CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Vikram Cement (VC): Energy efficiency improvement by up gradation of preheater in cement manufacturing.
Version 04
16/01/2007

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

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Vikram Cement (VC) is a progressive cement manufacturing company of India, operating since 1985. VC belongs to well known Grasim Industries Ltd., a unit of Aditya Birla group of companies. VC is manufacturing Ordinary Portland Cement (OPC), Portland Pozzolana Cement (PPC) and clinker. VC is operating in three production lines. This project activity is applied to line 1 and 2 of the VC plant at Neemuch, Madhya Pradesh, India.

The project activity is up-gradation of preheater section from 5 stages to 6 stages. Under the project activity, VC has enhanced the heat exchange area between outgoing flue gases of kiln and incoming clinker, by installing additional heat exchange stage (i.e. sixth stage).

To reduce the specific heat consumption in the preheater section and utilise the waste heat of the preheater outlet gases VC decided to trap the heat energy by means of addition of one more stage. This stage has increased heat transfer area between incoming feed and out going flue gases, increases the energy efficiency and reduces the fossil fuel use *i.e.* CO_2 emissions.

The project activity contributes to sustainable development at the local, regional and global levels in the following ways:

Thermal energy conservation

The project activity reduces specific thermal consumption for cement production and conserves the energy. Indian economy is highly dependent on "coal – a finite natural resource" as fuel to generate power and heat for production processes. Since, this project activity reduces its specific thermal energy consumption it has positively contributed towards conservation of coal, a non-renewable natural resource and making coal available for other important applications.

Natural Resource conservation and GHG emission reduction

The project activity is helping in the CO_2 emission reduction. Due to saving in coal and petcoke the natural resources are conserved and the emission for manufacturing of unit mass of clinker is reduced. This way this project activity is helping in sustainable development.

A.3. Project participants:

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Table A.1: Project Participants

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Vikram Cement (VC) (Private entity)	No

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

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

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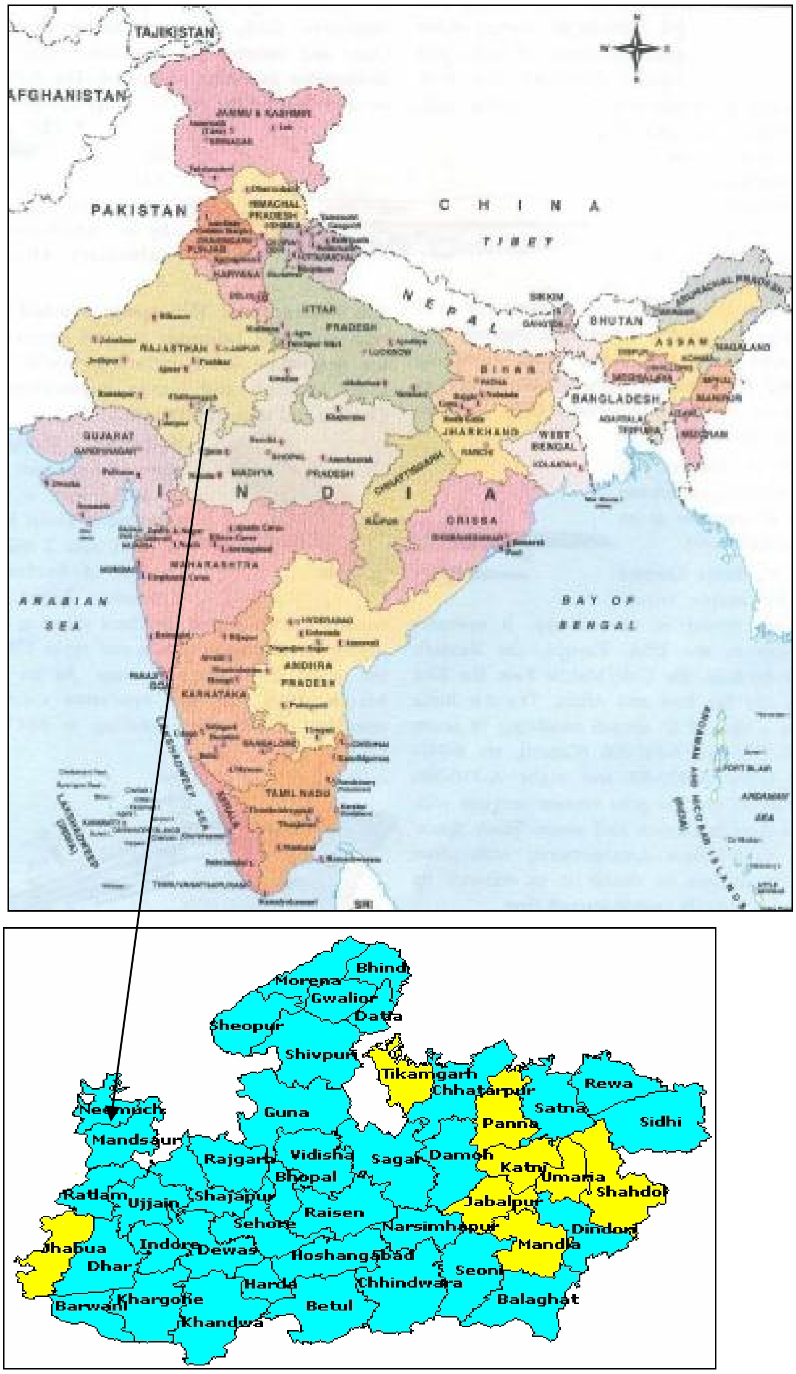
Figure 1: Physical representation of activity site



A.4.1.1.	Host Party(ies):

>> India

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

>> Madhya Pradesh

A.4.1.3. City/Town/Community etc:

>> Neemuch

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

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VC is located at Khor village in Neemuch district of state of Madhya Pradesh (MP). Neemuch lies between the parallels of latitude 24°15' – 24°35' North, and between the meridians of longitude 74°45' – 75°37' East. The location of proposed project activity is in the premises of Vikram Cement (VC). The plant is well connected by railway and road transport.

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

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The project activity is a cement sector specific project activity. The project activity may principally categorized in category 4: Manufacturing Industries sectoral scopes for accreditation of operational entities (List of sectoral scopes, Version 3, www.unfccc.com)

Category 4: Manufacturing Industries

Technology: A pre-heater is a counter current flow heat exchanger consists of number of cyclones to transfer heat from gases to the material. In the cyclone of pre heater there are two parts. The upper part called riser duct (raw meal) is meant for heat transfer, whereas the cone and cylindrical part acts as a separator. Material falls down and is transferred to another cyclone whereas gases are sucked by means of pre heater fan. At the entry point Raw meal temperature is approx. 70°C, but when it reaches kiln inlet; its temperature increases up to 1000 °C. The gas which flows from Kiln is at 1100°C and when it passes out of 5^{th} stage of pre heater it is approx. 300°C and at the outlet of 6^{th} Stage, it is around 260°C.

By this project activity pre heater exit gas temperature reduces to 260°C from 300°C. This 40°C temperature drop gives further reduction in specific fuel consumption. In practice, addition of one stage, raw feed, which enters the pre heater tower, has sufficient time to absorb temperature from gas and cool down pre heater exit gas temperature. By this retrofit measure, it is possible to achieve fossil fuel saving and feed more raw meal through kiln for processing higher quantity of clinker. The project activity reduces specific thermal energy consumption substantially and marginal increase in specific electrical energy consumption.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

>>

Line 1

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2002-03 (1 October to 31st March)	3183
2003-04	4838
2004-05	10570
2005-06	12000
2006-07	12000
2007-08	12000
2008-09	12000
2009-10	12000
2010-11	12000
2011-12	12000
2012-13 (1st April to 30th September)	6000
Total estimated reductions (tonnes of CO_2 e)	**108591**
Total no of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**10859**

Line 2

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2002-03 (1st October to 31st March)	2371
2003-04	3278
2004-05	8806
2005-06	10000
2006-07	10000
2007-08	10000
2008-09	10000
2009-10	10000
2010-11	10000
2011-12	10000
2012-13 (1st April to 30th September)	5000
Total estimated reductions (tonnes of CO_2 e)	**89455**

Total no of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**8946**

Total

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2002-03	5554
2003-04	8116
2004-05	19376
2005-06	22000
2006-07	22000
2007-08	22000
2008-09	22000
2009-10	22000
2010-11	22000
2011-12	22000
2012-13	11000
Total estimated reductions (tonnes of CO_2 e)	**198046**
Total no of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**19805**

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

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No public funding from parties included in Annex I is available to the project activity.

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

According to appendix C of simplified modalities and procedures for small-scale CDM project activities, '***debundling***' is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

According to para 2 of appendix C[1]

A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small- scale activity at the closest point

According to above-mentioned points of de-bundling, project activity is not a part of any of the above, therefore, considered as small scale CDM project activity.

[1] Appendix C to the simplified M&P for the small-scale CDM project activities, http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

SECTION B. Application of a baseline and monitoring methodology

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

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Main Category: **Type II – Energy efficiency improvement projects**

Sub Category: **II. D-Energy efficiency and fuel switching measures for industrial facilities**

The reference has been taken from the list of the small-scale CDM project activity categories contained in 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 8 (22nd December 2006)'.

B.2 Justification of the choice of the project category:

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The project meets the applicability criteria of the small-scale CDM project activity category, Type-II: energy efficiency improvement projects (D: Energy efficiency and fuel switching measures for industrial facilities) of the 'Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories'.

Main Category: *Type II – Energy efficiency improvement project*

Sub Category: *D. Energy efficiency and fuel switching measures for industrial facilities*

As per the provisions of appendix B of simplified modalities and procedures for small scale CDM project activities (version 08), Type II D "Comprises any energy efficiency and fuel switching measure implemented at a single industrial facility. This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B. Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial processes (such as steel furnaces, paper drying, tobacco curing, etc.). The measures may replace existing equipment or be installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh_e per year. A total saving of 60 GWh_e per year is equivalent to a maximal saving of 180 GWh_{th} per year in fuel input."

As per paragraph 1 of II. D. of appendix B of the UNFCCC defined simplified modalities and procedures for small-scale CDM project activities, 'The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh_e per year. A total saving of 60 GWh_e per year is equivalent to a maximal saving of 180 GWh_{th} per year in fuel input'. The project activity will reduce the thermal energy in tune of 60 GWh_{th} which is well within the limit of small scale project activity of this category. The project activity is energy efficiency project and saving depends on the preheater efficiency and clinker production. The

efficiency increase will be almost constant (Reducing with the age) and the production may vary within the limit.
The baseline and emission reduction calculations from the project would be based on paragraphs 3 and 4 of appendix B (version 08, dated 22nd December 2006) and the monitoring methodology would be based on guidance provided in paragraph 6, 7 and 8 of II D of the same appendix B.

B.3. Description of the project boundary:

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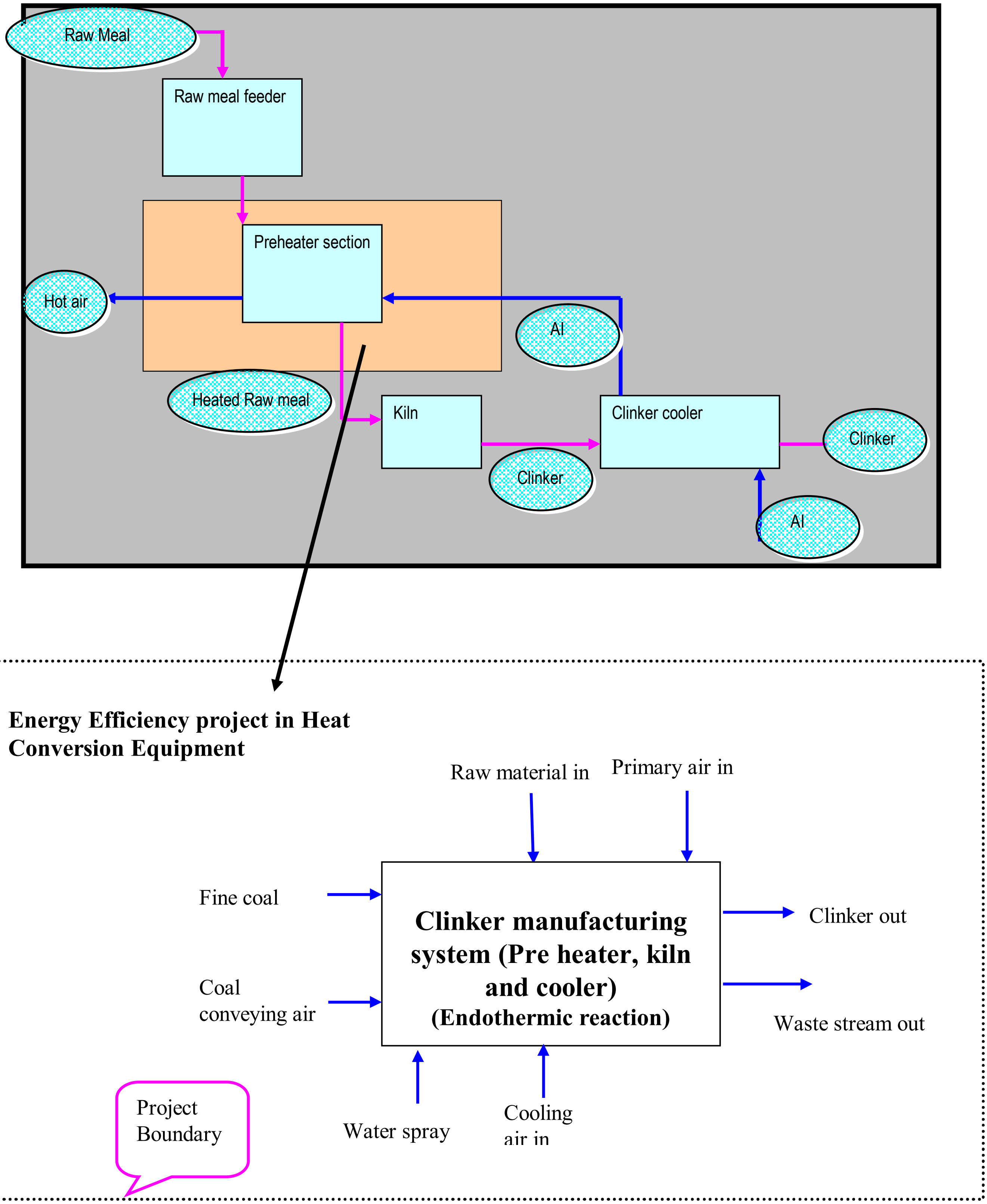
GHG selected is CO_2.
According to the baseline approach the project boundary selected is the cement manufacturing process, which contains input and output streams. In the above flow diagram Dark black line shows the project boundary.


Raw Meal
Raw meal feeder
Preheater section
Hot air
AI
Heated Raw meal
Kiln
Clinker cooler
Clinker
Clinker
AI
Energy Efficiency project in Heat Conversion Equipment
Raw material in
Primary air in
Fine coal
Coal conveying air
Clinker manufacturing system (Pre heater, kiln and cooler)
(Endothermic reaction)
Clinker out
Waste stream out
Water spray
Cooling air in
Project Boundary

B.4. Description of baseline and its development:

>>
The baseline for the project activity is the baseline efficiency of the preheater system. The weekly data is collected for the one year before the starting of the project activity. The average of one year is selected as the baseline efficiency.
The baseline data is given in the annex 3.

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 small-scale CDM project activity:

In accordance with paragraph 3 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used for a small-scale CDM project activity if project participants are able to demonstrate to a designated operational entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Attachment A of Appendix. B. These barriers are:

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

The main driving force to this 'Climate change initiative' is GHG reduction and Fossil fuel conservation. However, the project proponent was aware of the various barriers associated to project implementation. But it is felt that the availability of carbon financing against a sale consideration of carbon credits generated due to project activity would help to overcome these barriers. Some of the key barriers are discussed below:

Investment Barrier
The project activity is energy efficiency in preheater in cement manufacturing. The project is saving the fossil fuel heat input in the clinker manufacturing. The project activity is a retrofit measure in the preheater manufacturing. The project activity involves a huge capital investment and low returns. The IRR calculation of the project (9.7%) is below minimum required rate of return (10.5%) that can be achieved without CDM funds. It improves to 11.72% with CDM funds availed against sale of CERs, which is crossing the internal benchmark of Grasim Industries Limited.

The financial analysis- internal rate of return (IRR) is calculated for the project. The summary of IRR is given in PDD.

Table: IRR (%) figures with and without CDM funds

	IRR (%) without CDM fund	IRR (%) with CDM funds
IRR of preheater up-gradation project	9.7%	11.72%

Following are the assumptions while conducting IRR analysis of the project.

1. The average fuel price is Rs. 2484/MT when the project was conceived.
2. Operation and Maintenance cost (3% of capital cost).
3. Realization on production increase INR 130/ton.
4. Life of project is considered as 20 years.
5. CDM funds are available at the rate of INR 250/CER.

Technical Barriers

The retrofit measure in Vikram Cement was not easy due to relatively new technology in the plant. While crossing the well-established barriers of technology and going ahead with this project, VC had took a risk in terms technological unfamiliarity, risk of stoppages and quality problems. The project proponent has thought of technical problems of synchronization with the system. Other barriers associated were plant shutdown for retrofitting, resulting into production loss. The main technological barrier was the mindset of the operators operating on the well established system for so long.

Continuous training and experienced engineers has maintained the efficient operation of technology.

From the above analysis it is clear that the project is financially very less attractive without CDM funds. The project activity meets the additionally criteria defined for small scale CDM project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project efficiency calculation

1. Calculation of heat input

a). Sensible heat input to the equipment system

$$H_{Sensible}^{Input} = \sum_{1,2,..}^{n} M_{s1,s2,...sn}^{Input} \times C_{s1,s2,...sn}^{Input} \times T_{s1,s2,..sn..}^{Input} \qquad \textbf{PE}^{2}\textbf{1}$$

Where

[2] PE stands for project activity equations

$H_{Sensible}^{Input}$ = Heat input through the sensible heat streams (Kcal/hr)

$M_{s1,s2,...sn}^{Input}$ = Mass flow rate of stream 1, 2, 3….n (Kg/hr or NM^3/hr)

$C_{s1,s2,...sn}^{Input}$ = Specific heat of stream 1, 2, 3….n (Kcal/kg °C or Kcal/NM^3 °C)

$T_{s1,s2,...sn}^{Input}$ = Inlet temperatures of the streams 1, 2, 3…n (°C)

Specific heat of stream

1. Specific heat of cooling air ($CP_{cooling\ air}$) (Kcal/Nm^3)

Specific heat = $(0.237 + 23 \times Temp \times 10^{-6} + 0 \times Temp^2 \times 10^{-9}) \times Density$ **PE2**

2. Specific heat of raw meal ($CP_{raw\ meal}$) (Kcal/kg)

Specific heat = $(0.206 + 101 \times Temp \times 10^{-6} - 37 \times Temp^2 \times 10^{-9})$ **PE3**

3. Specific heat of fine fuel ($CP_{fine\ fuel}$)(Kcal/kg)

Specific heat = $(0.262 + 390 \times Temp \times 10^{-6} + 0 \times Temp^2 \times 10^{-9})$ **PE4**

b). Heat input to the equipment through heat of combustion

$$H_{Combustion}^{Input} = \sum_{1,2,..}^{n} M_{C1,C2,...Cn}^{Input} \times CV_{C1,C2,..Cn..}^{Input}$$ **PE5**

Where

$H_{Combustion}^{Input}$ = Heat input through heat of combustion (Kcal/hr)

$M_{c1,c2,...cn}^{Input}$ = Mass flow rate of fuel 1, 2, 3….n. (Kg/hr)

$CV_{c1,c2,...cn}^{Input}$ = Net calorific value of the fuel 1, 2, 3…n (Kcal/kg)

Total Heat input:

$$H_{Total}^{Input,Project} = H_{Sensible}^{Input} + H_{Combustion}^{Input}$$ **PE6**

2. Calculation of Useful heat output

a). Heat output from equipment through heat of reaction

$$H_{Reaction}^{Useful\ output} = M_{Clinker}^{Useful\ output} \times R_{Clinker}^{Useful\ Output}$$ **PE7**

Where

$H_{Combustion}^{Useful\ output}$ = Useful heat output through heat of reaction of the stream (Kcal/hr)

$M_{Clinker}^{Useful\ output}$ = Mass flow rate of clinker (Kg/hr)

$R_{Clinker}^{Useful\ output}$ = Heat of reaction of the clinker (Kcal/kg)

Heat of reaction for clinkerisation (Net heat of reaction)

Heat of reaction = 4.11 x (%Al_2O_3 in Clinker) +6.48 x (%MgO in Clinker) +7.646 x (%CaO in Clinker) – 5.116 x (%SiO_2 in Clinker) - 0.59 x (%Fe_2O_3 in Clinker) **PE8**

Useful heat output

$$H_{Total}^{Useful\,output,Project} = H_{Reaction}^{Useful\,output}$$ **PE9**

3. Efficiency calculation:

Direct efficiency:

$$\eta_{Project} = [H_{Total}^{Useful\,Output,Project} / H_{Total}^{Input,Project}] \times 100$$ **PE10**

Baseline Emissions

1. Calculation of heat input

a). Sensible heat input to the equipment system

$$H_{Sensible}^{Input} = \sum_{1,2,..}^{n} M_{s1,s2,...sn}^{Input} \times C_{s1,s2,...sn}^{Input} \times T_{s1,s2,..sn..}^{Input}$$ **BE[3]1**

Where

$H_{Sensible}^{Input}$	= Heat input through the sensible heat streams (Kcal/hr)
$M_{s1,s2,...sn}^{Input}$	= Mass flow rate of stream 1, 2, 3….n (Kg/hr or NM^3/hr)
$C_{s1,s2,...sn}^{Input}$	= Specific heat of stream 1, 2, 3….n (Kcal/kg °C or Kcal/NM^3 °C)
$T_{s1,s2,...sn}^{Input}$	= Inlet temperatures of the streams 1, 2, 3…n (°C)

Specific heat of stream

1. Specific heat of cooling air ($CP_{cooling\,air}$) (Kcal/Nm^3)

Specific heat = (0.237 +23 x Temp x 10^{-6}+0 x $Temp^2$ x 10^{-9}) x Density **BE2**

2. Specific heat of raw meal ($CP_{raw\,meal}$) (Kcal/kg)

Specific heat = (0.206+101 x Temp x 10^{-6}-37 x $Temp^2$ x 10^{-9}) **BE3**

3. Specific heat of fine fuel ($CP_{fine\,fuel}$)(Kcal/kg)

Specific heat = (0.262+390 x Temp x 10^{-6}+0 x $Temp^2$ x 10^{-9}) **BE4**

[3] BE stands for baseline equation

b). Heat input to the equipment through heat of combustion

$$H_{Combustion}^{Input} = \sum_{1,2,..}^{n} M_{C1,C2,...Cn}^{Input} \times CV_{C1,C2,..Cn..}^{Input}$$ **BE5**

Where

$H_{Combustion}^{Input}$ = Heat input through heat of combustion (Kcal/hr)

$M_{c1,c2,...cn}^{Input}$ = Mass flow rate of fuel 1, 2, 3….n. (Kg/hr)

$CV_{c1,c2,...cn}^{Input}$ = Net calorific value of the fuel 1, 2, 3…n (Kcal/kg)

Total Heat input:

$$H_{Total,Month}^{Input,Baseline} = H_{Sensible}^{Input} + H_{Combustion}^{Input}$$ **BE6**

2. Calculation of Useful heat output

a). Heat output from equipment through heat of reaction

$$H_{Reaction}^{Useful\ output} = M_{Clinker}^{Useful\ output} \times R_{Clinker}^{Useful\ Output}$$ **BE7**

Where

$H_{Combustion}^{Useful\ output}$ = Useful heat output through heat of reaction of the stream (Kcal/hr)

$M_{Clinker}^{Useful\ output}$ = Mass flow rate of clinker (Kg/hr)

$R_{Clinker}^{Useful\ output}$ = Heat of reaction of the clinker (Kcal/kg)

Heat of reaction for clinkerisation (Net heat of reaction)

Heat of reaction = 4.11 x (%Al_2O_3 in Clinker) +6.48 x (%MgO in Clinker) +7.646 x (%CaO in Clinker) – 5.116 x (%SiO_2 in Clinker) - 0.59 x (%Fe_2O_3 in Clinker) **BE8**

Useful heat output

$$H_{Total,Month}^{Useful\ output,Baseline} = H_{Reaction}^{Useful\ output}$$ **BE9**

3. Efficiency calculation:

Direct efficiency:

$$\eta_{Baseline}^{Month} = [H_{Total,Month}^{Useful\ Output,Baseline} / H_{Total,Month}^{Input,Baseline}] \times 100$$ **BE10**

Emission Factor$_{Grid}$

Central electricity Authority (CEA) Emission factors based on ACM002 is used.

Emission Factor Self generation

The emission factor for self generation (*EFsg,y*) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all self-generating sources in the project boundary serving the system.

$$EF_{sg,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$ **BE11**

Where:

$F_{i,j,y}$ = amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*,

j = *on-site* power sources,

$COEFi_{j\,y}$ = CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and

$GEN_{j,y}$ = electricity (MWh) generated by the source *j*.

The CO_2 emission coefficient *COEFi* is obtained as:

$$COEF_i = NCV_i \times EF_{CO2,i} \times OXID_i$$ **BE12**

Where:

NCV_i = net calorific value (energy content) per mass or volume unit of a fuel *i*,

$OXID_i$ = oxidation factor of the fuel

$EFCO_{2,I}$ = CO_2 emission factor per unit of energy of the fuel *i*.

Average electricity emission factor

$$EF_{NET} = \%\,Grid\ Share \times EF_{Grid} + \%\,self\ generation \times EF_{sg,y}$$ **BE13**

Emission due to additional electricity used

$$C_{electricity,er} = (Elect_{Project} - Elect_{Baseline}) \times EF_{NET}$$ **BE14**

Where

$C_{electricity,er}$ = Emissions due to additional electricity used

EF_{NET} = Electricity emission factor

$Elect_{Project}$ = Electricity used in project case

$Elect_{Baseline}$ = Electricity used in baseline

Emission Reduction

Step-1: Estimate the difference in Efficiencies of baseline and project scenarios: Calculate the difference between the efficiency in the project case with the equipment efficiency in baseline case.

$$\eta_{difference} = \eta_{Project}^{Month} - \eta_{Baseline} \quad \textbf{CE}^4\textbf{1}$$

Where

$\eta_{difference}$ = Difference in daily equipment efficiency in project case and the baseline case of the same month

$\eta_{Project}^{Month}$ = Daily equipment efficiency of the specific month in project case

$\eta_{Baseline}$ = Equipment efficiency of that month in baseline case

Step-2: Estimate net daily reduction in energy Input

$$E_{net} = H_{Total}^{Input,Project} \times \eta_{difference} \quad \textbf{CE2}$$

Where

E_{net} = Net daily reduction in heat input (Kcal/hr)

$\eta_{difference}$ = Difference in efficiency (%)

Step-3: Estimate actual energy reduction

$E_{acual} = E_{net}$ x no. of hours operation in a month **CE3**

E_{actual} = Actual daily heat reduction (Kcal/hr)

E_{net} = Net daily reduction in heat input (Kcal/months)

Step-4: Estimate fuel saving and emission reduction (C_{er})

Fuel saving = E_{actual} /average calorific value **CE4**

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[4] CE stands for emission reduction calculation equation

$$C_{er} = Fuel\ Saving\ x\ EF_{average} \qquad \textbf{CE5}$$

Where

C_{er} = Emission reduction (tCO_2/month)

$EF_{average}$ = Average fuel emission factor (tCO_2/ton)

$$EF_{\ average} = \sum_{1,2...}^{y} (\% HS_{1,2,....y} \times EF_{1,2,.......y}) \qquad \textbf{CE6}$$

Where

$EF_{\ average}$ = Average fuel emission factor (tCO_2/ton)

$HS_{\ 1,2,.....y}$ = % heat supplied by the fuel (%)

$EF_{\ 1,2,....y}$ = Emission factor of the fuel (tCO_2/ton)

$$\%\ HS_i = \frac{CV_i \times Q_i}{\sum_{1,2,....i}^{i=y} CV_i \times Q_i} \qquad \textbf{CE7}$$

$HS_{\ i}$ = % heat supplied by i^{th} fuel (%)

CV_i = Calorific value of ith fuel (Kcal/kg)

Q_i = Quantity of ith fuel (kg)

Step-5 : Estimate the CO_2 net emission reduction due to project

$$Net\ emission\ reduction(C_{ernet}) = Emission\ reduction(C_{er}) - Emission\,due\,to\,electricity\,(C_{Electicity,er})$$

CE8

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

(Copy this table for each data and parameter)

Data / Parameter:	$H_{Sensible}^{Input}$
Data unit:	Kcal/hr
Description:	Heat input through sensible heat streams
Source of data used:	Calculated based on the monitored data in baseline
Value applied:	Different values applied for weekly efficiency
Justification of the choice of data or description of measurement methods and procedures actually	This is the calculated data based on actual monitored data in baseline case.

applied :	
Any comment:	

Data / Parameter:	$H_{Combustion}^{Input}$
Data unit:	Kcal/hr
Description:	Heat input through heat of combustion
Source of data used:	Calculated based on the fuel combustion and calorific value of the fuel
Value applied:	Different values applied for different fuels. The excel sheet is attached for the calculations.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is based on actual monitored data in baseline.
Any comment:	

Data / Parameter:	$\mathbf{M_{clinker}}$
Data unit:	Ton
Description:	Mass of clinker produced
Source of data used:	Plant
Value applied:	The value applied depends on the production in a day when efficiency calculations performed.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is monitored and calculated in baseline scenario.
Any comment:	

Data / Parameter:	$\mathbf{R_{clinker}}$
Data unit:	Kcal/Ton
Description:	Heat of reaction of clinker produced
Source of data used:	Plant
Value applied:	The value applied depends on the quality of clinker and for every efficiency calculation different values applied.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is monitored and calculated in baseline scenario.
Any comment:	

Data / Parameter:	EF_{grid}
Data unit:	tCO_2/MWh
Description:	Grid emission factor
Source of data used:	CEA, India
Value applied:	Depends on different years of calculation and given in the excel sheet.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from authorised government source and its authentic.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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Project efficiency calculation

1. Calculation of heat input

a). Sensible heat input to the equipment system

$$H_{Sensible}^{Input} = \sum_{1,2,..}^{n} M_{s1,s2,...sn}^{Input} \times C_{s1,s2,...sn}^{Input} \times T_{s1,s2,..sn..}^{Input}$$

For sample calculation of 1st October 2002

Heat input			
Inlet temperature of the cooling air in system	°C	37	37
Flow rate of cooling air in system	Nm^3/hr	227934	227934.00
Specific heat of cooling air	kcal/Nm ^{3} °C	=(0.237+23*C17*10^-6+0*C17^2*10^-9)*1.287	0.306
Inlet temperature of the feed in system	°C	75	75
Flow rate of feed in system	Kg/hr	169322.4	169322.40
Specific heat of raw feed	kcal/Kg °C	=(0.206+101*C20*10^-6-37*C20^2*10^-9)	0.213
Inlet temperature of conveying air	°C	0	0.000
Flow rate of conveying air in system	Nm3/hr	0	0.000
Specific heat of	kcal/Nm	=(0.237+23*C23*10^-6+0*C23^2*10^-9)*1.292	0.306

conveying air	3 °C		
Inlet temperature of pulversied fuel in system	°C	70	70.000
Flow rate of pulversied fuel	Kg/hr	10330	10330.000
Specific heat of fine fuel	kcal/Kg °C	=(0.262+390*C26*10^-6+0*C26^2*10^-9)	0.289
Inlet temperature of fuel conveying air (Kiln)	°C	50	50.000
Flow rate of fuel conveying air (Kiln)	Nm3/hr	1156	1156.000
Specific heat of fuel conveying air (Kiln)	kcal/Nm 3 °C	=(0.237+23*C29*10^-6+0*C29^2*10^-9)*1.292	0.308
Inlet temperature of fuel conveying air (PC)	°C	50	50.000
Flow rate of fuel conveying air (PC)	Nm3/hr	1156	1156.000
Specific heat of fuel conveying air (PC)	kcal/Nm 3 °C	=(0.237+23*C32*10^-6+0*C32^2*10^-9)*1.292	0.308
Inlet temperature of primary air (Fan)	°C	37	37.000
Flow rate of primary air (Fan)	Nm3/hr	6770	6770.000
Specific heat of primary air (Fan)	kcal/Nm 3 °C	=(0.237+23*C35*10^-6+0*C35^2*10^-9)*1.292	0.307
Temperature of seal air	°C	37	37.000
Flow rate of seal air (Based on fan capacity)	Nm3/hr	10000	10000.000
Specific heat of seal air	kcal/Nm 3 °C	=(0.237+23*C38*10^-6+0*C38^2*10^-9)*1.292	0.307
Heat from fuel burning	kcal/hr	=C9	76782890.000
Total heat input	Kcal/hr	**=C17*C18*C19+C20*C21*C22+C23*C24*C25+ C26*C27*C28+C29*C30*C31+C35*C36*C37 +C38*C39*C40+C41**	**82491762.568**

2. Calculation of Useful heat output

a). Heat output from equipment through heat of reaction

$$H_{Reaction}^{Useful\ output} = M_{Clinker}^{Useful\ output} \times R_{Clinker}^{Useful\ Output}$$

Useful Heat output			
% SiO_2 in clinker	%	21.62	21.62
% Al_2O_3 in clinker	%	5.12	5.12
% MgO in clinker	%	1.34	1.34
% CaO in clinker	%	64.94	64.94
% Fe_2O_3 in clinker	%	5	5.00
Heat of reaction per kg of clinker	kcal/kg of clinker	= 4.11*C45+6.48*C46 +7.646*C47-5.116*C44 - 0.59*C48	412.70
Heat of reaction	kcal/hr	=C49*C12*1000	44794427.61

3. Efficiency calculation:

Direct efficiency:

$$\eta_{Project} = [H_{Total}^{Useful\ Output,Project} / H_{Total}^{Input,Project}] \times 100$$

Efficiency = 44794427.61/82491762.568
= 54.3%

Baseline Emissions

1. Calculation of heat input

a). Sensible heat input to the equipment system

$$H_{Sensible}^{Input} = \sum_{1,2,..}^{n} M_{s1,s2,...sn}^{Input} \times C_{s1,s2,...sn}^{Input} \times T_{s1,s2,..sn..}^{Input}$$

Based on 1st January 2001

Heat input			
Inlet temperature of the cooling air in system	°C	36	36
Flow rate of cooling air in system	Nm^3/hr	196875	196875.00
Specific heat of cooling air	kcal/Nm^3 °C	=(0.237+23*C14*10^-6+0*C14^2*10^-9)*1.287	0.306
Inlet temperature of the feed in system	°C	75	75

Flow rate of feed in system	Kg/hr	146250	146250.00
Specific heat of raw feed	kcal/Kg °C	=(0.206+101*C17*10^-6-37*C17^2*10^-9)	0.213
Inlet temperature of conveying air	°C	50	50
Flow rate of conveying air in system	Nm3/hr	8875	8875.000
Specific heat of conveying air	kcal/Nm^3 °C	.237+23*C20*10^-6+0*C20^2*10^-9)*1.292	0.308
Inlet temperature of pulversied fuel in system	°C	70	70
Flow rate of pulversied fuel	Kg/hr	9400	9400.000
Specific heat of fine coal	kcal/Kg °C	=(0.262+390*C23*10^-6+0*C23^2*10^-9)	0.289
Inlet temperature of fuel conveying air (Kiln)	°C	50	50
Flow rate of fuel conveying air (Kiln)	Nm3/hr	1156	1156.000
Specific heat of fuel conveying air (Kiln)	kcal/Nm^3 °C	=(0.237+23*C26*10^-6+0*C26^2*10^-9)*1.292	0.308
Inlet temperature of fuel conveying air (PC)	°C	50	50.000
Flow rate of fuel conveying air (PC)	Nm3/hr	1156	1156
Specific heat of fuel conveying air (PC)	kcal/Nm^3 °C	=(0.237+23*C29*10^-6+0*C29^2*10^-9)*1.292	0.308
Inlet temperature of primary air (Fan)	°C	36	36
Flow rate of primary air (Fan)	Nm3/hr	2770	2770.000
Specific heat of primary air (Fan)	kcal/Nm^3 °C	=(0.237+23*C32*10^-6+0*C32^2*10^-9)*1.292	0.307
Temperature of seal air	°C	36	36
Flow rate of seal air (Based on fan capacity)	Nm3/hr	10000	10000.000
Specific heat of seal air	kcal/Nm^3 °C	=(0.237+23*C35*10^-6+0*C35^2*10^-9)*1.292	0.307
Heat from fuel burning	kcal/hr	=C7	67905600.000
Total heat input	Kcal/hr	**=C14*C15*C16+C17*C18*C19+ C20*C21*C22+C23*C24*C25**	**72901283.9**

		+C26*C27*C28+C32*C33*C34 +C35*C36*C37+C38*C39*C40+C41	

2. Calculation of Useful heat output

a). Heat output from equipment through heat of reaction

$$H_{Reaction}^{Useful\ output} = M_{Clinker}^{Useful\ output} \times R_{Clinker}^{Useful\ Output}$$

Useful Heat output			
% SiO_2 in clinker	%	22.32	22.320
% Al_2O_3 in clinker	%	4.76	4.760
% MgO in clinker	%	1.39	1.390
% CaO in clinker	%	64.8	64.800
% Fe_2O_3 in clinker	%	4.8	4.800
Heat of reaction per kg of clinker	kcal/kg of clinker	= 4.11*C45+6.48*C46+ 7.646*C47-5.116*C44 - 0.59*C48	407.010
Heat of reaction	kcal/hr	=C49*C9*1000	38157232.5 0

3. Efficiency calculation:

Direct efficiency:

$$\eta_{Baseline}^{Month} = [H_{Total,Month}^{Useful\ Output,Baseline} / H_{Total,Month}^{Input,Baseline}] \times 100$$

Emission Factor$_{Grid}$

Central electricity Authority (CEA) Emission factors based on ACM002 is used.

Combined Margin in tCO2/MWh (incl. Imports)					
	2000-01	2001-02	2002-03	2003-04	2004-05
North	0.76	0.76	0.77	0.76	0.75
East	1.06	1.05	1.04	1.05	1.04
South	0.86	0.85	0.85	0.86	0.85
West	0.88	0.89	0.88	0.88	0.89
North-East	0.39	0.38	0.39	0.36	0.45
India	0.85	0.86	0.85	0.86	0.86

Emission Factor $_{Self\ generation}$

Electricity generation Plant	Diesel Generating Set	Unit	Sources
Fuel used	FO		
Emission factor	20.2	tC/TJ	IPCC
	74.1	tCO2/TJ	
Calorific value of fuel	40.1	TJ/1000 tons	IPCC
Emissions	2972.1	tCO2/1000 ton	
	2.97	kg CO2/kg FO	
Electricity generation/lt of fuel	4.06	kwh/lt	BEE
Density	0.89	kg/lt.	
Electricity generation per kg of fuel	4.6	kWh/kg	
Fuel required	0.22	kg FO/kWh	
Emission factor	**0.65**	kg CO2/kWh	

Average electricity emission factor

$$EF_{NET} = \%\,Grid\ Share \times EF_{Grid} + \%\,self\ generation \times EF_{sg,y}$$

CPP share of electricity used	%	**70**
Grid electricity share of electricity used	%	**30**
Emission factor of CPP	kg CO_2/kWh	0.65
Emission factor of Grid	kg CO_2/kWh	0.75
Average Emission factor	kg CO_2/kWh	0.68

Emission due to additional electricity used

$$C_{electricity,er} = (Elect_{Project} - Elect_{Baseline}) \times EF_{NET}$$ **BE14**

Average Emission factor	kg CO_2/kWh	0.68
Additional electricity consumed	kWh/t Clinker	2.13
Emissions due to Electricity used	kg CO_2/t Clinker	**1.5**

Emission Reduction

Efficiency	**%**	**=C50/C42%**	**54.30**
Baseline efficiency	**%**	**51.65**	**51.65**
%Increase in efficiency	~~%~~	=H51-C52	2.869
Saving in input heat	kCal/hr	=C53*H9/100	2285304.966
Total energy saving	Kcal	=C54*27*24	1480877618.076
Saving in fuel	tons/month	=C55/H10/1000	196.257
Emissions reduced	**tonnes/day**	**=C56*H11**	**628**
Emissions due to additional electricity used	**tonnes/day**	**=1.5*24*H14/1000**	**97.29**
Emission reduction	**tonnes/day**	**=C57-C58**	**530.5**

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

>>

Line 1

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2002-03 (1 October to 31st March)	3183
2003-04	4838
2004-05	10570
2005-06	12000
2006-07	12000
2007-08	12000
2008-09	12000
2009-10	12000
2010-11	12000
2011-12	12000
2012-13 (1st April to 30th September)	6000
Total estimated reductions (tonnes of CO_2 e)	**108591**

Total no of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**10859**

Line 2

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2002-03 (1st October to 31st March)	2371
2003-04	3278
2004-05	8806
2005-06	10000
2006-07	10000
2007-08	10000
2008-09	10000
2009-10	10000
2010-11	10000
2011-12	10000
2012-13 (1st April to 30th September)	5000
Total estimated reductions (tonnes of CO_2 e)	**89455**
Total no of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**8946**

<u>Total</u>

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2002-03	5554
2003-04	8116
2004-05	19376
2005-06	22000
2006-07	22000
2007-08	22000

2008-09	22000
2009-10	22000
2010-11	22000
2011-12	22000
2012-13	11000
Total estimated reductions (tonnes of CO_2 e)	**198046**
Total no of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**19805**

B.7 Application of a 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:	$\mathbf{M_{Clinker}}$
Data unit:	Ton
Description:	Clinker production
Source of data to be used:	Daily production report of the plant
Value of data	For every efficiency calculation the daily data is used.
Description of measurement methods and procedures to be applied:	This is most important data monitored in the cement plant. The monitoring will be done as per the established plant procedure.
QA/QC procedures to be applied:	ISO 9001 or similar type of system.
Any comment:	

Data / Parameter:	Operating hours
Data unit:	Hrs
Description:	No of operating hours in a month
Source of data to be used:	Daily production report of the plant consolidated to month
Value of data	For every efficiency calculation the daily data is used.
Description of measurement methods and procedures to be	The monitoring will be done as per the established plant procedure.

applied:	
QA/QC procedures to be applied:	ISO 9001 or similar type of system.
Any comment:	

Data / Parameter:	**CV_{fuel}**
Data unit:	Kcal/kg
Description:	Calorific value of the fuel used
Source of data to be used:	Plant laboratory
Value of data	Will be different for different fuels.
Description of measurement methods and procedures to be applied:	The value will be monitored from bomb calorimeter.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**Q_{fuel}**
Data unit:	Ton
Description:	Quantity of the fuel used
Source of data to be used:	Daily production report consolidated to monthly.
Value of data	Will be different for different fuels.
Description of measurement methods and procedures to be applied:	The value will be monitored from weigh bridge.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**$T_{in, cooling\ air}$**
Data unit:	Deg C
Description:	Inlet air temperature
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from thermometer.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**$M_{in, cooloing air}$**
Data unit:	NM^3/hr
Description:	Quantity of the cooling air consumed
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from pitot tube.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**$T_{in, kiln feed}$**
Data unit:	Deg C
Description:	Inlet kiln feed temperature
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from thermometer.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**$M_{in, kiln feed}$**
Data unit:	Kg/hr
Description:	Quantity of the cooling air consumed
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from pitot tube.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**$T_{in, raw meal coveying air}$**
Data unit:	Deg C

Description:	Raw meal conveying air temperature
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from thermometer.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$M_{in,\ raw\ meal\ conveying\ air\ temperature}$
Data unit:	NM^3/hr
Description:	Quantity of the raw meal conveying air
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from pitot tube.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$T_{in,\ fine\ fuel}$
Data unit:	Deg C
Description:	Fine fuel inlet temperature
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from thermometer.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$M_{in,\ fine\ fuel}$
Data unit:	Kg/hr
Description:	Quantity of the raw meal
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.

Description of measurement methods and procedures to be applied:	The value will be monitored from pitot tube.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$\mathbf{T}_{\mathbf{in,\ fine\ fuel\ conveying\ air}}$
Data unit:	Deg C
Description:	Fine fuel conveying air inlet temperature
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from thermometer.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$\mathbf{M}_{\mathbf{in,\ fine\ fuel\ conveying\ air}}$
Data unit:	NM^3/hr
Description:	Quantity of the raw meal conveying air
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from pitot tube.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$\mathbf{T}_{\mathbf{in,\ primary\ air}}$
Data unit:	Deg C
Description:	Primary air inlet temperature
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from thermometer.

QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$\mathbf{M_{in,\ primary\ air}}$
Data unit:	NM^3/hr
Description:	Quantity of the raw meal conveying air
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from pitot tube.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$\mathbf{T_{in,\ seal\ air}}$
Data unit:	Deg C
Description:	Seal air inlet temperature
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from thermometer.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	$\mathbf{M_{in,seal\ air}}$
Data unit:	NM^3/hr
Description:	Quantity of the seal air in the system
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from pitot tube.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**% SiO_2**
Data unit:	%
Description:	SiO_2 content in clinker
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored in quality lab.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**% Al_2O_3**
Data unit:	%
Description:	Al_2O_3 content in clinker
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored in quality lab.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**% MgO**
Data unit:	%
Description:	MgO content in clinker
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored in quality lab.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**% CaO**
Data unit:	%
Description:	CaO content in clinker
Source of data to be	Weekly monitoring report for efficiency calculation

used:	
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored in quality lab.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**% Fe_2O_3**
Data unit:	%
Description:	Fe_2O_3 content in clinker
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored in quality lab.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**$Elect_{Project}$**
Data unit:	kWh
Description:	Quantity of the electricity consumed in project activity
Source of data to be used:	Weekly monitoring report for efficiency calculation
Value of data	Will be different for different efficiencies.
Description of measurement methods and procedures to be applied:	The value will be monitored from electronic meter.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

Data / Parameter:	**$Gen_{j,y}$**
Data unit:	MWh/annum
Description:	Quantity of the electricity generated from power plant
Source of data to be used:	Power plant data
Value of data	Will be different for different power plants.
Description of measurement methods	The value will be monitored from electronic power meter.

and procedures to be applied:	
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

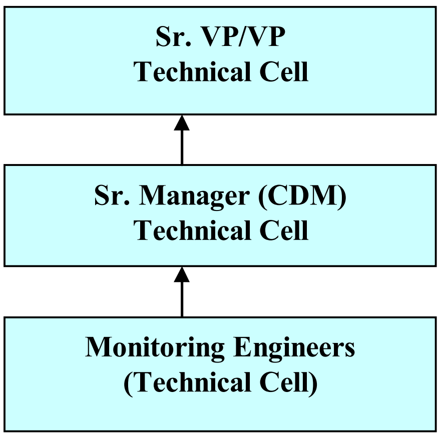
Data / Parameter:	$\mathbf{F}_{j,i,y}$
Data unit:	Tons/annum
Description:	Quantity of the fuel consumed in power plant
Source of data to be used:	Power plant data
Value of data	Will be different for different power plants.
Description of measurement methods and procedures to be applied:	The value will be monitored from weigh bridge.
QA/QC procedures to be applied:	The calibration is done as per ISO procedure.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

Emission monitoring and calculation procedure will follow the following organisational structure. All data and calculation formula required to proceed is given in the section D in PDD.

Organisational structure for monitoring plan



Monitoring and calculation activities and responsibility

Monitoring and calculation activities	**Procedure and responsibility**
Data source and collection	Data is taken from the purchase, materials and accounting system. Most of the data is available in ISO 9001 quality management system.
Frequency	Monitoring frequency should be as per section D of PDD.
Review	All received data is reviewed by the engineers in the technical cell.
Data compilation	All the data is compiled and stored in technical cell.
Emission calculation	Emission reduction calculations will be done annual based on the data collected. Engineers of technical cell will do the calculations
Review	Sr. Manager, Technical cell will review the calculation.
Emission data review	Final calculations is reviewed and approved by VP/EVP technical cell.
Record keeping	All calculation and data record will be kept with the technical cell.

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

>>

Date of completion: 10/09/2005

Name of person/entity: Vikram cement and Grasim industries (Cement division) and their consultants

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:

>>

The starting date of project activity is.

Line 1: 31/01/2002

Line 2: 30/06/2002

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

>>

25 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:

>> Not applicable

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

The starting date of crediting period is 01/10/2002.

C.2.2.2. Length:

>> 10 years 0 months

SECTION D. Environmental impacts

>>

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

>>

The Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S.O. 60(E) dated 27/01/94 has listed a set of industrial activities in Schedule I of the notification which for setting up new projects or modernization/ expansion will require environmental clearance and will have to conduct an Environment Impact Assessment (EIA) study. However, the project under consideration does not require any EIA to be conducted, as the activity is not included in Schedule I.

Article 12 of the Kyoto Protocol requires that a CDM project activity contribute to the sustainable development of the host country. Assessing the project activity's positive and negative impacts on the local environment and on society is thus a key element for each CDM project.

The VC's CDM project activity ensures global and regional benefits in relation to certain environmental and social issues and is a small step towards sustainable development. The project activity does not have any significant negative environmental impact at the site. The GHG emission reductions from project activity benefit the global environment.

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:

>>

Project activity does not lead to any significant negative impact. Neither does the host country require EIA study to be conducted for this kind of projects. As stated above project activities not included under Schedule I of Environment Impact Assessment Notification of MoEF for environmental clearance of new projects or modification of old ones needn't conduct the EIA.

SL. NO.	ENVIRONMENTAL IMPACTS & BENEFITS	REMARKS
A	CATEGORY: ENVIRONMENTAL – RESOURCE CONSERVATION	
1	**Coal / Petcoke conservation:** The project activity reduces specific thermal energy consumption for cement production and conserves the energy. By reducing the specific thermal energy, the project activity reduces an equivalent amount of coal / petcoke consumption per unit of cement produced that would have been required to cater to the baseline project option. "Coal is a finite natural resource" used as fuel to generate power and for production processes. Since this project activity reduces its thermal energy demand it positively contributes towards conservation of coal and making coal available for other important applications.	The project activity is a step towards fossil fuel conservation.
B	CATEGORY: ENVIRONMENTAL – AIR QUALITY	
	By reducing the thermal energy content of the cement manufacturing, the project activity reduces CO_2 emissions.	The project activity reduces emission of CO_2 -a global entity.
C	CATEGORY: ENVIRONMENTAL –WATER	
1	The project activity does not contribute to water pollution.	No impact
D	CATEGORY: ENVIRONMENTAL – LAND	
1	Reduction in specific consumption demand further reduces quarry/coal mining; which leads to loss of biodiversity, land destruction and erosions arising from such activities. There is no possible soil or land pollution arising due to project activity.	No impact
E	CATEGORY: ENVIRONMENTAL – NOISE GENERATION	
1	The project activity does not contribute to noise pollution.	-
F	CATEGORY: ECOLOGY	
1	By reducing the coal, the project activity has a beneficial impact on the flora, fauna in the vicinity of the mining sites.	-

SECTION E. Stakeholders' comments

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

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Stakeholder consultation is an important matter for an esteemed organisation, where comments on the project activity are invited from identified stakeholders with a view to maintain transparency in the activities of the project promoter and also assist to comply with applicable regulations. Representatives of Vikram have already identified the relevant stakeholders and they have been consulting with them looking for their comments and approvals for the project activity. The necessary consultation is the form of the oral and written documents. Vikram cement has communicated to identify stakeholders about the project activity and asked for the comments on the activity.

The project activity occurred at Grasim industries cement plant namely Vikram cement at MP. The project activity will reduce the use of thermal energy *i.e.* fossil fuel. The project activity is in the plant boundary and does not involve any direct interferences other than the employees of the plant. The employees were considered as the main stakeholder of the project activity. The various stakeholders identified for the project are as under.

- State Pollution Control Board
- Employees of the plant
- Ministry of Environment & Forest (MoEF), Government of India
- Consultants and equipment Suppliers

Stakeholders list includes the government and non-government parties, which are involved in the project at various stages. At the appropriate stage of the project development, stakeholders/ relevant bodies were involved to get the project clearance.

E.2. Summary of the comments received:

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The project activity is energy efficiency in preheater in cement manufacturing. Due to this project activity project proponent will use less quantity of fossil fuels in clinker manufacturing. The project activity has positive environmental impact in term of emissions. Madhya Pradesh state pollution control board (MPPCB) has prescribed standards of environmental compliance and monitors the adherence to the standards. The cement plant received the Consent to Establish (CTE)) and the Consent to Operate (CTO) from MPPCB during the commissioning of the plant. The project activity reduces the environmental impacts on the local ambient quality and meets all the statutory requirements. VC submits an annual Environmental Statement to MPPCB and also describes the Environmental aspects of the plant in its annual report.

The project is being implemented at existing facility of VC thus project does not require any displacement of the local population. This implies that the project will not cause any adverse social impacts on the local population but helps in improving the quality of life for them.

The project proponent has received positive comments from the employees that the project activity has reduced maintenance problems and given good working environment at the area. The letters received from the stakeholder is already submitted to validators.

The project has not received any comments from international stakeholders.

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

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The project proponent has not received any negative comment for the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vikram cement
Street/P.O.Box:	Vikramnagar, P. O. Khor
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Represented by:	
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Salutation:	Mr.
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Middle Name:	M
First Name:	R
Department:	Unit head
Mobile:	-
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is available for the project.

Annex 3

BASELINE INFORMATION

The detailed information is given in the attached enclosure.

Annex 4

MONITORING INFORMATION

Detailed monitoring parameters are available in the enclosures.

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