CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Cimentos do Mozambique – Matola Gas Company Fuel Switch Project
Version: 2.9
Date: 24 September 2009

A.2. Description of the project activity:

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The project involves switching from coal to natural gas at the rotary kiln of a clinker manufacturing plant outside of Maputo, Mozambique. The Cimentos do Mozambique (CM) Matola plant is the largest cement plant in Mozambique and the only clinker production plant in Mozambique. With an output of roughly 240,000 tonnes clinker and 400,000 tonnes cement per year, it produces more than half of the cement consumed in Mozambique. The plant is owned by CIMPOR Cimentos do Portugal.

The Matola Gas Company SARL (MGC), a joint venture of the Mozambique Government and Gigajoule International, is responsible for a gas transmission pipeline leaving the main Mozambique to South Africa pipeline at Ressano Garcia on the border. MGC has rights to a fixed quantity of natural gas to market to industrial and commercial consumers in the Maputo area or along this gas pipeline. The contract between MGC and Cimentos do Mozambique is premised on developing the fuel switching project as a CDM project, and the price of gas offered to Cimentos includes the expected carbon revenue that Cimentos grants MGC the right to receive for the fuel switching project.

MGC and CM have considered CDM from the early stages of project development. MGC undertook a study on the CDM potential of fuel switching in cement manufacturing in 2004 (funded by IFC), which was carried out by Econ Analysis. MGC then contracted ECON Carbon (now Carbon Limits) to develop the CDM project proposal in April 2007, before signing the contract with CM. The MGC Board took the final decision to move forward with the Cimentos fuel switching project as a CDM project activity on 30 May 2007. The gas supply contract between MGC and Cimentos, which included the requirement that MGC was allowed to develop the project as a CDM project activity and market the CERs, was signed on 3 July 2007. Because this contract was a binding financial commitment for both MGC and CM, this date is considered the “start of the project”, based on the EB33 guidance on starting dates of project activities.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Party considered as project participant (Yes/No)
Mozambique (host)	Matola Gas Company SARL (MGC)	No
Norway	Carbon Limits A/S	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public

at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>>
Mozambique

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

>>
Maputo

A.4.1.3. City/Town/Community etc:

>>
Matola

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

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The Cimentos do Mozambique Matola Plant is in the industrial area of Matola, just outside Maputo. The plant is located at coordinates 25° 57' 27.47" S 32° 29' 17.16" E, as shown in the maps below.

Figure 1. Maputo area map showing CM Matola plant

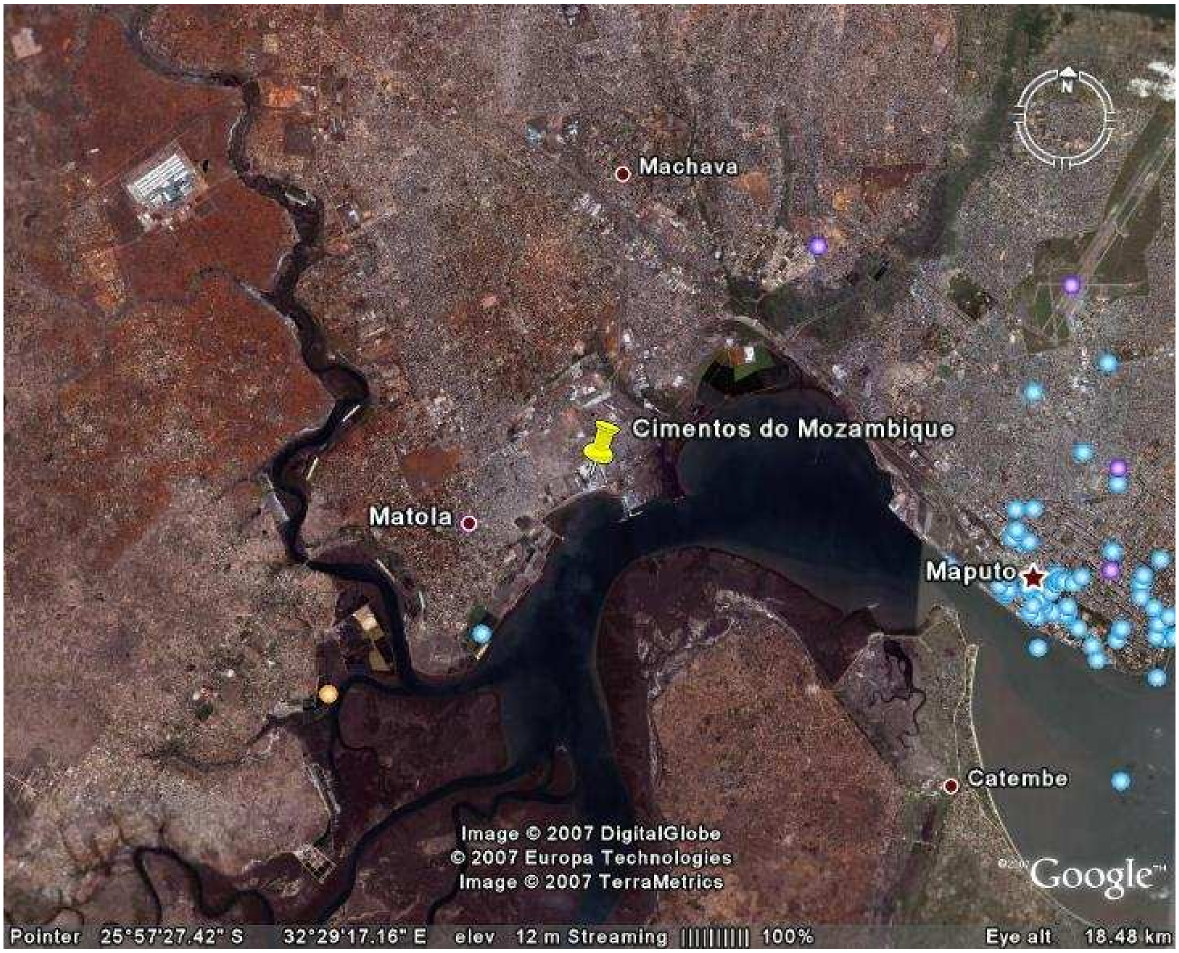

Figure 2. Map of CM Matola plant area

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

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Scope 1 – Energy industries
Scope 4 – Manufacturing industries

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

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The technology is to use natural gas rather than coal in firing a rotary kiln used to produce clinker. The installation will comprise a gas distribution system piping and controls, as well as new burner. The 6 inch gas supply pipeline will go from the main gas pipeline, at the edge of the CM property, to a Customer Metering Station (CMS) next to the CM plant. A second 8 inch internal pipeline will connect the CMS to the gas burner.

The proposed burner technology is a high efficiency precessing jet burner. The precession creates a much larger scale of mixing than occurs in a conventional jet, as well as increased spreading of and entrainment by the jet. The precessing motion is generated without any moving parts within the nozzle.

The natural gas will completely replace the coal currently used a fuel in clinker production.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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Table 1. Summary of emission reductions

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2009	916
2010	37,153
2011	37,153
2012	37,153
2013	37,153
2014	37,153
2015	37,153
2016	36,237
Total estimated reductions (tonnes of CO_2 e)	260,074
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	37,153

A.4.5. Public funding of the project activity:

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There is no public funding of the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

>> ACM 0009 – "Consolidated baseline methodology for fuel switching from coal or petroleum fuel to natural gas", Version 03, Valid from 28 July 2006.

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

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The project meets all of the applicability criteria prescribed in the methodology (shown in italics below, followed by explanation):

Prior to the implementation of the project activity, only coal or petroleum fuel (but not natural gas) have been used in the element processes;

Plant records shows that over the last 3 years prior to the start of the project activity, Cimentos has used only coal and diesel as heating fuel (see Table 2). Diesel is only used in small quantities as a start up fuel. No natural gas has been used, as this facility did not have access to a gas pipeline prior to the project activity.

Table 2. Historical fuel use at CM Matola Plant

	2004	2005	2006
Coal (tonnes)	44,666	44,989	24,886
Diesel (tonnes)[1]	818	662	489

Source: CM Monthly Statistical Reports

Regulations/programs do not constrain the facility from using the fossil fuels being used prior to fuel switching;

There are no regulations in Mozambique that restrict the use of coal in cement manufacturing. In fact, coal is the predominant industrial fuel used in this sector in Mozambique and neighbouring South Africa. Mozambique and South Africa are both members of the WTO[2], so they are not legally allowed to restrict fuel trade. In addition, both countries are signatories to the SADC Protocol on Energy[3], which promotes energy trade and self-reliance within the region. South Africa is the 3rd largest coal exporter in the

[1] Diesel is reported in litres, and has been converted to tonnes using a density of 0.89 kg/litre

[2] www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm

[3] www.sadc.int/index/browse/page/147

world[4]. In addition, Mozambique itself has significant coal reserves that will be developed in coming years[5].

Regulations do not require the use of natural gas or any other fuel in the element processes;

There are no regulations in Mozambique requiring the use of natural gas in cement manufacturing. Mozambique's energy policy includes investment in developing energy resources as a priority and there are significant gas reserves under development[6], as well as new coal reserves, as mentioned above.

The project activity does not increase the capacity of thermal output or lifetime of the element processes during the crediting period (i.e. emission reductions are only accounted up to the end of the lifetime of the relevant element process), nor is there any thermal capacity expansion planned for the project facility during the crediting period;

There are no plans to expand the capacity of the factory or the amount of heat generated for cement production. In addition, the rotary kiln has a useful lifetime of more than 15 years. This has been verified by the Plant Manager of the Matola Plant, and also the engineering design documents for the supply pipeline, internal pipeline, gas metering station, and burner. .

The proposed project activity does not result in integrated process change;

No process changes are implemented as part of the project activity, only changes in fuel supply for process heat in clinker production. This has been verified by the Plant Manager of the Matola Plant, and also the engineering design documents for the supply pipeline, internal pipeline, gas metering stating, and burner.

B.3. Description of the sources and gases included in the project boundary

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As per ACM0009, the **baseline emissions** source is CO_2 from combustion of coal in cement manufacturing and the **project activity emissions** source is CO_2 from natural gas combustion in cement manufacturing. Other gases and sources are considered minor.

Table 3. Emission sources included and excluded in the project boundary

	Source	Gas	Included	Justification
Baseline	Baseline coal	CO_2	Yes	Main emissions source

[4] tonto.eia.doe.gov/country/country_energy_data.cfm?fips=SF

[5] See Mozambique's Initial National Communication (INC) to the UNFCCC unfccc.int/resource/docs/natc/moznc1.pdf

[6] See Mozambique's INC and Scanteam Analysts. Alignment, Harmonisation and Coordination in the Energy Sector, Mozambique: Final Report. Oslo, February 2005

	burning	CH_4	No	Minor source
		N_2O	No	Minor source
	Baseline diesel burning	CO_2	Yes	Main emissions source
		CH_4	No	Minor source
		N_2O	No	Minor source
Project	Natural gas burning	CO_2	Yes	Main emissions source
		CH_4	No	Minor source
		N_2O	No	Minor source

The **spatial extent** of the project boundary encompasses the physical, geographical site of the cement manufacturing plant.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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The baseline scenario identification is followed in accordance with ACM0009, Ver3. In this case the project activity involves fuel switching in only one element process, which is the combustion of fuel in the rotary kiln.

Step 1: Identify all realistic and credible alternatives for the fuel use in the element process

Based on the guidance in the methodology, the relevant alternatives that must be considered include the following:

- **Scenario 1**. Continuation of the current practice of using coal and/or diesel;
- **Scenario 2.** Switching from coal or diesel to a different fuel than natural gas (such as biomass);
- **Scenario 3.** The project activity not undertaken under the CDM (switching from coal and/or diesel to natural gas);
- **Scenario 4.** Switching from coal or diesel to natural gas at a future point in time during the crediting period;

Step 2: Eliminate alternatives that are not complying with applicable laws and regulations

The methodology states that alternatives that are not in compliance with all applicable legal and regulatory requirements should be eliminated, by using Sub-step 1b of the latest version of the "Tool for demonstration assessment and of additionality" (version 5) agreed by the CDM Executive Board.

There are no regulations on the use of coal or natural gas for cement manufacture in Mozambique. Mozambique and South Africa are both members of the WTO, so they are not legally allowed to restrict fuel trade. In addition, both countries are signatories to the SADC Protocol on Energy, which promotes energy trade and self-reliance within the region. South Africa is the 3rd largest coal exporter in the world There are environmental regulations on the local pollutant emissions from the plant, effluents, etc, but these would not prevent continued use of coal, diesel or future use of natural gas.

This means that all 4 scenarios comply with applicable laws and regulations.

Step 3: Eliminate alternatives that face prohibitive barriers

The methodology states that scenarios that face prohibitive barriers should be eliminated by applying step 3 of the latest version of the "Tool for demonstration assessment and of additionality" (version 5)

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

The following barriers were considered (text in italics is quoted from the methodology):

Barrier 1: (Technological barriers) "*Skilled and/or properly trained labour to operate and maintain the technology is not available, which leads to an unacceptably high risk of equipment disrepair and malfunctioning or other underperformance; Lack of infrastructure for implementation and logistics for maintenance of the technology (e.g. natural gas can not be used because of the lack of a gas transmission and distribution network); Risk of technological failure: the process/technology failure risk in the local circumstances is significantly greater than for other technologies that provide services or outputs comparable to those of the proposed CDM project activity, as demonstrated by relevant scientific literature or technology manufacturer information; The particular technology used in the proposed project activity is not available in the relevant region*."

Barrier 2: (Barriers due to prevailing practice) "*The project activity is the 'first of its kind'* ".

Barrier 3: (Other barriers) Barrier related with securing the supply of the fuel.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

Barrier 1: Technology Barriers: This would not apply to Scenario 1, since that involves no change in fuel. For scenario 2, this barrier is prohibitive, because there is no experience with alternative (biomass) fuel use in cement production in Mozambique, or South Africa, and the technology needed to process and prepare this fuel for mixing with coal or using on a stand alone basis is more complex and has higher technological risks than existing coal technology. Using biomass would require major changes in the combustion equipment at the plant, leading to technological risks. As evidence of this, there are only 20 CDM projects worldwide that has been registered using the approved methodology for alternative fuels in cement manufacturing (ACM0003) – and none of these is in Africa. This is after 3 ½ years of this methodology being available for CDM projects. There are no examples of biomass use in clinker manufacturing in South Africa or Mozambique, based on interviews with South African clinker producers and statements from CM and the Ministry of Energy in Mozambique. This biomass fuel processing and preparation technology is also not available in Mozambique.

Barrier 2: Barriers due to prevailing practice: This would not apply to Scenario 1, but it would apply to all other three scenarios, since there are no other examples of use of natural gas or alternative fuels in cement manufacture in Mozambique or South Africa.

Barrier 3: Security of fuel supply: This would not apply to Scenario 1, since coal is readily available in Southern Africa. This barrier would prohibit Scenario 2, however, because there are no surplus biomass alternative fuels or other waste materials that could be an alternative fuel available in Mozambique. Scenario 3 does not face a barrier, because MGC currently has royalty gas available to market. Scenario 4 does face this barrier, because MGC must secure consumers for their royalty gas urgently in order to be profitable and also to request more than the minimum gas quantities. This means that implementing this project 4-5 years in the future would not be possible because it is very unlikely that this quantity of gas would still be available in Matola.

The table below shows how barriers affect each one of the alternative scenarios identified in Step 1.

Table 4. Matrix showing whether the barriers prevent the implementation each alternative scenario.

Barrier Evaluated	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Barrier 1- Technological	No	Yes	No	No
Barrier 2- Prevailing Practice	No	Yes	Yes	Yes
Barrier 3 – other (fuel supply)	No	Yes	No	Yes
Summary Evaluation	Not prohibited by any barriers	Prohibited - No fuel available and high risk	First of kind	First of kind, with fuel supply risks

On the basis of barriers alone, it is possible to eliminate Scenarios 2 and 4. We have therefore included Scenario 1 and 3 in the economic analysis in the next step.

Step 4: Compare economic attractiveness of remaining alternatives

The methodology requires the use of Step 2 of the latest version of “Tool for demonstration assessment and of additionality” (version 5) to compare the economic attractiveness of the remaining alternatives. The economic analysis must use Net Present Value (NPV) as the financial indicator, and the methodology also lists the parameters that must be explicitly stated. The NPV must also take into account the residual value of new equipment at the end of the lifetime of the project activity. A sensitivity analysis must also be included, as in approval tool. Because the start of the project activity, based on the contract date between MGC and CM, is in June 2007, the economic analysis is based on the information available to decision makers at that time, rather than current prices and costs.

Investment requirements: the investment required by CM includes the capital costs of the conversion, including the new burner, the gas line from the Customer Metering Station to the burner, and the Customer Metering Station. Based on quotes from equipment suppliers and analysis by MGC provided to CM, estimated capital cost was $810,448.

Discount rate: CM is a subsidiary of the multi-national corporation, and would not have to go to local commercial lending markets to finance this project. CM is required by their parent company, CIMPOR, to calculate a weighted average cost of capital, taking into consideration the cost of debt, tax rates, and equity returns. In mid 2007 that WACC was 12.8%.

Efficiency: The methodology specifies that energy efficiency shall be measured monthly in the 6 months prior to project implementation, to establish the baseline energy efficiency of the element process. The 6 months prior to the investment decision in May/June 2007 would be November 2006 to April 2007. However, the plant was offline most of November and December 2006 due to maintenance problems, so September and October 2006 have been included as two months to replace these uncharacteristic months. Efficiency is calculated from fuel consumption and clinker production. Fuel consumption is not measured directly, but calculated from measured coal and diesel deliveries and changes in measured stocks. Clinker production is also not measured directly but calculated from measured raw meal consumption by the kiln and a fixed raw meal to clinker ratio that is established by a period empirical engineering study of the plant. The results of this calculation are shown in Table 5 below. The calculations are shown in the accompanying spreadsheet "Cimentos NPV, v2.7.xls".

Table 5. Historical energy efficiency

Year		Sep 06	Oct 06	Jan 07	Feb 07	Mar 07	Apr 07	Average
Energy efficiency	Tonnes clinker/ GJ	0.2731	0.2425	0.1759	0.2148	0.2008	0.2002	0.2179

Source: CM Monthly Statistical Reports

Clinker production: Clinker production is taken from the same 6 month period as energy efficiency, and doubled to provide an annual figure. The results are shown in Table 6 below, and the detailed calculation from raw meal consumption in the attached "Cimentos NPV, v2.7.xls".

Table 6. Historical clinker production

Year	Sep 06	Oct 06	Jan 07	Feb 07	Mar 07	Apr 07	Annualised
Clinker Production Tonne	21,917	15,405	11,522	16,344	28,430	21,667	230,572

Source: Cimentos Monthly Statistical Reports

Current price and expected future price of each fuel: Coal prices increased dramatically in recent years. For example, between November 2005 and November 2007, coal prices jumped by 29% per year, from R210.80/tonne to R351.25/tonne. For this reason, CM internal analysis of the fuel switching project assumed that coal prices would rise 20% per year for the next five years. The price of coal in April 2007 was R312/tonne, or $45.19 at the prevailing exchange rates at the time.

Gas prices in Mozambique are driven not only by the underlying production cost, but also by the fact that most of the infrastructure for gas is relatively new, so that it must still be paid off through gas revenues. MGC has entered into a contract with Cimentos to supply gas at a fixed price in US$/GJ, which is adjusted each year by the USA Producer Price Index (US PPI). This index has increased an average of 3.6% per year over the last decade.[7] In addition the contract states that by ceding the rights to carbon credits to MGC, CM will receive an additional discount on the gas price. The price in the financial is analysis is therefore the price before the carbon credit discount, which is US$4.55/GJ in the first year. The rebate on the gas price is set at a level so that the fuel switching is financially viable on a five year time horizon for CM, given all the documented assumptions in Table 7, and this is the basis upon which CM made the decision to go ahead with the investment in the gas burner. MGC intended to recover a portion of the discount offered by generating CERs for the project, although recognised that carbon revenue might not cover the entire discount. MGC is in a strategic position, however, both to development the gas market in Mozambique and also to develop a pipeline of CDM projects around these investments. MGC already supplies the Mozal aluminium smelter, and the addition of CM as an anchor client would provide long term security of demand for a significant portion of MGC's royalty gas, In addition, MGC saw the strategic value of offering CDM project development services with its gas, and so the experience gained in the CM project would be an important investment towards a larger carbon portfolio. MGC had already started to explore other carbon opportunities with Econ Carbon (now Carbon Limits) even before the contract between MGC and CM was signed.

Although CM did not evaluate the fuel switch beyond five years, the CDM rules require that this economic analysis be over the economic life of the project, which is 15 years. For the coal price increase after the 5 year period, we have used the same PPI adjusted as used for gas (3.6%).

Operating costs for each fuel: Switching to natural gas will eliminate the need for coal handling and processing facilities at the Cimentos, as well as the cost of pulverizing the coal prior to injection in the kiln. On the other hand, there will be some maintenance costs with gas, but these are difficult or predict since no cement plants in the company are already using gas. At the time of the investment decision, CM estimated that they would save $200,000 per year in operating costs.

Reduced plant downtime: Switching from coal to gas will eliminate the current plant shutdowns caused by the coal fuel preparation system. During these periods of shut down, CM must import clinker to use

[7] US PPI from 1998 to 2008 is accessed from www.bls.gov

for cement manufacturing, at an additional cost of $50/tonne clinker and 1671tonnes clinker per day. The CEO of CM estimated that the downtime avoided in the first five years would be 15, 10, 7, 5 and 2 days per year, respectively. This means a savings in the first five years of $1,275,000, $850,000, $595,000, $425,000 and $170,000, respectively. The reason that this amount reduces over time is because over time maintenance and operation of the plant and the fuel system would improve. In other words, rather than assume that there would always be the same downtime in the future, and all of this is avoided each year by moving to gas, CM assumed that the benefits of the switch in terms of maintenance would diminish over time because of business as usual improvements to plant operations.

Lifetime of the project, equal to the remaining lifetime of the existing heat generation facility: The rotary kiln was installed in 1920 and could be used more than 25 remaining years. The lifetime of the project is determined by the burner, which is 15 years. Because the project will use the burner for its entire life, and there is no local market for second hand gas injection burners, there would be no residual value of any equipment used by the project after 15 years.

Other operation and maintenance costs: this is all included in the operating costs discussion above.

Energy efficiency: Although it is possible that the natural gas will lead to higher energy efficiency in rotary kiln, there has been no conclusive evidence of this yet in the country or region. For this reason, we have assumed that the energy efficiency of the plant using gas is the same as when using coal.

As shown in Table 7 below, the net present value analysis results in a NPV of Scenario 3 (the project activity without CDM) of US$ -6.1 million. Therefore, **Scenario 1** is the most economically attractive.

Table 7. Parameters in Net Present Value analysis

Item	Value	Units	Source
Capital cost of conversion	810,448	US$	Quotations for burner and feasibility analysis by CM and MGC
Discount rate	12.8%		CM Weighted Average Cost of Capital
Projected plant output	230,572	tonne clinker	Double the total from Sep-Oct 06 and Jan-Apr 07
Energy efficiency: coal	0.218	tonne clinker/GJ	Average of Sep-Oct 06 and Jan-Apr 07
Energy efficiency: gas	0.218	tonne clinker/GJ	Same as baseline
Delivered fuel price – coal – yr 1	45.19	US$/tonne	April 2007 price
Expected escalation for coal		%	
- First 5 years	20%		Based on 2005-2007 increases
- After year 5	3.6%		Historical US PPI
Delivered fuel price - gas- no discount – yr 1	4.55	US$/GJ	in contract between MGC and CM
Expected escalation for gas	3.6%		Historical US PPI
Net calorific value – coal	23.85	GJ/tonne	Cimentos laboratory measurements
Net calorific value – gas	38.58	GJ/m3	Sasol Temane laboratory
Density of gas	0.81	Kg/m3	Sasol Temane laboratory
	47.6	GJ/tonne	Calculated

Change in O&M costs	-200,000	US$/year	CEO of CM
Reduced downtime costs			See paragraph above
Life of project	15	Yrs	

Cash Flow Analysis

Details show in spreadsheet annex
“Cimentos NPV, ver2.5.xls”

Project NPV without CDM	-$6,282,736

Table 8 shows the sensitivity of the NPV analysis to changes in the key input variables. This includes not only the percentage growth rates of fuel prices as discussed above but also the absolute price levels in 2012 that correspond to the percentage changes. In other words, a 15% annual growth rate for coal prices from 2007 to 2012 would mean a price in 2012 of $91/tonne.
The most important variables in this analysis are fuel prices, since the change in annual cash flow from fuel switching is much greater than the capital cost of the conversion. Because the price of natural gas will only vary according to the US PPI, the likelihood of significant variation is relatively low. In addition, the escalation rate used was based on 10 years of the US PPI, so it is unlikely that the growth rate will be significantly different. It is important to emphasise that the gas price is not subject to external market fluctuations, but is only affected by changes in the US PPI.

The main fuel price sensitivity is for coal prices, which are more difficult to predict because of the rapid changes in international commodity markets. During 2007, when the investment decisions were made, CM had seen an increase of 29% per year for the previous two years. In addition, there were articles in the media at the time predicting continued supply constraints and higher prices.[8] One article published as late as mid-2008 quoted the CEO of ArcelorMittal expecting coking coal prices to increase another 150% to 200%. [9]. As Figure 3 below shows, after relative stability, coal prices became increasingly volatile after 2003, and were increasing steadily from August 2005. For all of these reasons, for CM management to expect prices to rise to more than $110/tonne was reasonable. However, even if prices increased to $138/tonne, or almost three times the current price in April 2007, the project still would not have been viable without carbon revenue and other strategic considerations.

In addition, the operating cost savings and reduced down time are significant, so these are also tested for sensitivity, but as

[8] http://www.miningweekly.com/article/coal-still-a-hot-topic-for-south-africa-ndash-chamber-of-mines-2007-03-16; http://www.fin24.com/articles/default/display_article.aspx?Nav=ns&ArticleID=1518-25_2096157; http://www.xstrata.com/annualreport/2007/page34

[9] http://europe.theoildrum.com/node/4383

Table 8 shows, they do not change the conclusion of the investment analysis.

Table 8. Sensitivity of NPV for Scenario 3 (table has been revised)

			Likelihood
Coal price growth rate	15%	-11,150,429	Medium
	20%	-6,282,736	
	25%	-621,001	Low
Operating Cost Savings	50%	-6,935,708	Medium
	100%	-6,282,736	
	150%	-5,629,765	Medium
Reduced Downtime	50%	-7,566,998	Medium
	100%	-6,282,736	
	150%	-4,998,475	Medium
Gas price escalation	5.0%	-8,698,434	Very low
	3.6%	-6,282,736	
	2.0%	-3,875,061	Very low
Coal price 2012 ($/t)	91	-11,150,429	medium
	112	-6,282,736	
	138	-621,001	low
Gas price 2012 ($/GJ)	5.81	-8,698,434	very low
	5.43	-6,282,736	
	5.02	-3,875,061	very low

Figure 3. Historical South African coal export prices ($/tonne)

Source: IMF Commodity Price database

This leads to the conclusion that the baseline is **Scenario 1: Continuation of the current practice of using coal**.

B.5. 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 (assessment and demonstration of additionality):

In terms of prior consideration of CDM, MGC first undertook a study on the CDM potential of fuel switching in cement manufacturing in 2004 (funded by IFC), which was carried out by Econ Analysis. MGC contracted ECON Carbon (now Carbon Limits) to develop the CDM PDD in April 2007, before signing the contract with CM and before the starting date of the project. The MGC Board decision in May 2007 to proceed with the project also explicitly stated that this was under the condition that the project would qualify for CDM. The contract between MGC and CM signed on 3 July 2007 also explicitly states the condition that MGC be allowed to develop the project as a CDM project and received the CERs.

According to the methodology, additionality is assessed in three steps (*text from methodology in italics*).

Step 1: Investment & sensitivity analysis

Demonstrate that the project activity undertaken without the CDM is economically less attractive than the most plausible baseline scenario, by following the instructions given in step 4 of the Section B.4 "Identification of the baseline scenario" above. Include a sensitivity analysis applying Sub-step 2d of the latest version of the "Tool for demonstration assessment and of additionality" agreed by the CDM Executive Board. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity not undertaken as CDM is unlikely to be the most financially attractive.

As shown in section B.4, Scenario 1 (Continuation of the current practice of using coal) is the most financially attractive, not Scenario 3 (The project activity not undertaken under the CDM).

Step 2: Common practice analysis

Demonstrate that the project activity is not common practice in the relevant country and sector by applying Step 4 of the latest version of the "Tool for demonstration assessment and of additionality" agreed by the CDM Executive Board.

As discussed in section B.4, Cimentos do Mozambique is the only producer of clinker in Mozambique, and has never used natural gas for clinker production. Furthermore, there are no examples of natural gas use in cement production in Mozambique. There are also no examples in neighbouring South Africa either.

Step 3: Impact of CDM registration

Describe the impact of the registration of the project activity by applying Step 5 of the latest version of the "Tool for demonstration assessment and of additionality" agreed by the CDM Executive Board.

The current version of Additionality Tool (version05) does not include Step 5 or any other reference to the impact of CDM registration on the project. For this project, CER revenue will help to offset the higher cost of natural gas as a fuel. More importantly, the development of a CDM project and ceding of the rights to CERs is a condition of MGC supplying gas to CM at the discounted price necessary to make the project viable.

If all 3 steps are satisfied, then the project is considered additional.

All three steps have been satisfied, so the project is considered additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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There are a small number of methodological choices required to apply ACM0009, version 03 to this project:

- Only one element process is considered, which is the rotary kiln
- The baseline fuel is coal. While there is some diesel use in the kiln during start up periods, as reported in the PDD, the Plant Manager at the Matola Plant has confirmed that the existing kiln is designed to run on only coal as the main fuel. The plant has a dedicated pulverised fuel handling system for coal. It can not be run on diesel as the main fuel, so using this diesel as the baseline fuel would be technically incorrect
- The last 6 months of data is used for energy efficiency, as prescribed in the methodology. Because of plant downtime in November and December 2006, this six month period is Sep-Oct 2006 and Jan-April 2007.
- For clinker production volume, the same six month period is used as for energy efficiency, and this is doubled for annual production volume.
- There are no local sources for CO_2 emissions factors in Mozambique, so IPCC defaults were used
- For leakage emissions from natural gas, the “rest of world” values were used for Mozambique
- For leakage emissions from coal mining, the coal supplier has stated that the coal is from underground mining.

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**$EF_{FF,CO2,i}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emissions factor of the coal or diesel type that would be combusted in the absence of the project activity in element process i (i.e. the rotary kiln)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Vol 2, Ch 2, Table 2.2
Value applied:	Coal: 0.094600 (other bituminous coal) Diesel: 0.0741
Justification of the choice of data or description of	The coal used by CM is imported from South Africa. The South African First National Communication to the UNFCCC also uses IPCC default emissions factors for fuels. The registered CDM project “Lawley Fuel Switch Project”

measurement methods and procedures actually applied :	(Ref: 0177) also uses IPCC defaults (0.09607 from the 1996 IPCC Guidelines). Neither the Mozambique nor South African Initial National Communications provide any country-specific emissions factors.
Any comment:	

Data / Parameter:	**$NCV_{FF,i}$**
Data unit:	GJ/tonne
Description:	Net calorific value of the coal or diesels that would be combusted in the absence of the project activity in the element process i
Source of data used:	Coal: Cimpor-Tec laboratory tests in March-April 2007 Diesel: IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	Coal: 23.9 Diesel: 43.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	CM's parent company, CIMPOR, tests the coal characteristics in their IPAC accredited Cimpor Tec laboratory in Portugal.
Any comment:	

Data / Parameter:	**$\varepsilon_{baseline,i,y}$**
Data unit:	tonnes clinker/GJ
Description:	Energy efficiency of the rotary kiln process when fired with coal and diesel
Source of data used:	Historical CM plant records
Value applied:	0.218
Justification of the choice of data or description of measurement methods and procedures actually applied :	The methodology states that the average most recent 6 months should be used to estimate the energy efficiency of the baseline process. Data for September – October 2006 and January –April 2007 has been used to calculated this, because November and December 2006 were abnormal production months (see Table 5). Efficiency is calculated from clinker production and fuel consumption. Fuel consumption is not measured directly, but calculated from measured fuel deliveries and measured changes in stocks. Clinker production is calculated from measured raw meal consumption in the kiln and a fixed raw meal to clinker ratio determined by an empirical engineering study of the plant.
Any comment:	

Data / Parameter:	**$EF_{NG,upstream,CH4}$**
Data unit:	tCH4/GJ natural gas supplied to final consumers
Description:	Emissions factor for upstream fugitive methane emissions from production, transportation and distribution of natural gas
Source of data used:	Table 2 in ACM0009, ver03
Value applied:	0.000296
Justification of the choice of data or description of	Mozambique would be in "rest of world" category in Table 2

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**$EF_{coal,upstream,CH4}$**
Data unit:	tCH4/kt
Description:	Emissions factor for upstream fugitive methane emission from the production of coal
Source of data used:	Table 2 in ACM0009, ver03
Value applied:	13.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the coal supplier, Gentrade CC, the 25.8% of the coal supplied to CM is from underground mining and the balance from open cast mines.
Any comment:	

Data / Parameter:	**$EF_{diesel,upstream,CH4}$**
Data unit:	tCH4/kt
Description:	Emissions factor for upstream fugitive methane emission from the production of diesel
Source of data used:	Table 2 in ACM0009, ver03
Value applied:	0.0000041 t/GJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	From default factors provided in methodology.
Any comment:	

Data / Parameter:	**$EF_{NG,CO2,y}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emissions factor natural gas combusted in element process i (i.e. the rotary kiln)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Vol 2, Ch 2, Table 2.2
Value applied:	0.056100
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Mozambique Initial National Communication does not provide any country-specific emission factors, nor does the South Africa Initial National Communication.

Any comment:	

Data / Parameter:	--
Data unit:	%
Description:	Share of baseline fuel from coal and diesel
Source of data used:	Company internal records for last 3 years
Value applied:	Coal: 96.9 Diesel: 3.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>Note that for all of these equations, the energy units are given in GJ rather than MWh, since the underlying data sources are given in GJ. (this is also the case with registered PDD Ref No. 1289 in India using the same methodology)

Project Emissions

The methodology provides the following equations to calculate project emissions:

$$PE_y = FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,CO2} \qquad \textbf{(1)}$$

with

$$FF_{project,y} = \sum_i FF_{project,i,y} \qquad \textbf{(2)}$$

where:

PE_y Project emissions during the year y in t CO_2e

$FF_{project,y}$ Quantity of natural gas combusted in all element processes during the year *y* in Nm³

$FF_{project,i,y}$ Quantity of natural gas combusted in the element process *i* during the year *y* in Nm³

$NCV_{NG,y}$ Average net calorific value of the natural gas combusted during the year *y* in GJ/Nm³

$EF_{NG,CO2}$ CO_2 emission factor of the natural gas combusted in all element processes in t CO_2/GJ

Only one element process is considered in this project, which is the rotary kiln. To estimate the natural gas consumption by the project we use the historical clinker production during the same period over which energy efficiency is calculated, divided by the expected energy efficiency of the process when using natural gas. We have used the same efficiency for the natural gas-fired kiln as for coal. This is because the thermal efficiency of the kiln is determined by the overall structure and design of the kiln,

not on the type of fuel that is used. Both NCV and density are measured by the Sasol Petroleum Temane laboratory, as 38.58 MJ/m^3 and 0.81 kg/m^3, respectively.

$FF_{project,y}$ = 230,572 tonnes clinker / 0.218 t clinker/GJ / 0.03858 GJ/m^3 = 27,430,864 m^3 natural gas

PE_y = 27,430,864 m^3 natural gas x 0.03858 GJ/m^3 x 0.0561 tCO_2/GJ = 59,370 tCO_2

Baseline Emissions

The methodology provides the following equations to calculate baseline emissions:

$$BE_y = \sum_i FF_{baseline,i,y} \cdot NCV_{FF,i} \cdot EF_{FF,CO2,i} \tag{3}$$

with

$$FF_{baseline,i,y} = FF_{project,i,y} \cdot \frac{NCV_{NG,y} \cdot \varepsilon_{project,i}}{NCV_{FF,i} \cdot \varepsilon_{baseline,i}} \tag{4}$$

where:

BE_y	Baseline emissions during the year y in t CO_2e
$FF_{baseline,i,y}$	Quantity of coal or diesel that would be combusted in the absence of the project activity in the element process *i* during the year *y* in a volume or mass unit
$FF_{project,i,y}$	Quantity of natural gas combusted in the element process *i* during the year *y* in m^3
$NCV_{NG,y}$	Average net calorific value of the natural gas combusted during the year *y* in GJ/m^3
$NCV_{FF,i}$	Average net calorific value of the coal or oil that would be combusted in the absence of the project activity in the element process *i* during the year *y* in GJ per volume or mass unit
$EF_{FF,CO2,i}$	CO_2 emission factor of the coal or oil type that would be combusted in the absence of the project activity in the element process *i* in t CO_2/GJ
$\varepsilon_{project,i}$	Combustion efficiency of the element process *i* if fired with natural gas
$\varepsilon_{baseline,i}$	Combustion efficiency of the element process *i* if fired with coal or oil respectively

The methodology states that the emissions factor used should be the for the least carbon intensive fuel in the element process. While some diesel is used during start up periods, the Plant Manager at the Matola Plant has confirmed that the existing kiln is designed to run on only coal as the main fuel. The plant has a dedicated pulverised fuel handling system for coal. It can not be run on diesel as the main fuel, so using this diesel as the baseline fuel would be technically incorrect. A weighted average of the two fuels is therefore used, since the natural gas will replace both fuels.

During the period 2004-2006 an average of 3.1% of the energy in the kiln was supplied by diesel. To incorporate this less carbon intensive fossil fuel into the calculations, we use a Net Calorific Value and Emissions Factor that is the weighted average of coal and diesel. In other words, the NCV_{FF} would be 24.5 (0.969 x 24.5 + 0.031 x 43.0) and the $EF_{FF,CO2}$ would be 0.0940 (0.969 x 0.0946 + 0.031 x 0.0741).

$FF_{baseline,i,y}$ = 27,430,864 m^3 natural gas x (0.03858 GJ/m^3 x 0.218 t clinker/GJ)/(24.5 GJ/t x 0.218 t clinker/GJ) = 43,220 t coal

BE_y = 43,220 t coal x 24.5 GJ/t x 0.0940 tCO_2/GJ = 99,448 tCO_2

Leakage Emissions

The methodology provides the following equations to calculate leakage emissions:

$$L_{CH4,y} = \left[FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,upstream,CH4} - \sum_k FF_{baseline,k,y} \cdot NCV_k \cdot EF_{k,upstream,CH4} \right] \cdot GWP_{CH4}$$

with

$$FF_{project,y} = \sum_i FF_{project,i,y} \text{ and } FF_{baseline,k,y} = \sum_i FF_{baseline,i,k,y}$$

where:

$L_{CH4,y}$	Leakage emissions due to upstream fugitive CH_4 emissions in the year y in t CO_2e
$FF_{project,y}$	Quantity of natural gas combusted in all element processes during the year *y* in m³
$FF_{project,i,y}$	Quantity of natural gas combusted in the element process *i* during the year *y* in m³
$NCV_{NG,y}$	Average net calorific value of the natural gas combusted during the year *y* in GJ/m³
$EF_{NG,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production, transportation and distribution of natural gas in t CH_4 per GJ fuel supplied to final consumers
$FF_{baseline,k,y}$	Quantity of fuel type *k* (a coal or oil type) that would be combusted in the absence of the project activity in all element processes during the year *y* in a volume or mass unit
$FF_{baseline,i,k,y}$	Quantity of fuel type *k* (a coal or oil type) that would be combusted in the absence of the project activity in the element process *i* during the year *y* in a volume or mass unit
NCV_k	Average net calorific value of the fuel type *k* (a coal or oil type) that would be combusted in the absence of the project activity during the year *y* in GJ per volume or mass unit
$EF_{k,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or oil type) in tCH_4 per GJ fuel produced
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period (21)

There are two fuels used in the baseline, diesel and coal. As shown in the previous section, the historical share of those fuels 2004-2006 is 3.1% and 96.9% respectively. Leakage emissions for both of these fuels must be calculated separately, using the total baseline fuel consumption and share of fuels.

Baseline coal use = 27,430,864 m^3 gas x 0.03858 GJ/m^3 gas x (efficiency project/efficiency baseline) / 24.5 GJ/tonne x 0.969 = 42,921 t coal

Baseline diesel use = 27,430,864 m^3 gas x 0.03858 GJ/m^3 gas x (efficiency project/efficiency baseline) x 0.031 = 32,475 GJ diesel

Because the natural gas replaces coal and diesel used to fire the rotary kiln, the leakage emissions from coal and diesel must be subtracted from the leakage emissions from gas. According to the coal supplier, 25.8% of the coal supplied is from underground mining, and the remaining from open cast mines. For this reason the emissions factor for upstream coal emissions is the weighted average of the values given in the methodology for underground and open cast mines (e.g. [25.8% x 0.0008 tCH_4/t coal + 74.2% x 0.0134 tCH_4/t coal] = 0.0041 tCH_4/t coal). For diesel, the default emission factor from the methodology is used.

Leakage emissions for the project are therefore given as follows:

LE_y = [27,430,864 m^3 gas x 0.03858 GJ/m^3 x 0.000296 tCH_4/GJ gas – {(42,921 t coal x 0.0041 tCH4/t coal)+(32,475 GJ diesel x 0.0000041 tCH_4/t diesel])} x 21 = 2,924 tCO_2e

Emissions Reductions

$$ER_y = BE_y - PE_y - L_y \quad (8)$$

Where,

ER_y	Emissions reductions of the project activity during the year *y* in t CO_2e
$BE_{,y}$	Baseline emissions during the year *y* in t CO_2e
PE_y	Project emissions during the year *y* in t CO_2e
L_y	Leakage emissions in the year y in t CO_2e

The ex-ante estimate of emissions reductions is therefore as follows:

ERy = 99,448 tCO_2e – 59,370 tCO_2e – 2,924 tCO_2e = 37,153 tCO_2e

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

Year	Estimation of project activity emissions (tonnes CO_2e)	Estimation of baseline emissions (tonnes CO_2e)	Estimation of leakage (tonnes CO_2e)	Estimation of overall emissions reductions (tonnes CO_2e)
2009	1,464	2,452	72	916
2010	59,370	99,448	2,924	37,153
2011	59,370	99,448	2,924	37,153
2012	59,370	99,448	2,924	37,153
2013	59,370	99,448	2,924	37,153
2014	59,370	99,448	2,924	37,153
2015	59,370	99,448	2,924	37,153
2016	57,906	96,996	2,852	36,237
Total in first period	415,590	696,135	20,470	260,074

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**$FF_{project,y}$**
Data unit:	m^3
Description:	Natural gas consumed in element process i (i.e. rotary kiln) at normal conditions
Source of data to be used:	Continuous measurement using volumetric flow meter at Customer Metering Station (CMS)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	27,460,864 m^3 gas
Description of measurement methods and procedures to be applied:	Monitored during all operational periods (e.g. start up, normal, maintenance) of the rotary kiln. Because there is only one element process, the fuel monitored for that process is equal to the total annual fuel use for the project.
QA/QC procedures to be applied:	Cross check with natural gas purchase records from MGC and MGC gas meter
Any comment:	See Annex 4 for detail on flow meter

Data / Parameter:	**$NCV_{NG,y}$**
Data unit:	GJ/tonne
Description:	Net calorific value of natural gas supplied to the project activity
Source of data to be used:	Standard calorimeter equipment at Sasol Petroleum Temane Lta laboratory
Value of data applied for the purpose of calculating expected emission reductions in section B.5	47.6
Description of measurement methods and procedures to be applied:	Measured monthly and sampled to ensure 95% confidence level
QA/QC procedures to be applied:	Cross check with IPCC default values or other official national data, where this is available.
Any comment:	Sasol Petroleum Temane Lta has a valid calibration certificate from EffecTech UK, and ISO 9001:2000 Certification from TUV-SUD.

Data / Parameter:	**$Density_{NG}$**
Data unit:	t/Nm^3

Description:	Density of natural gas combusted in element process i at Normal temperature and pressure
Source of data used:	Sasol Petroleum Temane laboratory
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.00081
Description of measurement methods and procedures to be applied:	Sasol Petroluem Temane conducts daily tests of density and net calorific value and send these to Matola Gas Company. The lab has a valid calibration certificate from EffecTech, UK .
QA/QC procedures to be applied:	As per international standards required by the lab's certification from EffectTech, UK
Any comment:	

Data / Parameter:	$\boldsymbol{\varepsilon}_{\mathbf{project,i,y}}$
Data unit:	Tonnes clinker/GJ
Description:	Energy efficiency of element process i (i.e. rotary kiln)
Source of data to be used:	Calculated from the monthly clinker production, monthly gas consumption, and net calorific value of gas $\boldsymbol{\varepsilon}_{\mathbf{project,i,y}} = P_{clinker,y}$ (t) / ($FF_{project,y}$ x NCV_{NG})
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.218 tonne clinker/GJ
Description of measurement methods and procedures to be applied:	Clinker production calculated from measured raw meal input to the kiln and a fixed raw meal to clinker ratio.; Net calorific value of gas measured daily by Sasol Petroluem Temane Lta. Gas consumption from $FF_{project,i,y}$ measured as indicated above. Monitored across all operational periods (e.g. start up, normal, maintenance) of the rotary kiln.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\mathbf{P_{clinker,y}}$
Data unit:	Tonnes clinker
Description:	Clinker production
Source of data to be used:	Calculated from measured raw meal input to the kiln and a fixed raw meal to clinker ratio from empirical engineering study of the Matola plant
Value of data applied for the purpose of calculating expected emission reductions in	230,572

section B.5	
Description of measurement methods and procedures to be applied:	Raw meal scale is at the entrance to the kiln. Details are presented in Annex 4.
QA/QC procedures to be applied:	Cross check against cement production and cement formulation. Calibration procedures presented in Annex 4.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

This section details the steps taken to monitor on a regular basis the GHG emissions reductions from the Cimentos de Mozambique Matola Plant natural gas fuel switch project.
The requirements of this monitoring plan are in line with the kind of information routinely collected by similar companies in the sector, so the procedures should be simple and straightforward for CM and MGC. If necessary, the monitoring plan 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.

Roles and responsibilities

Table 9: Project management and monitoring structure

Task	**Person responsible**
Overall project monitoring and verification responsibility	Marketing Manager, Matola Gas Company
Overall project responsibility at Matola plant	Matola Plant Manager, Cimentos do Mozambique
Day-to-day project and monitoring supervision	Head of Fabrication Division, Matola Plant, Cimentos do Mozambique
Monitoring of natural gas flow	Operations Manager, Matola Gas Company
Reporting gas flow measurements	Operations Manager, Matola Gas Company
Monitoring clinker production	Head of Fabrication Division, Matola Plant
Reporting clinker production	Head of Fabrication Division, Matola Plant
Monitoring natural gas net calorific value (NCV_{NG})	Technical Director, Matola Gas Company through contract with Temane Gas Laboratory
Reporting natural gas net calorific value	Technical Director, Matola Gas Company
Preparation of monitoring reports, including calculation of $\boldsymbol{\varepsilon_{project,i,y}}$	Head of Fabrication Division, Matola Plant and Marketing Manager, Matola Gas Company
Review and quality control of monitoring reports	Matola Plant Manager, Cimentos do Mozambique and Chief Executive Officer, Matola Gas

	Company
Identification of corrective actions to provide more accurate future monitoring and reporting	Head of Fabrication Division, Matola Plant and Marketing Manager, Matola Gas Company

Each year all of the monitoring data for the previous 12 months will be collated electronically and cross checked against the original records by the Director of Safety, Matola Plant and Marketing Manager, Matola Gas Company. The resulting monitoring report, include the calculation of emissions reductions, will then be reviewed by the Matola Plant Manager, Cimentos do Mozambique and Chief Executive Officer, Matola Gas Company. Following their approval, the monitoring report will be submitted to the Designated Operational Entity (DOE) contracted for annual verification. During the reporting and review, the Director of Safety, Matola Plant and Marketing Manager, Matola Gas Company will also highlight any corrective actions needed to provide more accurate monitoring and reporting in the future. These corrective actions will also be included in the monitoring report.

Instrumentation and data collection

Natural gas consumption will be monitored using volumetric flow meters in the Customer Metering Station (CMS) hourly and consolidated monthly. Natural gas flow meters are installed only in the entrance of the Matola plant and at the burner for the rotary kiln. Detail on the CMS are presented in Annex 4.

Clinker production is calculated from measured raw meal consumption in the kiln. Raw meal is weighed on a scale before entering the kiln, and these values recorded by the operator. Details on the procedure are presented in Annex 4. All data is consolidated monthly.

Net calorific value of the natural gas is measured using standard calorimeter equipment at Sasol Petroleum Temane Lta laboratory. This is reported to CM monthly and included in monitoring reports.

Note that energy efficiency of the kiln in the project is a calculated value and is not measured directly.

Data storage and reporting

All information will be collected and recorded on-site electronically as well as in hard copy, and kept for 2 years after the end of the crediting period.

CM will supply electronic and hard copies of the data to MGC. MGC is responsible for emission reduction calculations and submission of the monitoring report.

Training

The head of department for the rotary kiln at the Matola plant is Mr. Jose Francisco dos Santos Neto, Brazilian, a native of Alagoas, Brazil, who formerly worked at a Group Cimpor (Group Cimpor) plant at Cement Atoll in San Miguel dos Campos, Alagoas, Brazil. This plant used natural gas as the primary fuel for 20 years, with successful operation throughout this period. Mr. dos Santos Neto was training in natural gas use at Cement Atoll and worked at this plant from 1989 to 2003, and brings this expertise to the Matola plant.

The staff at CM Matola plant undertook a three-day site visit to Twiga Cement Tanzania to learn about the use of natural gas in cement manufacturing, including all issues related to normal operation, start up procedures, routing maintenance, safety procedures and emergency procedures. This trip was supervised by Peter R. Kashushura of Twiga Cement Tanzania and the CM team was led by Mr. dos Santos Neto. The team included: John Bergum, Carlos Anastácio Tinga, Jorge António Magalhães and Isidro Rui Salamagy. These staff members in turn conducted training for other Matola plant operators and staff during the March – June 2008.

Note that the staff in charge of monitoring clinker production have been implementing this task for many years, so no additional training is necessary. This is also true of the staff at the Sasol Petroleum Temane laboratory that measures the net calorific value and density of the natural gas, under contract with Matola Gas Company.

Emergency procedures

Cimentos de Mozambique has a comprehensive emergency procedures manual and system in place, based on procedures and systems used in Cimentos do Portugal plants worldwide. Emergency procedures are under the supervision of the Director of Safety for the Matola plant, acting on behalf of the Matola Plant Manager. Regular training on emergency procedures is provided for all plant staff and details of this are kept with the Director of Safety.

In addition, the gas metering station and pipeline are all equipped with regulation safety equipment to prevent any accidental release due to the failure of any components of the metering station or pipeline joints or phlanges.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

The application of the baseline study and monitoring methodology was completed on 25 October 2008.

Randall Spalding-Fecher
Director, South Africa
ECON Analysis
PO Box 26441, Hout Bay 7806 South Africa
Tel: +27 82 857 9486
Email: spalding-fecher@tiscali.co.za
(not a project participant)

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:

>> 03 /07/2007

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

>> 15 years 0 months

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:

>> 23/12/2009

C.2.1.2. Length of the first crediting period:

>> 7 years 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>> not selected

C.2.2.2. Length:

>> not selected

SECTION D. Environmental impacts

>>

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

>>
The switch from coal to natural gas as a fuel will have significant positive local environmental impacts. Natural gas eliminates the need for costly and hazardous coal handling, and significantly reduces the local air pollutants that are caused by coal use. There have been previous incidents at the CM plant when excessive CO2 emissions from the kiln would trip the electrostatic precipitators, resulting in a plume of coal dust and ash that affected surrounding areas. This will not be an issue when using natural gas as a fuel for the rotary kiln.

There are no negative environmental impacts associated with the fuel switch. The environmental authority responsible for licensing CM did not request any environmental study for the fuel switch.

Environmental impacts studies are requested only when the activity presents significant negative impacts, thus there are no significant negative impacts related to the project activity.

CM has an SABS "Quality of Product" certificate and also has a valid environmental license for the current plant configuration. This license is not affected by the project activity.

D.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:

>>

The environmental impacts of the project are significantly positive. No Environmental Impact Assessment is required for this type of project under Mozambique Law.

SECTION E. Stakeholders' comments

>>

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

>>

The government of Mozambique has notified the UNFCCC of the DNA as follows:

Ministério para a Coordenação da Acção Ambiental (MICOA)
Av. Acordos de Lusaka nº 2115
P.O. Box nº 2020
Maputo
Mozambique
Ms. Marília Telma António Manjate (telma.manjate@micoa.gov.mz)
Phone: (258-21)46 5849/46 6245
Fax: (258-21)46 6495

There is no formal process required by the DNA for consulting with stakeholders, other than what may be required for normal environmental and business licenses.

Letters were sent to the stakeholders listed below, along with a summary of the proposed CDM project activity, requesting comments by 8 November 2007.

Consultec
Mobil
Provincial Department of Mineral Resources and Energy
Provincial Department of Public Works and Housing
Maputo Provincial Government
Provincial Department for Coordination of Environmental Activity
BP Mozambique
Center for the Promotion of Investment (CPI)
Shell Mozambique
National Department of Health
National Department of Industry

University of Eduardo Mondlane (UEM), Faculty of Engineering
Matola City Municipality

E.2. Summary of the comments received:

>>
The following reply was received from the National Department of Industry:
“We hereby acknowledge receiving your letter, dated 30/10/2007, in which you present the project to substitute natural gas for coal as combustion fuel for the production of clinker at your cement plant in Matola.

About the matter, we hereby inform you that we see no problems with the implementation of the above mentioned project, since it will contribute to the reduction of the emission of harmful substances to the environment.

Best regards

Sérgio Carlos Macamo
Director Nacional”

The following reply was received from the University of Eduardo Mondlane:

“We hereby acknowledge the receiving of your letter dated 30.11.07 on the above mentioned subject, of which we have the following comment to make. The Project Idea Note presented is in accordance to the norms previously typified for projects under the Clean Development Mechanism. However, it will be necessary for you to develop a Project Design Document, for which Cimentos could require the services of CEE-UP.

Best regards
Dr. Nhambiu
Principal, Engineering Faculty “

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

>>
The National Department of Industry reply did not require any response. The UEM reply was noted, but the Project Participants had already engaged a firm to develop the PDD.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Matola Gas Company SARL
Street/P.O.Box:	Oswaldo Tazama No 169, 10 Andar Esquerdo
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City:	Maputo
State/Region:	Mozambique
Postfix/ZIP:	Caixa Postal No. 4207 Maputo
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for this project.

Annex 3

BASELINE INFORMATION

All relevant baseline information has been included in the body of the PDD

Annex 4

MONITORING INFORMATION

Table 10: Technical specifications of gas metering station (Customer Metering Station – CMS)

Item	Explanation
Type and model of instrument	Sensus 6" T-57
Instrument accuracy	+/- 1%
How instrument is read	By operator, electronically from meter corrector onto computer with cable
Person responsible for instrument readings	MGC Technical staff
How/where data is recorded	Laptop manually downloaded to computer system via Ethernet cable
Error checking and handling	Done by operator
Calibration frequency	6 month intervals
Calibration process or standard	Done by appointed third party that is supplier of metering equipment.
Person responsible for calibration	Technical staff of appointed third party
Other maintenance required: what and frequency	None
Person responsible for other maintenance	MGC operations manager

Table 11: Technical specifications of raw meal scale

Item	Explanation
Type and model of instrument	Hasler, Impact flow meter
Instrument accuracy	±2%
How instrument is read	electronically by computer
Person responsible for instrument readings	Operator, Technical Staff
How/where data is recorded	Logbook
Error checking and handling	Error measurements removed from dataset
Calibration frequency	Monthly, or sooner if requested by production
Calibration process or standard	Electronic calibration with reference weight
Person responsible for calibration	Technical Staff
Other maintenance required: what and frequency	Check regularly and remove accumulated dust and material inside
Person responsible for other maintenance	Technical staff

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