800	Fuel oil	Dec 2006	More than 20 years
ATM-2	Eliane I	Spray Dryer	SACMI	ATM 25	2600	5500	Fuel oil	Dec 2004	More than 20 years
ATM-3	Eliane I	Spray Dryer	IMECAL	ATM 15	1750	3800	Fuel oil	Dec 2006	More than 20 years
FB9	Eliane I	refratary tunnel kiln	IMECAL		300,000 m^2 of porcelain/month		Fuel oil	May 2001	More than 20 years
ATM 1	Eliane II	Spray Dryer	SACMI	ATM 50	6500	14000	Fuel oil	Dec 2000 / Jan 2001	More than 20 years
ATM 2	Eliane II	Spray Dryer	IMECAL	ATM 51	6500	14000	Fuel oil	Jan 2001	More than 20 years
ATM 3	Eliane II	Spray Dryer	SACMI	ATM 65	7700	16500	Fuel oil	Jan 2001	More than 20 years
ATM 1	Eliane IV	Spray Dryer	ICON	ATM 25	2600	5500	Fuel oil	Feb 2001	More than 20 years

Eliane Code	Location	Name	Manufacturer	Model	Nominal capacity (litter of water vaporised/hour)	Nominal Production Capacity (Kg of powder atomised/hour)	Energy Source	Fuel Switch date	Remaining Lifetime
ATM 2	Eliane IV	Spray Dryer	IMECAL	ATM 25	2600	5500	Fuel oil	Feb 2001	More than 20 years
ATM 1	Eliane V	Spray Dryer	ICON	ATM 25	2600	5500	Fuel oil	Jan/ Feb 2001	More than 20 years

Excluído: *The facilities of Eliane III moved to Eliane II¶

The Spray Dryers dries out the ceramic in an aspersion system where the slip is launched against a current of hot air produced by the combustion of fuel oil(in the baseline scenario, and natural gas in the Project Activity) reducing the humidity of the ceramic from 35% to 6% (atomizing system). The Spray Dryers give the atomized mass the right granulometry for the powder, leading a perfect production of ceramic.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The baseline is defined as the consumption of fuel oil, in the equipment listed above, to produce ceramic. All the equipments are located in Eliane I, II, IV and V units (as described above), and are part of ceramic production processes. Given that during the previous years the natural gas prices were higher than fuel oil, the fuel switch was not the most attractive course of action, and thus not the baseline.

Excluído: III,

The project activity will reduce CO_2 emissions by replacing the fuel oil, a carbon intensive source, with natural gas (less carbon intense fuel), in the ceramicl production line. The CH_4 and N_2O resulting from fuel combustion are also accounted for in the calculation of baseline and project emissions.

The project activity, due to the replacement of fuel oil, will reduce the fugitive CO_2 emissions related to fuel transportation. However, the increased natural gas use will increase the fugitive methane emissions in the natural gas pipeline used to supply the project activity. Only CO_2 and CH_4 are accounted in the leakage calculation.

The project activity changes significantly the emissions of CH_4 and CO_2. The other GHG emission reduction related to N_2O is negligible. The GHG emissions reduction are detailed in section A.4.4.1 and calculations presented in section E.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reduction in tonnes of CO_2e
2001	19,794
2002	19,794
2003	19,794
2004	19,794
2005	19,794
2006	19,794
2007	19,794
Total estimated reductions (tonnes of CO2e)	138,555
Total Number of crediting period	21 years (three periods of seven years)
Annual Average over the crediting period of estimated emission reduction (tonnes of CO2e)	19,794

A.4.5. Public funding of the project activity:

The project developer is not receiving any funding from Annex I parties.

SECTION B. Application of a baseline methodology

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

AM0008 "Industrial fuel switching from coal and petroleum to natural gas without extension of capacity and lifetime of the facility". Version 1, approved on 15 June 2004.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity attends all the applicability requirements of AM0008.

- There are no local or regional regulations or programs that constrain the facility from using fuel oil. All environmental licenses do not present any complain or request of changes related to use of fuel oil.
- The fuel oil and natural gas prices fluctuate, depending the petroleum prices and international scenarios. During the years before the fuel switch (2000), the natural gas was more expensive than fuel oil. For more detail, see section B.3, related to additionality demonstration.
- The project activity is related to conversion of equipments, allowing the consumption of natural gas instead of fuel oil. The project activity is not related to installation of new equipments, increase the equipment installed capacity, neither gains of energy efficiency or extends of equipment lifetime.

B.2. Description of how the methodology is applied in the context of the project activity:

According to the methodology, the Baseline Scenario is defined as the current use of fossil fuels (petroleum and/or coke) in the existing facility up to the end of the crediting period without any retrofit, which extends its capacity or lifetime or improves its fuel efficiency. According to the baseline methodology, for this project activity the baseline is defined as the continued consumption of fuel oil for the production of ceramic, excluding any additional equipment or expansion.

Additionality is demonstrated by analysing the national and sector trends and elaborating a financial analysis. All the gains and costs related to the implementation of the project activity must be included, explicitly the following parameters:

- Investment requirements for using natural gas;
- Discount rate appropriate to country and sector;
- Efficiencies of fuels;
- Current price and projected prices of each fuel;
- Operation costs of each fuel;
- Residual value of equipment at the end of lifetime of the project activity.

If the NPV of project activity is negative, the project is additional. The financial analysis parameters, emission reduction data and data sources are detailed in Annex 3.

The emission reduction calculations include CO_2, CH_4 and N_2O from combustion and CO_2 and CH_4 from fugitive emissions associated with fuel transportation and distribution. Carbon dioxide emission factors are determined using country-specific lower heat values (specific for Brazil) and standard IPCC values for carbon content and oxidation fraction. CH_4 and N_2O from fuel combustion are estimated using IPCC standard emission factors for each fuel and equipment type. The leakage emissions related to transportation and distribution of baseline fuels and natural gas are estimated using region-specific emission factors given by IPCC. The CH_4 and N_2O emissions are converted to equivalent CO_2 emissions using the respective GWPs, 21 and 310, as agreed in the Kyoto Protocol.

Spray Dryers and the kiln that were using fuel oil before the fuel switch were considered for emission reduction calculation. Costs related to the conversion were taken into account in the financial analysis.

Following the Meth-Panel recommendation, the data used to demonstrate additionality was based on the period prior to decision-making. This means the year of 2000 given that the decision was made on December 2000, and the project activity started during the first half of 2001. For baseline calculations the data used is the most recent possible, meaning updated future plans, and any other recent applicable publications.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

The baseline is defined as what would have occurred in the absence of the project activity. The baseline definition was made according to additionality requests, and it is detailed in section B.2. This section will focus on demonstration of additionality.

The first condition related to additionality is the demonstration of absence of mandatory policy or regulations requiring the fuel switch. The project activity meets this first requirement. There are no public politics requiring the fuel switch for the project developer or other companies in the sector or region. Moreover, all the environmental licenses do not present any requirements related to diminishing of air pollutants or more specifically, requirements for fuel switch.

To better illustrate the project scenario a description of the region and why it is relevant to the project activity should be made: Santa Catarina and specially Criciuma and it's outer bounds is known as the Coal region, due to the high amount of coal mines and industries making use of it. There is an easy access to coal and it's price is very competitive in comparisons with others fuel.

National and sectoral trends were analysed. The Project Activity takes place in very competitive region in ceramic business, in order to analyse the sectoral trend a comparison with the top five producers and the Type of fuel used in the spray dryers in the region was accounted:

Table: Fuel use of main competitor in the region.

Competitors in ceramic business	Type of Fuel
Ceusa	Coal
Cecrisa	Coal
De Luca	Oil (and switched in 2004 to coal)
Portobello	Coal (and switched in 2003 to Natural Gas)
Itagers	Coal

As proven in the table above, the use of natural gas is not a trend in the sector. Among the top five ceramic producers none of them decided to use Natural Gas, as soon as it arrived in the region. Eliane was the first ceramic producer to use natural gas in the spray dryers, starting the fuel switch in 2001 six month after the arriving of the pipeline. It stays clear that Eliane's decision in doing the fuel switch has influenced the market towards a more environmental correct type of fuel.

The decision on fuel switching was made based on the average price of fuels in the years before the fuel switch (2000), in order to avoid an analysis based on instantaneous oscillations in fuel prices. The table below provide the information about the price.

Table: Fuel prices

Parameter	unit	value
Fuel oil price	R$/kj	0,0082
Natural Gas price	R$/Kj	0,0098
Coal price	R$/Kj	0,0033
Increase in annual fuel costs	R$	750.812

Moreover, the fuel switch requires investments for connecting the plant to the gas supply pipeline, internal pipeline installation (including regulators, pumps and safety equipments), and equipment conversions from oil to gas. All these investments were estimated to sum approximately R$ 250,000.00

Considering the investments, operational costs differences, fuel prices and a discount rate of 18%, the project activity presents the following financial analyses.

Table: Financial Analysis

Parameter	unit	value
Investments	R$	(R$ 263,504)
Discount Rate	%	18%
NPV baseline	R$	(R$ 19,556,023)
NPV project	R$	(R$ 22,987,456)
Difference between NPVs	R$	R$ 3,431,433

To guarantee the consistency of the result, a sensitivity analysis was done with variations as presented in table 1 below, and even in these cases, the difference between baseline and project activity NPV was always negative.

Table: Sensitivity Analysis

Parameter	Variation	Result (Baseline NPV minus project activity NPV)
Investment change	decrease of 50%	(R$ 3,037,503)
Natural gas price modification	decrease of 10%	(R$ 1,344,193)
Discount rate variation	3 times higher	(R$1,212,263)

The additionality condition presented by the methodology is:

"*Project is additional if the NPV of project is negative*"

The project activity attends this condition even after a sensitivity analysis, demonstrating that it is additional to the baseline scenario.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The Eliane site presents many buildings. The project boundary will consider only facilities that were using fuel oil in 2000. The equipments to be considered are listed in section A.4.3. The project boundary is illustrated in Figure 3 below.

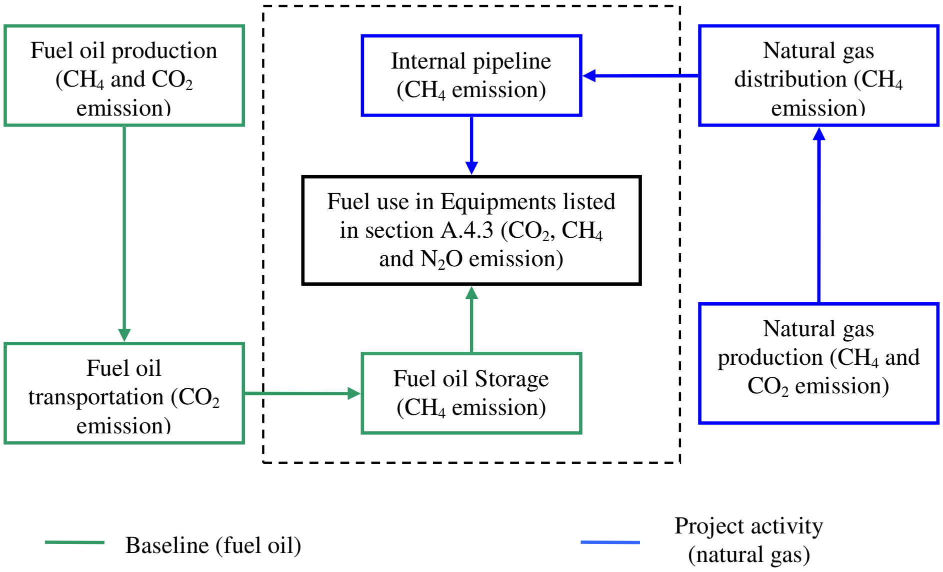

Figure: Definition of boundaries, and emissions inside and outside boundaries.

Besides these equipments, the fuel storage sites and the internal natural gas pipeline are also included inside the boundary. Natural gas pipeline distribution and the roads used to transport the fuels or the refineries where the fuel is produced are outside the project boundary, and emissions associated with this are considered as leakage.

Table: GHG emission sources included in calculations

Boundary	Source	Gas	Consider or not	justification
Outside	Fuel oil transportation	CO_2	Included	Attending methodology requests
Outside	Natural gas distribution	CH_4	Included	Attending methodology requests
Inside	Internal pipeline	CH_4	Excluded	Negligible, and not requested by methodology
Inside	Fuel oil storage	CH_4	Excluded	Negligible, and not requested by methodology

Inside	Fuel combustion on equipments listed in A.4.3	CO_2	Included	Attending methodology requests
Inside	Fuel combustion on equipments listed in A.4.3	CH_4	Included	Attending methodology requests
Inside	Fuel combustion on equipments listed in A.4.3	N_2O	Included	Attending methodology requests

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

Date of conclusion: 27 December 2005
Person/entity determining the baseline:

Pablo Fernandez/ Marcelo Duque
Ecosecurities do Brasil Ltda.
Rua Lauro Muller n°116, sala 4303, Botafogo
Rio de Janeiro – RJ, Brazil
CEP: 22290 369
Phone: +55 (21) 2275 9570
e-mail: Pablo@ecosecurities.com
e-mail: marcelo@ecosecurities.com

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01 December 2000

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

More than 20 years

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

C.2.1. Renewable crediting period

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

01 January 2001

C.2.1.2. Length of the first crediting period:

7 years or 84 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Application of a monitoring methodology and plan

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

AM 0008 "Industrial fuel switching from coal and petroleum to natural gas without extension of capacity and lifetime of the facility". Version 1, approved on 15 June 2004.

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

The project activity meets all the applicability requirements of AM0008.

- There are no local or regional regulations or programs that constrain the facility from using fuel oil. All environmental licenses do not present any requirements to make any changes related to the use of fuel oil.
- The fuel oil and natural gas prices fluctuate, depending the petroleum prices and international scenarios. During the last year before the fuel switch (2000), representing the period of decision making on the project, natural gas was more expensive than fuel oil. For more detail, see section B.3, related to additionality demonstration.
- The project activity is related to conversion of equipment, allowing the consumption of natural gas instead of fuel oil. The project activity is not related to the installation of new equipment, an increase in the equipment's installed capacity, or gains in energy efficiency, nor does it extend the equipment's lifetime.
- The fuel switch is applied for spray dryers and one kiln, and each piece of equipment represents an element process. They are not fully integrated. An indication of this is the fact that the fuel switch process was done in many steps, one step for each element process. Each element process does not affect other processes, thus, there is no additional leakage.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	Quantity of Natural Gas (*Q_NG*)	*Natural Gas Supplier*	*Joule*	*m*	*monthly*	*100%*	*** electronic*	Given that there are equipments that were not included in the project activity, the sum of Q*n*_NG will not be equal to the consumption of natural gas of Elianes unit's.
2	Quantity of Natural Gas used at the process *n* (*Qn_NG*)	*Project developer*	*Joule*	*m*	*Monthly*	*100%*	*** electronic*	
3	Fuel efficiency of natural gas used at process *n* (*ηn_NG)*	*Project developer*	*Joule*	Measured; estimated *ex ante* to calculate the total ER	*Once at early stage of project activity*	*100%*	*** electronic*	Process *n* is identified by the Eliane code presented in section A.4.3 The curve with significant statistical value will be presented during the verification.
4	Load Factor of operation at the process *n* (L_factor n)	*Project developer*	*Joule*	*Once before fuel switch*	*Once before fuel switch*	*100%*	*** electronic*	

***The data will be kept archived during the project lifetime more 2 years*

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

PEy = (Σi Qi_NG) * (EF_NG + FC_NG_CH4 * GWP_CH4 + FC_NG_N2O * GWP_N2O)

Where:

Qi_NG Is the quantity of natural gas used in the project scenario for replacing QFi quantity of fuel *i* used in the baseline scenario, measured in energy units (e.g., Joules)

Q_NG = Σi Qi_NG Is the total quantity of natural gas in the project scenario for replacing all quantities of fuel *i* used in some element process in baseline scenario

EF_NG Is the CO_2 emission factor per unit of natural gas associated with fuel combustion (e.g., tCO_2/joule)

FC_NG_CH4 Is the IPCC default CH_4 emission factor of natural gas associated with combustion, measured in tCH_4/joule

FC_NG_N2O Is the IPCC default N_2O emission factor of natural gas associated with combustion, measured in tN_2O/joule

GWP_CH4 Is the global warming potential of CH_4 set as 21 tCO_2e/tCH_4 for the 1st commitment period.

GWP_N2O Is the global warming potential of N_2Oset as 310 tCO_2e/tN_2O for the 1st commitment period.

An important algorithm for calculating the project emission is:

QnFi * ηn_Fi = Qn_NG * ηn_NG

Where:

QnFi Quantity of energy consumed in process *n* of fuel *i* in energy unit (e.g.Joule)

ηn_Fi Fuel efficiency of process *n* for use of fuel *i* (e.g. ton of output/Joule)

Qn_NG Quantity of energy consumed in process *n* of natural gas in energy unit (e.g.Joule)

ηn_NG Fuel efficiency of process *n* for use of natural gas (e.g. ton of output/Joule)

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
5	Quantity of fuel *i* (*Q_F i*)	*Project developer*	*Joule*	*c*	*Monthly*	*100%*	*** electronic*	Calculated as the sum of Q*n*_F*i*
6	Quantity of Fuel *i* used at the process *n* (*Qn_F i*)	*Project developer*	*Joule*	*c*	*monthly*	*100%*	*** electronic*	Calculated as: Q*n*_NG*(*ηn_NG / ηn_F i).*
7	Fuel efficiency of Fuel *i* used at process *n (ηn_F i)*	*Project developer*	*Joule*	*m*	*Once before fuel switch*	*100%*	*** electronic*	
8	Load Factor of operation at the process *n* (L_factor n)	*Project developer*	*Joule*	*m*	*Once before fuel switch*	*100%*	*** electronic*	Process *n* is identified by the Eliane's code presented in section A.4.3 The curve with significant statistical value will be presented during the verification.
9	Local regulation constraint	*Legislation pertinent to project developer*	-	*checked*	*At renewable of crediting period*	*100%*	*** Paper and electronic*	The question to be answered is: Does local regulation allow to utilize the coal/petroleum fuels? If not, the project is no longer additional.

***The data will be kept archived during the project lifetime more 2 years*

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

PEy = (Σi Qi_Fi) * (EF_Fi_CO2 + FC_Fi_CH4 * GWP_CH4 + FC_Fi_N2O * GWP_N2O)

Where:

Qi_Fi	Is the quantity of fuel *i* used in baseline scenario, measured in energy units (e.g., Joule)
EF_Fi	Is the CO_2 emission factor per unit of energy of fuel *i* (e.g., tCO_2/joule)
FC_Fi_CH4	Is the IPCC default CH_4 emission factor of fuel *i* associated with combustion, measured in tCH_4/joule
FC_Fi_N2O	Is the IPCC default N_2O emission factor of fuel *i* associated with combustion, measured in tN_2O/joule
GWP_CH4	Is the global warming potential of CH_4 set as 21 tCO_2e/tCH_4 for the 1st commitment period.
GWP_N2O	Is the global warming potential of N_2Oset as 310 tCO_2e/tN_2O for the 1st commitment period.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

Not applicable

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	*For how long is archived data kept?*	Comment
10	Calorific value of transportation mode *j* used in the project scenario (Q_TF j)	Project developer	Joule	*E*	*yearly*	*100%*	*electronic*	*Project lifetime + 2 years*	*Converted from physical quantity, if needed, using conversion factor provided by local suppliers. Rough estimation can be used if this effect is demonstrated to be minor.*
11	Calorific value of transportation mode *k* used in the baseline scenario (Q_TF k)	Project developer	Joule	*E*	*yearly*	*100%*	*electronic*	*Project lifetime + 2 years*	*Converted from physical quantity, if needed, using conversion factor provided by local suppliers. Rough estimation can be used if this effect is demonstrated to be minor.*

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The leakage was calculated for baseline and project activity,i.e. the emissions outside the project boundary were calculated for both scenarios. The net leakage emissions are calculated as the difference between the project leakage and the baseline leakage. As a conservative approach, if the baseline leakage emission is higher than project activity, the leakage is considered equal to zero, and the emission reductions from these sources are not requested.
The leakage formula is:

LE = [Q_NG * FE_NG_CH4 – Σi (Q_Fi * Fi_CH4)] * GWP_CH4 + [Σj(Q_TFj * EF_TFj) – Σk(Q_TFk * EF_TFk)]
Where:
Q_NG Is the quantity of natural gas used in the project scenario for replacing QFi quantity of fuel *i* used in the baseline scenario, measured in energy units (e.g., Joule)
FE_NG_CH4 Is the IPCC default CH_4 emission factor of natural gas associated with fugitive emissions (tCH_4/joule)
Q_Fi Is the quantity of fuel *i* used in baseline scenario, measured in energy units (e.g., Joule)
Fi_CH4 Is the IPCC default CH_4 emission factor of fuel *i* associated with fugitive emissions (tCH_4/joule)

Q_TFj Quantity of fuel transported in mode *j* for project scenario, measured in energy unit (e.g., joule)
EF_TFj Are CO_2 emission factor related to transport mode *j* for project scenario (tCO_2/Joule)
Q_TFk Quantity of fuel transported in mode *k* for baseline scenario, measured in energy unit (e.g., joule)
EF_TFk Are CO_2 emission factor related to transport mode *k* for baseline scenario (tCO_2/Joule)

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The formula used to estimate the emission reduction is:
ER = BE – PE – LE
Where:
ER Emission reduction (tones of CO_2e)
BE Baseline emissions (tones of CO_2e)
PE Project activity emissions (tones of CO_2e)
LE Leakage emissions (tones of CO_2e)

Total emission reduction is calculated *ex ante,* using an estimated value for efficiency of equipment. The accurate emission reduction calculation will be based on measured data during project activity.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	*Low*	*Confirmed by natural gas distributor measurements.*
2	*Low*	*When possible, there will be a recorder for each piece of equipment.*
3	*Low*	*Not a single value, but a pattern (function) of load factor at the process n. The measurement will be repeated with several load factors in order to get a statistically significance.*
4	*Low*	*Operational pattern will be cross-checked with actual production to avoid wrong interpretations.*
5	*Low*	*This value is calculated based on natural gas measured data, thus no QA/QC is applicable.*
6	*Low*	*This value is calculated based on natural gas measured data, thus no QA/QC is applicable.*
7	*Low*	*Not a single value, but a pattern (function) of load factor at the process n. The measurement will be repeated with several load factors in order to get statistical significance.*
8	*Low*	*No. It is calculated only once before starting the first crediting period.*
9	*Low*	*This data will be used only during the next renewable credit period to check if the applicability conditions are met. No QA/QC are needed.*
10	*Medium*	*This data only provides minor effects, so QA/QC procedures are not needed.*
11	*Medium*	*This data only provides minor effects, so QA/QC procedures are not needed.*

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

Eliane has an internal commission related to energy conservation inside the Engineering department. All information and data relating to fuel consumption and energy efficiency have been collected for a long time. Moreover, information about fuel consumption is also requested to render account. The fuel switch process will not request modifications or improvements on the existing internal process. The detailed monitoring plan is presented in annex 4.

D.5 Name of person/entity determining the monitoring methodology:

Date of conclusion: 27 December 2005

Person/entity determining the baseline:

Pablo Fernandez/ Marcelo Duque
Ecosecurities do Brasil Ltda.
Rua, Lauro Muller n°116, sala 3107, Botafogo
Rio de Janeiro – RJ, Brazil
CEP: 22290 369
Phone: +55 (21) 2275 9570
e-mail: Pablo@ecosecurities.com
e-mail: marcelo@ecosecurities.com

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

The formula used for calculating the project emissions is presented in section D.2.1.2.

An important algorithm for calculating the project emissions is:
QnFi * ηn_Fi = Qn_NG * ηn_NG

Where:

QnFi	Quantity of energy consumed in process *n* of fuel *i* in energy unit (e.g.Joule)
ηn_Fi	Fuel efficiency of process *n* for use of fuel *i* (e.g. ton of output/Joule)
Qn_NG	Quantity of energy consumed in process *n* of natural gas in energy unit (e.g.Joule)
ηn_NG	Fuel efficiency of process *n* for use of natural gas (e.g. ton of output/Joule)

The QnFi, ηn_Fi and ηn_NG are determined based on the measured data and expected Natural gas efficiency of converted equipments (see annex 3 for more details). From these three values, the Qn_NG is estimated.

Natural Gas consumption (m3)	CO2 emissions (tones of CO2e)	CH4 emissions (converted to tones of CO2e)	N2O emissions (converted to tones of CO2e)	TOTAL (tones of CO2e)
14,475,000	35,004	14	0	35,018

E.2. Estimated leakage:

Leakage emissions are associated with fugitive CH_4 emission and CO_2 fuel transportation emissions. The formula is presented in section D.2.3.2. Values used for calculating leakage are in Annex 3.

Leakage was calculated for the baseline and project activity. The net leakage emissions are calculated as the difference between the project leakage and the baseline leakage. As a conservative approach, if the baseline leakage emission is higher than project activity, the leakage is considered equal to zero, and the emission reductions from these sources are not requested.

Project leakage emissions (in tonnes of CO_2e).	Baseline emissions (in tonnes of CO_2e).	Net emissions (in tonnes of CO_2e).
1,487	1,554	-

E.3. The sum of E.1 and E.2 representing the project activity emissions:

35,018 tones of CO_2e per year.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

Fuel oil consumption (tones of fuel)	Coal consumption (tones of fuel)	CO2 emissions (tones of CO2e)	CH4 emissions (converted to tones of CO2e)	N2O emissions (converted to tones of CO2e)	TOTAL (tones of CO2e)
16,707,276	1,936,490	54,797	15	0	54,812

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

19,794 tones of CO_2e per year.

E.6. Table providing values obtained when applying formulae above:

E.6 Table providing values obtained when applying formulae above				
The ex post calculation of baseline emissions rates may only be used if proper justification is provided . Not withstanding, the baseline emissions rates shall be calculated ex ante reported in the CDM-PDD. The result of the application of the formulae above shall be indicated using the following tabular format				
Year	Estimation of project activity emissions reductions (tonnes of CO2)	Estimation of Baseline emissions (tonnes of CO2)	Estimation of leakege (tonnes of CO2 e)	Estimation of emissions reductions (tonnes of CO2)
2001	35,018	54,812	-	19,794
2002	35,018	54,812	-	19,794
2003	35,018	54,812	-	19,794
2004	35,018	54,812	-	19,794
2005	35,018	54,812	-	19,794
2006	35,018	54,812	-	19,794
2007	35,018	54,812	-	19,794
Total (tones of CO2e)	245,129	383,684	-	138,555

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The environmental authority responsible for licensing Eliane activities did not request any environmental study for the fuel switch. Environmental impacts studies are requested only when the activity represents a significant impacts, thus there are no significant negative impacts related to project activity.

Table: Environmental licenses number for each unit.

Unit	Operational License number
Eliane I	LAO 1919/04
Eliane II	LAO 1921/04
Eliane IV	LAO 1459/04
Eliane V	LAO 1921/04

Excluído: Eliane III ... [1]

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Given that the project activity will not induce to significant impacts, no impact assessment was undertaken.

SECTION G. Stakeholders' comments

G.1. Brief description how comments by local stakeholders have been invited and compiled:

According to the Resolution #1 dated on December 2nd, 2003, from the Brazilian Inter-Ministerial Commission of Climate Change (Comissão Interministerial de Mudança Global do Clima -CIMGC), decreed on July 7th, 1999[1], any CDM projects must send a letter with a description of the project and an invitation for comments by local stakeholders. In this case, letters were sent to the following local stakeholders:

- City Hall of Cocal do Sul and Criciuma;
- Chamber of Cocal do Sul and Criciuma
- Environment agencies from the state and Local Authority;
- Brazilian Forum of NGOs;
- District Attorney (known in Portuguese as Ministério Público, i.e. the permanent institution essential for legal functions responsible for defending the legal order, democracy and social/individual interests) and;
- Local communities associations.

Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation. EcoSecurities and the project developer addressed questions raised by stakeholders during this period.

G.2. Summary of the comments received:

No comments received up to date.

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

No comments received up to date.

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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Eliane
Street/P.O.Box:	Rua Maximiliani Gaidzinski 245,
Building:	
City:	Cocal do Sul
State/Region:	Santa Catarina
Postfix/ZIP:	CEP: 88845-000
Country:	Brazil
Telephone:	+55 (48) 441 7764
FAX:	
E-Mail:	
URL:	www.eliane.com.br
Represented by:	
Title:	Engineering Manager
Salutation:	Mr.
Last Name:	Batista
Middle Name:	
First Name:	Jaime
Department:	Engineering
Mobile:	
Direct FAX:	+55 (48) 441 7706
Direct tel:	+55 (48) 441 7752
Personal E-Mail:	jaime@eliane.com.br

Organization:	EcoSecurities Ltd.
Street/P.O.Box:	40-41 Park End Street
Building:	
City:	Oxford
State/Region:	OX1 1JD
Postfix/ZIP:	
Country:	United Kingdom of Great Britain and Northern Ireland
Telephone:	+44 - 1865 202 635
FAX:	+44 - 1865 251 438
E-Mail:	br@ecosecurities.com
URL:	www.ecosecurities.com
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Moura Costa
Middle Name:	
First Name:	Pedro
Department:	
Mobile:	
Direct FAX:	+44 – 1865 297 483
Direct tel:	pedro@ecosecurities.com
Personal E-Mail:	

Excluído: UK

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable

Annex 3

BASELINE INFORMATION

Calculation data

Fuel data

Sources	density (Kg/m^3)	lower heating value (Kcal/kg)	Net calorific value (TJ/Ktonne)	Carbon oxidation (%)	Carbon content (tC/TJ)	Carbon Emission Factor (t CO2/TJ)	Carbon Emission Factor (t CO2/ton)	Fuel unit	Burning efficiency
coal	864	4.500	18,84	99,0%	25,80	93,65	1,76	kg	0,7
fuel oil	1000	9.590	40,15	99,0%	21,10	76,59	3,08	kg	0,7
natural gas	634	13.564	56,79	99,5%	15,30	55,82	3,17	kg	0,95

Source:

(orange)	Brasilian energy Balance, 2004 http://www.mme.gov.br/site/menu/select_main_menu_item.do?channelId=1432&pageId=4060
(pink)	IPCC 1996
(yellow)	SCGas data
(white)	Calculated

Basic Technology	Basic Technology	CH4 (kg/TJ)	N2O (kg/TJ)
Chemical Processes,Wood, Asphalt,Copper, Phosphate	Dryer - Natural Gas	1.1	0
Chemical Processes,Wood, Asphalt,Copper, Phosphate	Dryer - Oil	1	0

Leakage data

Project Emission Type Factor	tonne of CH4/TJ	Source
Natural Gas Processing, Transport, and Distribution	0.118	IPCC 1996

Transportation	unit	value
Distance from purchase site	km	300
Truck capacity	ton	20
Truck consumption rate	l diesel / km	0.40
Truck consumption rate	kg diesel / km	0.336

Equipment data

Code	Location	Annual energy consumption (in TJ)
ATM 1	Eliane II	69.56
ATM 2	Eliane II	48.50
ATM 3	Eliane II	97.54
ATM 1	Eliane IV	29.90
ATM 2	Eliane IV	29.90
ATM 1	Eliane V	36.92
FB9	Eliane I	157.26
ATM1	Eliane I	25.54

Financial Analysis data

	Parameter	value	Unit	Source
investments	Total Investments	250,000	R$	Company data
energy prices	Natural gas price	0.00837	R$/kJ	Company data (obtained from suppliers). Average price of years 2000 and 2001
	Fuel oil price	0.00981	R$/kJ	Company data (obtained from suppliers). Average price of years 2000 and 2001
others	Discount rate	18%		

Annex 4

MONITORING PLAN

This section details the steps taken to monitor on a regular basis the GHG emissions reductions from the Eliane's natural gas fuel switch project, in Brazil. The main components covered within the monitoring plan are:

1. Parameters to be monitored, and how the data will be collected;
2. The equipment to be used in order to carry out monitoring;
3. Operational procedures and quality assurance responsibilities.

The requirements of this MP are in line with the kind of information routinely collected by similar companies in the sector, thus, internalizing the procedures should be simple and straightforward. If necessary, the MP can be updated and adjusted to meet operational requirements, provided that such modifications are approved by a Designated Operational Entity during the process of verification.

As the project activity is currently operating, monitoring has been undertaken since January 2001. All data have been achieved electronically, and data will be kept for the full crediting period, plus two years.

The monitoring structure will be quite different, depending of the site location. Currently, the project activity involves two locations: Cocal do Sul and Criciuma. Each one has it own internal procedures for calculating and measuring the fuel consumption and production.

COCAL DO SUL (Eliane I, II and V)

Excluído: ,

Excluído: III

In Cocal do Sul, two departments are involved with data collection related to project activity: "Central de Massas" and Engineering department. "Central de Massas" department is responsible for collecting the data, and inputting it into the electronic system. Natural gas measuring devices are installed only in the entrance of Cocal do Sul unit (SCGAS measuring device), and for the following equipments:

ELIANE II
ATM-1
ATM-2
ATM-3

The fuel consumption of other equipments is calculated based on energy efficiency consumption factors.

Table: Data to be collected or used to monitor emission reduction from project activity.

ID number	Data variable	Data unit	(m), (c), (e)	Monitoring frequency	Monitoring method	Responsible parties/ individuals for monitoring	Monitoring equipments	Comments
1	Q_NG	Joule	m	Monthly	Flow meter	SC GAS	Entrance flow meter	Supported by SC GAS
2	Qn_NG	Joule	m	Monthly	Flow meter	Engineering department	Individual equipment flow meter	Supported by Eliane

Table: Equipment used to monitor emission reduction from project activity.

Equipment	Variables monitored	Parties responsible for operating equipment	Procedure in case of failure	Default values to use in case of failure	Comments
Entrance flow meter	Q_NG	SC GAS	Failure reported to equipment supplier and repairs carried out. If repairs are not possible, equipment will be replaced by equivalent item.	Previous reading minus 5%	
Individual equipment flow meter	Qn_NG	Engineering department	Failure reported to equipment supplier and repairs carried out. If repairs are not possible, equipment will be replaced by equivalent item.	Previous reading minus 5%	

Table: Natural gas flow meters (Manufacturers and models)

Equipment	Manufacturer/ model	Specific information	Serial number
Eliane IV ATM 1	Elster DVGW	Nr.: DG4705 AQ 1264 QA 100 802 Pmax 4bar Qmin 10m³/h Qmax 160m³/h	69111800/2000
Eliane IV ATM 2	Elster DVGW	Nr.: DG4705 AQ 1264 QA 100 802 Pmax 4bar Qmin 10m³/h Qmax 160m³/h	69111801/2000
Eliane I ATM 1 – Klin Tunnel	Krom Schroder DG-4705	AQ 1264 DM 2502100 Pmax 4bar Qmin 20m³/h Qmax 400m³/h	69096189/98
Eliane II ATM 1	Elster DVGW	Nr.: DG4705 AQ 1264 QA 250 1002 Pmax 4bar Qmin 20m³/h Qmax 400m³/h	69111805/2000
Eliane II ATM 2	Elster DVGW	Nr.: DG4705 AQ 1264 QA 250 1002 Pmax 4bar Qmin 20m³/h Qmax 400m³/h	69111806/2000
Eliane II ATM 3	Elster DVGW	Nr.: DG4705 AQ 1264 QA 250 1002 Pmax 4bar Qmin 20m³/h Qmax 400m³/h	69110159/2000

Table: Operational procedures and responsibilities for monitoring and quality assurance of emissions from project activity (E=responsible for executing, R=responsible for overseeing and assuring quality, I=to be informed)

Task	ELIANE		Equipment Supplier	SC GAS (Natural gas supplier)	EcoSecurities
	"Centro de Massas" department	Engineering department			
Collect data	E			E	
Enter data into spreadsheet	E	R			
Make monthly and annual reports		E			I
Achieve data & reports		E			I
Calibration / Maintenance, rectify faults		R	E	E	I

CRICIUMA (Eliane IV)

In Criciúma, the unique department involved with data collection and calculation is Engineering department. Natural Gas measuring devices is installed only in the entrance of Criciúma unit (SCGAS measuring device). The consumption of each equipment is calculated based on energy efficiency consumption factors. Data monitored is presented below.

Table: Data to be collected or used to monitor emission reduction from project activity.

ID number	Data variable	Data unit	(m), (c), (e)	Monitoring frequency	Monitoring method	Responsible parties/ individuals for monitoring	Monitoring equipments	Comments
1	Q_NG	Joule	m	Monthly	Flow meter	SC GAS	Entrance flow meter	Supported by SC GAS

Table: Equipment used to monitor emission reduction from project activity.

Equipment	Variables monitored	Parties responsible for operating equipment	Procedure in case of failure	Default values to use in case of failure	Comments
Entrance flow meter			Failure reported to equipment supplier and repairs carried out. If repairs are not possible, equipment will be replaced by equivalent item.	Previous reading minus 5%	

Table: Operational procedures and responsibilities for monitoring and quality assurance of emissions from project activity (E=responsible for executing, R=responsible for overseeing and assuring quality, I=to be informed)

Task	ELIANE	Equipment Supplier	SC GAS (Natural gas supplier)	EcoSecurities
	Engineering department			
Collect data			E	
Enter data into spreadsheet	E			
Make monthly and annual reports	E			I
Achieve data & reports	E			I
Calibration / Maintenance, rectify faults	R	E	E	I

Página 25: [1] Excluído	Thiago Viana	20/6/2006 14:51:00

Eliane III	LAO 1920/04