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

CONTENTS

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SECTION A. General description of project activity

A.1 Title of the project activity:

"Replacement of fossil fuel by biomass in Pyro-Processing" in Rajasthan by M/s JK Lakshmi Cement limited. (JKLCL)

Version 04

26th October 2006

A.2. Description of the project activity:

Pre Project Activity

JK Lakshmi Cement Ltd. (JKLCL), a member of JK Organisation has its cement manufacturing facility at Jaykaypuram in Rajasthan in India. There are three kilns in the plant with an annual installed clinker production capacity of 1700, 4200 and 4200 TPD respectively. Kiln number 1, a four stage system was installed in the year 1982 and does not have any Pre calciner. Kiln number 2 and 3 are six stage systems which were commissioned in the year 1995 and 1996 respectively and are provided with parallel pre heaters and pre calciners. In pre project scenario JKLCL has been using pet coke as predominant fuel in its kilns for clinker production.

Project Scenario and Post Project activity

The purpose of project activity is partial replacement of fossil fuel (Pet coke in present case) by an alternative fuel (Biomass) for burning in Kiln number 2 and 3 of cement manufacturing facility at Jaykaypuram. JKLCL conducted a biomass availability study[1] in project command area for assessing the biomass potential. It has been reported that there is a surplus of 573007 MTPA of biomass in the command area of the manufacturing unit. After considering various factors like future biomass demand, collection efficiency, technological factors and likely production losses, JKLCL decided to use approximately 75000 MTPA of biomass in each of its Kiln number 2 and 3.

Contribution to Sustainable Development

The entire supply chain of biomass including collection, handling, and transportation will give employment opportunities to local people, farmers and biomass dealers improving the social and

[1] Refer Biomass Assessment Study Report Prepared by Mitcon Consultancy Services Ltd.

economical status of the community. Replacement of carbon intensive fossil fuel with carbon neutral biomass results in reduction in emissions thereby contributing to the global environmental initiative of reducing green house gas emissions. Use of biomass in cement manufacturing is not a common practice, introduction of biomass in cement sector for burning biomass in Kilns will improve technical know how of the cement industry and give impetus to introduction of clean technology in cement manufacturing.

A.3. Project participants:

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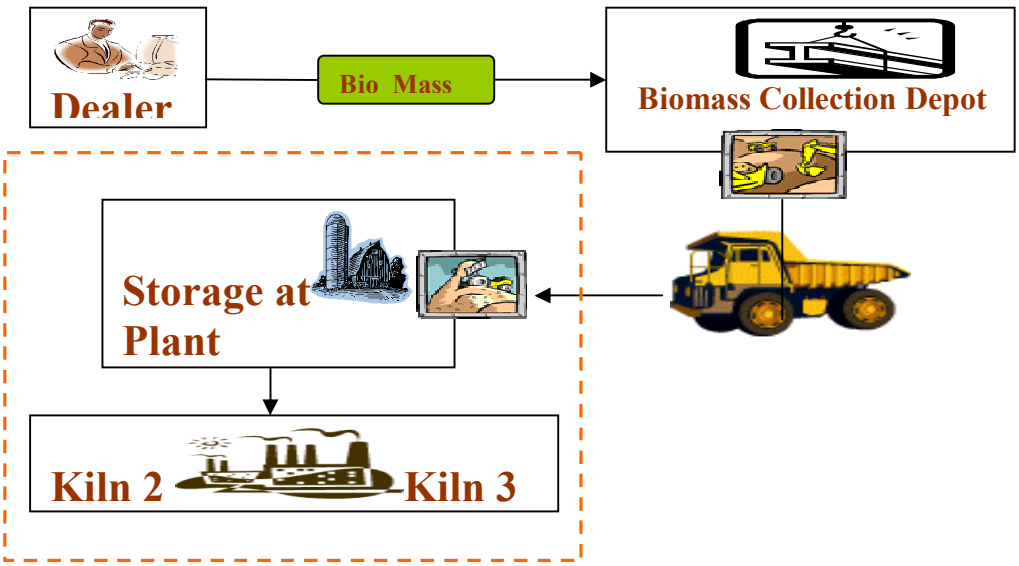
Name of Party involved (indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	JK Lakshmi Cements Limited (Private entity)	No

A.4. Technical description of the project activity:

The project activity is replacement of fossil fuel partially by alternative fuel (biomass). Biomass will be collected from dealers and brought to the collection depots, from where it will be brought to the storage yards inside the plant premises. Biomass will then be fed into the kilns along with petcoke as fuel, for clinker production.



A.4.1. Location of the project activity:

The project activity is located at cement manufacturing facility of JK Lakshmi Cements Ltd. at Jaykaypuram.

A.4.1.1. Host Party(ies):

Ministry of Environment and Forest, Government of India

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

Rajasthan

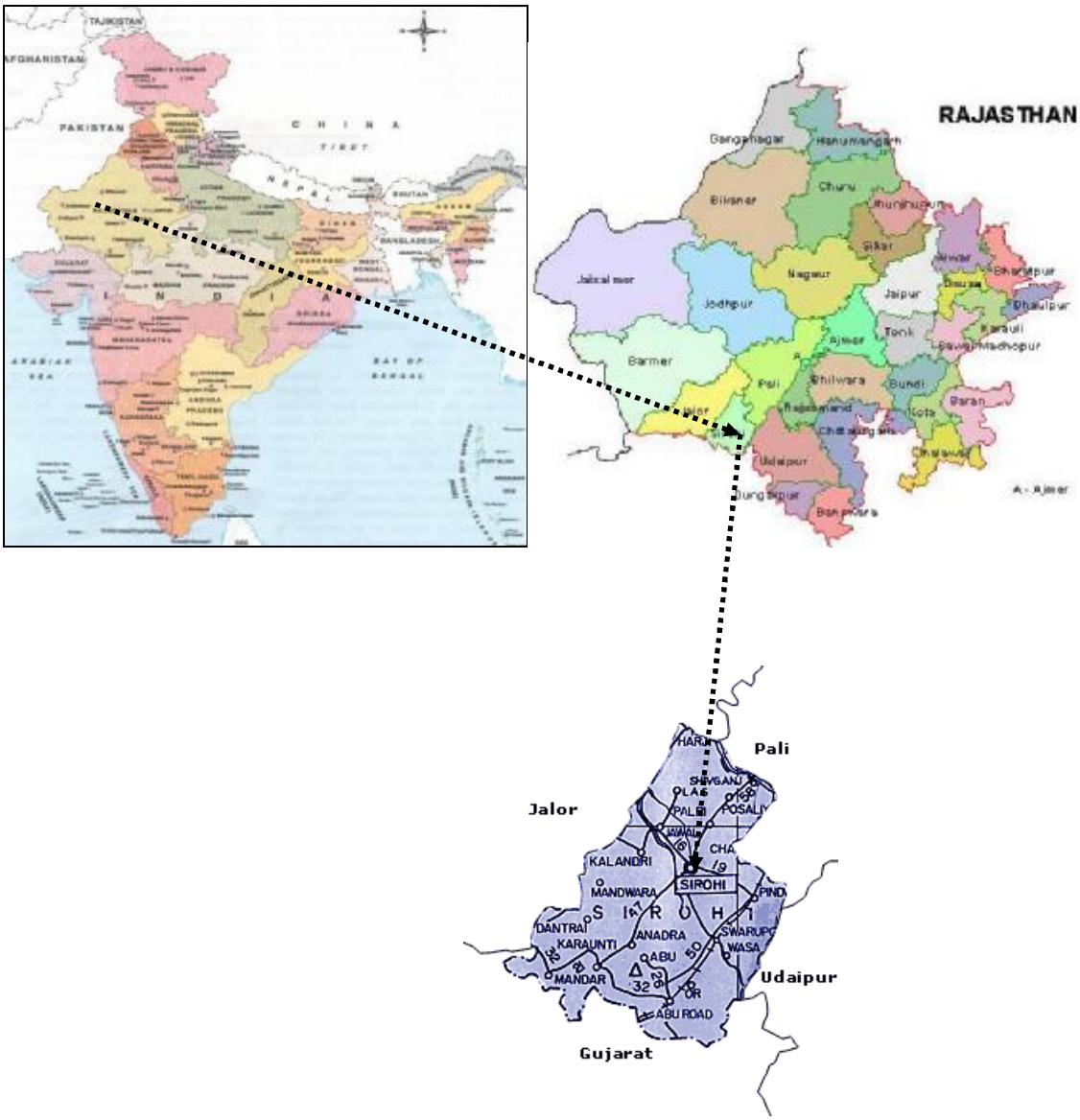
A.4.1.3. City/Town/Community etc:

Jaykaypuram, Sirohi

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

JK Lakshmi Cement Ltd. is situated at Jaykaypuram which is 3.5 KMs from Banas on Ajmer-Ahemedabad national highway No. 14. It is part of village Banas, Tehsil-Pindwara and having police station at Swarupganj. The nearest railway station Banas is approximately 3 KMs whereas the nearest airport Udaipur is 135 Km from the plant.

Fig 1 : Location of activity site



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

The project activity is categorised under sectoral scope number 4 for Manufacturing Industries, as per the classification of sectoral scope for accreditation of designated operational entity. This sectoral scope is based on list of sectors and sources contained in annexure A of the Kyoto Protocol.

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

The technology to be employed for the project activity includes construction of biomass depots. The biomass from these depots would be brought at project site and fed into the kilns through conveyor belt for firing.

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

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The project activity is replacement of fossil fuel by biomass partially, for burning in kilns. Emissions associated with burning of biomass are quantitatively same as sequestered from the atmosphere during biomass growth. Hence there are no net emissions on biomass burning. In absence of project activity, the existing manufacturing facility would continue using fossil fuel which on burning emits large quantity of GHGs.

The storage facility of the plant will be designed for a storage period of approximately one month, so there will be no long term methane emissions associated with biomass storage.

Although Government of India has taken various initiatives for using renewable energy sources in manufacturing units there is no mandatory legislation which makes usage of biomass imperative upon them. The fuel receipt and consumption pattern[2] for cement industry, which is presented in Table 1 below clearly depicts that biomass is not being used for cement manufacturing in India.

Table 1: Fuel receipt and consumption pattern in cement manufacturing process in India

Year	Receipt (Mn.T)				Consumption (Mn.T)				
	Coal	Lignite	Petcoke	Total	Coal	Lignite	Petcoke	CPP	Total
2000-01	14.93	0.05	0.37	15.35	13.05	0.05	0.37	1.9	15.37

[2] Cement Manufacturing Association (CMA) statistics.

2001-02	15.33	0.08	0.88	16.29	12.82	0.08	0.88	2.03	15.81
2002-03	20.44	0	1.09	17.87	14.17	0	1.09	2.57	17.83
2003-04	17.55	0.11	1.41	19.07	14.20	0.11	1.41	3.22	18.94
2004-05	19.74	0.76	1.87	22.37	14.95	0.76	1.87	3.63	21.21

Obstacles in collection and transportation of biomass, absence of price controlling or regulating body, technological constraints associated with use of biomass in high temperature kiln are some of the impediments in considering biomass use as fuel in cement manufacturing.

The project proponent has decided to go ahead with the project despite of various constraints. The financial benefits which will come from the project in terms of CER credits on registration of project as a CDM activity would contribute positively to the financial viability of the project. In absence of carbon revenues, the project activity will not take place and manufacturing plant shall continue using pet coke and coal combination emitting large quantity of GHGs.

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

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Table 2: Annual Estimation of Emission Reduction

Year	**Estimated CER**	
	Kiln-2	**Kiln-3**
2007-08	91,576	91,576
2008-09	91,576	91,576
2009-10	91,576	91,576
2010-11	91,576	91,576
2011-12	91,576	91,576
2012-13	91,576	91,576
2013-14	91,576	91,576
2014-15	91,576	91,576
2015-16	91,576	91,576
2016-17	91,576	91,576
Total estimated reductions (tonnes CO_2 equ.**)**	**915,760**	**915,760**
Total no of Crediting Years	10 years	10 years
Annual average over the crediting	**183,152**	

period of estimated reductions (tonnes of CO_2 e)	

A.4.5. Public funding of the project activity:

No public funding from Annexure-I parties has been involved in the project.

SECTION B. Application of a baseline methodology

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

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Title: **"Emissions reduction through partial substitution of fossil fuels with alternative fuels in cement manufacture"**

Reference: ACM0003,version 04, http://cdm.unfccc.int

28th July 2006

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

Approved Baseline methodology "Emission reduction through partial substitution of fossil fuels with alternative fuels in cement manufacture" (Approved consolidated methodology ACM0003, which is based on NM0040 & NM0048, is available on UNFCCC website) is appropriate for JKLCL project activity. The project activity of JKLCL qualifies all the applicability criteria stated in ACM0003. Following are the justifications for choosing ACM0003 as per the applicability criteria of the methodology.

Fossil fuel(s) used in cement manufacture are partially replaced by the following alternative fuels:

(a) Waste originating from fossil sources, such as tires, plastic, textiles from polymers, or rubber;

(b) Biomass residues, where they are available in surplus and would in the absence of the project activity be dumped or left to decay or burned in an uncontrolled manner without utilizing them for energy purposes

JKLCL is planning to use approximately 227 TPD of biomass residue, which is waste/residue from agriculture and non agriculture land, in each of its Kiln No. 2 and 3. Biomass availability study was conducted in the command area of the cement plant. It is evident from the study that large quantity of excess biomass is available in the command area. The results are given in the following table. There is no established practice of using biomass in the command area of the project hence no leakages are envisaged because of the project activity.

Table: **Surplus Biomass Availability in Command Area of JKLCL**

Sl. No.	Type of Biomass	Surplus Quantity (MTPA) at 100 % collection efficiency	Surplus Quantity (MTPA) at 70 % collection efficiency
1.	Til waste	38090	26663
2.	Arandi waste	115694	80986
3.	Rai waste	74957	52470
4.	Surplus biomass from N.A. Lands	589841	412889
	Total	818582	573007

In case of project activities using biomass residues, any preparation of the biomass, occurring before use in the project activity, does neither require significant energy quantities (e.g. esterification of waste oils), except from transportation and/or drying of the biomass, nor does it cause significant GHG emissions (such as, for example, methane emissions from anaerobic treatment or char coal production).

No significant energy quantity is required for processing of biomass residue except transportation.

CO_2 emissions reduction relates to CO_2 emissions generated from fuel burning requirements only and is unrelated to the CO_2 emissions from decarbonisation of raw materials (i.e. $CaCO_3$ and $MgCO_3$ bearing minerals)

Approved methodology ACM0003 suggests that emission reduction in Pyro processing due to replacement of carbon intensive fossil fuel by biomass should only be considered. No other process, like decarbonisation of raw material was considered in emission reduction calculations (Refer enclosure-1 and Section-E for calculation details)

The methodology is applicable only for installed capacity (expressed in tonnes clinker/year) that exists by the time of validation of the project activity

The annual installed capacity of the plant is 3.1 MT of clinker production. There are three production units with installed capacities as follows:

Kiln-2	**1.4 MT**
Kiln-3	**1.4 MT**

The project activity will be confined to Unit No. 2 and 3, hence only these units will be considered for emission reduction calculations. No increase in production activity is envisaged as of now.

The amount of alternative fuels available for the project is at least 1.5 times the amount required to meet the consumption of all users consuming the same alternative fuels, i.e. the project and other alternative fuel users.

Biomass availability study has been conducted in the command area so as to assess the surplus quantity of biomass available in the region. Total quantity of biomass available in the region is approximately 1.3 Million tons. The total biomass consumption in both the kilns shall be 0.15 Million tonnes per annum, approximately 227 TPD of biomass shall be used in each kiln for 330 working days. It is hereby evident that quantity of biomass available in the region is more than 1.5 times the total consumption in the region.

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

The approved methodology ACM0003 is based upon two cases, "Replacement of Fossil Fuel by Palm Kernel Shell Biomass residue in cement manufacturing" NM0040, prepared by Lafarge Asia, and "Indocement's sustainable cement production project"NM0048-rev, prepared by Indocement. The project activity of JK Lakshmi Cements Limited, partial replacement of fossil fuel by biomass residue fuel in Pyro processing fulfils all applicability conditions given in the applicability criteria of the methodology. Applicability criteria of ACM0003 have been discussed in details in the above section.

Baseline scenario selection

1. Define alternative scenarios for the fuel mix

As per approved methodology ACM0003 alternative scenarios should be identified which may occur in absence of the project scenario. The baseline scenario has to be selected by considering various alternative scenarios and selecting the most plausible scenario which would have occurred in the absence of project activity by performing barrier analysis.

Alternative Scenariao-1: Continuation of current practice scenario

Current practice scenario in case of JKLCL is usage of pet coke for burning in kiln. JKLCL recorded production of 2.871 million tonnes of clinker in the year 2004-05 and total quantity of fossil fuel consumed was 0.246 million tons. If the current practice continues, assuming no increase in the production of clinker, total quantity of fossil fuel that would be consumed during the entire project crediting period would be 2.46 million tonnes.

Alternative Scenario-2: Use of evolving fuel mix portfolio

The evolving practices in different industries include use of various kinds of fuels like Natural gas, Oil, Municipal waste, Biomass for burning. Although use of different fuel is evolving, cement industry in particular does not use alternatives to fossil fuel as evident from CMA statistics. Unavailability of gas in the region and lack of infrastructure like pipeline for transporting gas makes natural gas as not an obvious choice for firing in Kilns. Recent trends in global oil prices shows large upward variations in the prices hence can not be considered an economical alternative in absence of the project activity. Municipal waste in India varies from region to region in both its physical and chemical characteristics. Since municipal waste of required calorific value is not available at an economical distance in the region it has not been chosen for consideration. Biomass and petcoke are the available choices for consideration. Although, Biomass is available at cheaper prices than petcoke complete replacement is not feasible because of high volatile nature of the biomass and associated production losses with its usage.

Alternative Scenario-3: Scenario in which traditional fuels are partially substituted with alternative fuels (i.e. the proposed CDM project activity).

Partial replacement of fossil fuel with alternative fuel, biomass in this case, is the project scenario. Since this scenario faces barrier demonstrated in section below, it can not be the plausible baseline scenario. Although Ministry of Non Conventional Energy sources, Government of India promotes use of biomass fuel in manufacturing units there is no legal or mandatory guideline for using biomass in Cement industry.

Baseline Scenario Selection

Use of evolving fuel mixes as practiced in industries other than cement manufacturing which is defined in Alternative Scenario 2 can not be a plausible scenario because of barriers associated with their use. Natural gas is a costlier fuel and is not available nearby plant facility. Use of natural gas requires extensive modification in the plant facility which incurs high investment cost. Biomass usage in kilns requires extensive modification in the plant facility because of high volatile contents of biomass and hence ruled out as a plausible scenario in absence of the project scenario.

Partial replacement of fossil fuel by alternative fuel scenario which is illustrated in the Alternative 3 would face barriers like production losses, lack of infrastructure and lack of common practice (elaborated in section B.3 below) hence can not be the baseline scenario.

Continuation of current practice which includes use of fossil fuel for burning in kilns has various advantages as enumerated below and hence is the most plausible scenario in absence of the project activity.

- Availability of large quantity of coal in India and regulatory price mechanism of coal which removes uncertainties associated with its prices, make coal as the most sought fuel for burning in India.
- Biomass residue market being an unorganized market poses disadvantages in collection and distribution and hence not a preferred choice.
- Lack of technological advancement in area of burning biomass fuel at a very high temperature, as in kiln inhibits use of alternative fuel and vis a vis promote usage of fossil fuel.

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

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The project activity would replace fossil fuel partially by biomass residues thereby reducing GHG emissions from carbon intensive fossil fuel. Biomass being a renewable source of energy emits equivalent amount of carbon di oxide as sequestered during its cyclic growth. Additionality of the project activity has been demonstrated in following paragraphs.

Additionality

Step 0. Preliminary screening based on the starting date of the project activity.

The start date of the project activity is 09/08/2005 which is after the registration of first CDM project i.e 18th November 2004 hence the project crediting period shall start after the registration of the project activity.

Step 1 (a). Identification of alternatives to the project activity consistent with current laws and regulations

Various alternatives have been discussed above to select the most plausible baseline scenario. Alternative-1 is the most economical scenario as it does not faces barrier, which are associated with other alternatives. Alternative scenario-2 is not applicable as discussed above. Scenario-3 being uneconomical on account of anticipated production losses and barriers enumerated below, associated with use of alternative fuel, can not be considered as baseline scenario.

Step 1 (b) Enforcement of applicable laws and regulations:

Alternatives defined above are in compliance with all legal and statutory requirements laid down by Government of India.

Step 2. Investment analysis

Additionality of the project activity has been demonstrated by barrier analysis route.

Step 3. Barrier analysis

As per "Tools for the demonstration and assessment of additionality" barrier analysis has been carried out for demonstrating the additionality of the project activity.

Barriers to project activity must demonstrate following characteristics.

(a) Prevent the implementation of this type of proposed project activity; and

(b) Do not prevent the implementation of at least one of the alternatives stated above.

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

There are several barriers associated with the use of alternative fuel in cement manufacturing industry. It is evident from the fact that till now there is no well established practice of using alternative fuel in kiln in India as present in the European Union. The proposed project activity has to overcome various barriers which are illustrated in the following paragraphs.

- Technological Barrier

Unavailability of practising technology for using biomass in kiln for cement manufacturing in India inhibits usage of biomass as an alternative fuel. The fuel consumption pattern data of cement manufacturing association for the year 2004-2005 depicts that use of biomass fuel is not common in the cement industry**.**

Since use of alternative biomass is not practised in cement industry in India, trained manpower for using biomass is not available. Unsustainable biomass supply and non existence of biomass fuel market with unreliable supply and price fluctuations acts as a barrier in using biomass. Transportation difficulties associated with biomass poses barrier in setting up fuel transportation network and storage depots.

Production Losses: JKLCL used biomass on trial bases for assessing viability of the project activity. It was found that due to volatile matters present in large quantities in biomass residues there was loss in clinker production. The anticipated production losses act as a barrier in taking decision to implement the project activity. There has been a huge demand of cement in India because of spurt in infrastructure activities, backed by robust growth in economy. Likely production losses may tarnish the image of JKLCL in market and might prove fatal to its business. JKLCL decision to go ahead with the project activity despite of these barriers has showed its commitment towards GHG abatement, and confidence in the CDM.

- Barriers due to prevailing practice.

The table given below depicts the fuel consumption pattern in Indian cement industry. It is evident from table that fossil fuel is the preferred choice for burning in kilns and use of biomass as fuel is not a prevailing practice in the cement manufacturing in India.

Till date only three[3] cement manufacturing companies have initiated projects replacing fossil fuel by alternative fuels for cement production in the country. All these projects are undertaken considering CDM benefits only. Associated production losses with usage of biomass due to high volatile contents prohibit its usage in cement kilns.

Fuel consumption pattern in cement manufacturing process in India[4]

Sl No	Fuel type	Consumption in kilns (Million Tonnes)	%
1	Coal	14.95	85.04
2	Pet coke	1.87	10.64
3	Lignite	0.76	4.32
	Total	**17.58**	**100**

From the Step 1 and Step 3 it can be concluded that there are alternatives as given in section B.2. that do not have any impediments preventing their implementation. However the project activity faces barriers, which would prevent JKLCL from implementing the project activity as elaborated in the 'Barrier Analysis'.

Sub-step 3b: Identified barrier would not prevent the implementation of Alternative Scenario-1 which is continuation of current practice.

The current practice scenario is petcoke utilization in the kiln. Due to petroleum refineries in the region around project plant, large quantity of petcoke is easily available. Petcoke has a high calorific value and less contents of volatile matter and hence no production losses. Since petcoke utilization is well established in cement manufacturing industry there is no common practice related barrier associated with its use. Although government of India has promoted use of renewable energy sources in various manufacturing industries it is not mandatory or legally binding for manufacturers to use it. From the Step 1 and Step 3 it can be concluded that there are alternatives as given in section B.2. that do not have any impediments preventing their implementation. However the project activity

[3] M/s Shree Cements Limited, M/s Grasim South, M/s Vikram Cement

[4] Refer CMA statistics of 2004-05.

faces barriers, which would prevent JKLCL from implementing the project activity as elaborated in the 'Barrier Analysis'.

Step 4. Common practice analysis

Step 4a. Activities similar to the proposed project activity

Use of alternative fuel in cement manufacturing is not a common practice in India. Data of cement manufacturing association presented in above paragraphs depicts that use of fossil fuels like coal and pet coke is predominant in India..The project activity is unique as it has been taking the risk of implementing the project despite of barriers explained above.

Step 4b. Discussion on similar options that are occurring.

Till date only three[5] cement manufacturing companies have initiated projects replacing fossil fuel by alternative fuels for cement production in the country. All these projects are undertaken considering CDM benefits only. Although biomass has been used for power generation in Rajasthan, in cement manufacturing it has not been used because of its high volatility and associated production losses.

Step 5. Impact of CDM Registration

Registration of proposed project activity under CDM of UNFCC has increased its viability. Following are the major impacts of registration of project under CDM:

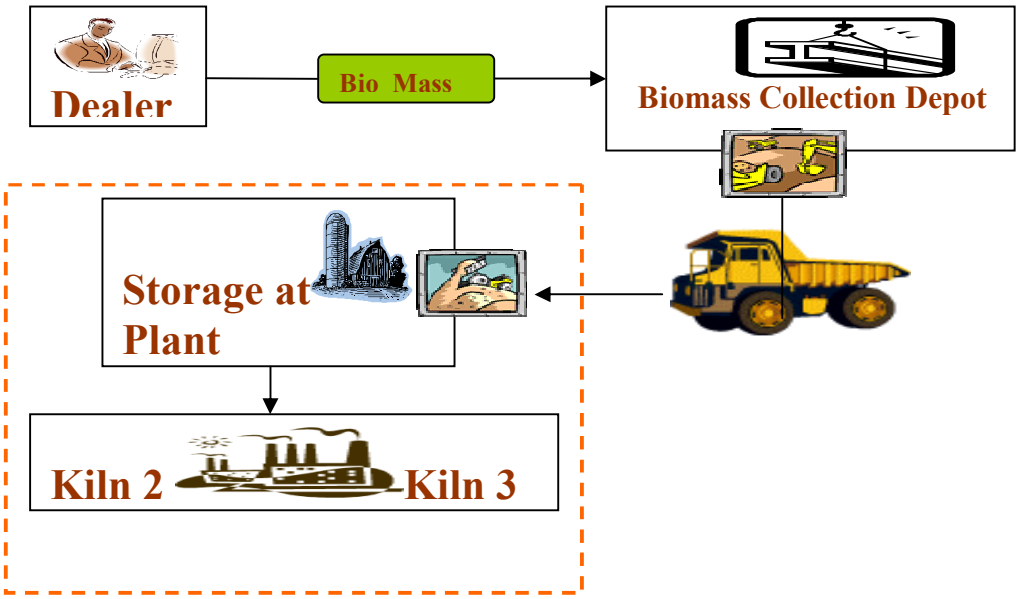
- Anticipation of production losses has made the project activity economically unviable. Inflow of carbon revenue as a result of registration may boost the financial attractiveness of the project.
- The project can become a role model for others in cement manufacturing, has it been able to achieve its financial bottom line because of registration and subsequent carbon revenues.
- Registration of project activity promotes the usage of renewable energy sources in manufacturing. Thereby causing net reduction in GHGs emissions.
- Registration of project activity will enhance the confidence of other project developers in Clean Development Mechanism of Framework.

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

The project boundary includes all processes related to clinker production. The specific production step is Pyro processing which has been considered for defining project boundary. Due to high

[5] M/s Shree Cements Limited, M/s Grasim South, M/s Vikram Cement

combustion temperature and long residence time only CO_2 from fuel burning is considered. Figure given below shows project boundary.



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

Date: 30/07/2006

Entity: JK Lakshmi Cements Limited (JKLCL)

Jaykaypuram, District Sirohi

Rajasthan. India. Pin code – 307019

Fax: +91-2971-244417

JKLCL is also project participant as mentioned in Annexure 1.

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:

>>
09/08/2005

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

>>
20 years

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

Project activity will use fixed crediting period of ten years.

C.2.1. Renewable crediting period

Not Applicable

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

>>
Not Applicable

C.2.1.2. Length of the first crediting period:

>>
Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/01/2007 / Date of Registration.

C.2.2.2. Length:

>>
10 years 0 months

SECTION D. Application of a monitoring methodology and plan

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

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Title: **"Emissions reduction through partial substitution of fossil fuels with alternative fuels in cement manufacture"**

Reference: ACM0003, version 04,

http://cdm.unfccc.int

28th July 2006]

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

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Approved monitoring methodology "Emission reduction through partial substitution of fossil fuels with alternative fuels in cement manufacture" is appropriate for proposed project activity as all the applicability conditions of this methodology are fulfilled.

Justification for using the said methodology has been given in the following paragraphs.

Fossil fuel(s) used in cement manufacture are partially replaced by the following alternative fuels:

- **(c) Waste originating from fossil sorces, such as tires, plastic, textiles from polymers, or rubber;**
- **(d) Biomass residues, where they are available in surplus and would in the absence of the project activity be dumped or left to decay or burned in an uncontrolled manner without utilizing them for energy purposes**

Proposed project activity will partially replace the fossil fuel by alternative biomass crop residues like Til, Arandi, Rai and Non Agriculture based biomass residue. Biomass availability study has been conducted and it was found that the agriculture by-products are available in excess quantity in the command area of the project. JKLCL has envisaged usage of approximately 75000 tons of Biomass annually in each of its Kiln No. 2 and 3.

In case of project activities using biomass residues, any preparation of the biomass, occurring before use in the project activity, does neither require significant energy quantities (e.g. esterification of waste oils), except from transportation and/or drying of the biomass, nor does

it cause significant GHG emissions (such as, for example, methane emissions from anaerobic treatment or char coal production).

No significant energy quantity is required for processing of biomass residue except transportation.

CO_2 emissions reduction relates to CO_2 emissions generated from fuel burning requirements only and is unrelated to the CO_2 emissions from decarbonisation of raw materials (i.e. $CaCO_3$ and $MgCO_3$ bearing minerals)

For the estimation of emissions reduction, the reduced emission due to fuel burning requirements only has been taken into account. No emission reductions from decarbonisation process of raw material were taken into consideration. Details of emission reduction calculations are given in the following sections.

The methodology is applicable only for installed capacity (expressed in tonnes clinker/year) that exists by the time of validation of the project activity

The proposed project activity envisaged replacement of fossil fuel by biomass in Kiln No.2 and 3 of the manufacturing facility. There will be no increase in the production capacity of the facility due to project activity. Emission reduction calculation has been done on the basis of clinker production details of 2004 -05, which are given below.

Kiln-2	**1.4 MT**
Kiln-3	**1.4 MT**

The amount of alternative fuels available for the project is at least 1.5 times the amount required to meet the consumption of all users consuming the same alternative fuels, i.e. the project and other alternative fuel users.

Biomass availability study has been conducted in the command area so as to assess the surplus quantity of biomass available in the region. Total quantity of biomass available in the region is approximately 1.3 Million tons. The total biomass consumption in both the kilns shall be 0.15 Million tonnes per annum, approximately 227 TPD of biomass shall be used in each kiln for 330 working days. It is hereby evident that quantity of biomass available in the region is more than 1.5 times the total consumption in the region.

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

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

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data Type	Data variable	Symbol	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is the archived data kept?	Comment	Instrument used to Record
Monitoring of parameter related to clinker production											
D.2.1.a	Mass	Clinker Production	C_{Pr}	Tonnes	M, C	Recorded/ calculated & reported monthly	100%	Electronic	2 years after the end of the crediting period	Clinker produced is measured on continuous basis by weighing feeders and monitored online.	Weighing Feeders
Monitoring of emissions related to the use of alternative fuels in kilns during the crediting period (for each type of fuels)											
D.2.1.b	Quantity	Quantity of	Q_{AF}	Tonne	M	Recorded continuously&	100%	Electronic	2 years after the	Alternative fuel shall be	Scale

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data Type	Data variable	Symbol	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is the archived data kept?	Comment	Instrument used to Record
		Alternative fuel used				reported monthly			end of the crediting period	measured on continuous basis by weighing scales.	
D.2.1.c	Heat Value	Heat value of alternative fuel	HV_{AF}	TJ/ton	M & C	Monthly	100%	Electronic	2 years after the end of the crediting period	Heat value of alternative fuel shall be measured by bomb calorimeter monthly.	Calorimeter
D.2.1.d	Heat	Alternative fuel heat input	HI_{AF}	C	Calculated & reported monthly	Monthly	100%	Electronic	2 years after the end of the crediting period	For each Kiln shall be calculated based on heat value and quantity of alternative fuel.	
D.2.1.e	Emission factor	Emission factor	EF_{AF}	TCO_2/TJ	IPCC Default value	Fixed	100%	Electronic	The entire crediting	Emission factor of alternative fuel (biomass in	

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data Type	Data variable	Symbol	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is the archived data kept?	Comment	Instrument used to Record
									period	the project activity) is zero.	
D.2.1.f	fraction	Share of heat input from alternative fuel	S_{AF}	%	Calculated	Monthly	100%	Electronic	2 years after the end of the crediting period	Calculated based on quantity of heat input from alternative fuel.	
D.2.1.g	ratio	Moisture penalty	Mp	MJ/tonne /% alt fuel share	Calculated	At start of crediting period	100%	Electronic	2 years after the end of the crediting period	Calculated based on specific heat consumption in pre and post project. (refer enclosure-1 for calculations	

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

>>

1. Calculate project heat input from alternative fuels

Heat input from alternative fuels with significant moisture content is calculated first to allow for the calculation of a project-specific moisture "penalty" for alternative fuel heat input requirements.

$$HI_{AF} = \sum Q_{AF} \times HV_{AF}$$

Where:

HI_{AF} = heat input from alternative fuels (TJ/yr)

Q_{AF} = quantity of each alternative fuel (tonnes/yr)

HV_{AF} = lower heating value of the alternative fuel(s) used (TJ/tonne fuel).

2. Estimate project specific moisture "penalty"

$MP_Y = C_{Pr,y}$ X ($HC_{AF} - HC_{FF}$)

Where:

MP_Y	moisture penalty (TJ/yr) for year y
$C_{Pr,y}$	is the clinker production for year y
HC_{AF}	is the specific fuel consumption on project case (TJ/tClinker) in year y
HC_{FF}	is the specific fuel consumption in the baseline when only fossil fuel is used, in TJ/tClinker

$$HC_{AF} = \frac{\left(\sum Q_{FF,\mathrm{Pr}} \times HV_{FF}\right) + HI_{AF}}{(C_{\mathrm{Pr}})}$$

Where:

$Q_{FF,Pr}$	is the quantity of fossil fuel used in the project case
HV_{FF}	is the lower heat value of the fossil fuel used (TJ/tonne)
HI_{AF}	is heat input from alternative fuels (TJ/yr) in project case;
C_{Pr}	is the production of clinker in the project case; and

$$HC_{AF} = \frac{\left(\sum Q_{FF,Ba} \times HV_{FF}\right)}{(C_{\mathrm{Bl}})}$$

$Q_{FF,Ba}$	is the quantity of fossil fuel used in the baseline case

HV_{FF} is the lower heat value of the fossil fuel used (TJ/tonne) used in the baseline (it would be the same as project case if the fossil fuel used in the project case is same as that in the baseline)

C_{Bl} is the clinker production in the base case corresponding to the $Q_{FF,Ba}$

Step 3 Calculate GHG emissions from the use of alternative fuels in kilns:

$$AF_{GHG} = \sum (Q_{AF} \times HV_{AF} \times EF_{AF}) \quad \textbf{(5)}$$

Where:

AF_{GHG} = GHG emissions from alternative fuels (tCO_2e/yr)

Q_{AF} = monitored alternative fuels input in clinker production (tonnes/yr).

HV_{AF} = heating value(s) of the alternative fuel(s) used (TJ/tonne fuel).

EF_{AF} = emission factor(s) of alternative fuel(s) used (tCO_2e/TJ).

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :											
ID number *(Please use numbers to ease cross-referencing to D.3)*	Data Type	Data variable	Symbol	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is the archived data kept?	Comment	Instrument used to Record
Monitoring of emissions related to the project as well as baseline GHG emissions from the fossil fuel(s) displaced by the alternative fuel(s)											
D.2.1.h	Quantity	Fuel type	Q_{FF}	Tons	Measured	Recorded continuously and reported monthly	100 %	Electronic	2 years after the end of the crediting period	For each of the fossil fuel consumed: (i) in the year prior to the validation (ii) during the project activity (iii) in the baseline scenario	Scale
D.2.1.i	Heat Value	Fuel heating value	HV_{FF}	TJ/tonne	Calculated	Monthly	100 %	Electronic	2 years after the end of the crediting	For each of the fossil fuel consumed: (i) in the year	

									period	prior to the validation (ii) during the project activity (iii) in the baseline scenario	
D.2.1.j	Quantity	Clinker production	C_{Bl}	Tonne	From records	At start of project activity				Three years data from the records of the project plant	
D.2.1.k	Emission factor	Emission factor	EF_{FF}	tCO_2/TJ	IPCC default	Fixed	100 %	electronic	2 years after the end of the crediting period	For each of the fossil fuel consumed: (i) in the year prior to the validation (ii)during the project activity (iii) in the baseline scenario	

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

>>

1. Calculate the baseline GHG emissions from the fossil fuel(s) displaced by the alternative fuel(s)

$$FF_{GHG} = [(Q_{AF} \times HV_{AF}) - MP_{TOTAL}] \times EF_{FF} \quad \textbf{(7)}$$

Where:

FF_{GHG} = GHG emissions from fossil fuels displaced by the alternatives (tCO_2/yr)

$Q_{AF} * HV_{AF}$ = total actual heat provided by all alternative fuels (TJ/yr)

MP_{total} = total moisture penalty (TJ/yr)

EF_{FF} = emissions factor(s) for fossil fuel(s) displaced (tCO_2/TJ).

EF_{FF} is the baseline value and would be the weighted average for the mix of fossil fuels if more than one fossil fuel is used.

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

Not applicable.

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

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

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

>>

D.2.3. Treatment of leakage in the monitoring plan

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

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data Type	Data variable	Symbol	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is the archived data kept?	Comment	Instrument used to record
Monitoring of emissions due to off-site transport of fuels											
D.2.3.a	Quantity	Alternative fuels	Q_{AF}	Ton	Measured	Recorded continuously & reported monthly based on actual silo stock level change	100%	Electronic	2 years after the end of the crediting period	Quantity of alternative fuel required shall be measured.	Weighing feeders
D.2.3.b	Specific Quantity	Average truck capacity for alternative fuel	CT_{AF}	Ton/truck	Calculated	Monthly	100%	Electronic	2 years after the end of the crediting period	The quantity can be estimated based on additive material hauling distance and estimated fuel consumption per shipment.	
D.2.3.c	Distance	Average distance for transportation of alternative	D_{AF}	Km/truck	Calculated	Monthly	100%	Electronic	2 years after the end of the crediting period	Average distance for transporting biomass shall be measured	

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data Type	Data variable	Symbol	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is the archived data kept?	Comment	Instrument used to record
		fuels								and used for paying transportation cost.	
D.2.3.d	Emission factor	Emission factor	EF_{CO2e}	tCO_2/TJ	Fixed	Fixed	100%	Electronic	2 years after the end of the crediting period	IPCC default values (Refer Enclosure-1)	
D.2.3.e	Quantity	Quantity of fossil fuel which is reduced due to consumption of alternative fuels	RQ_{FF}	Ton	Measured	Recorded continuously and reported monthly	100%	Electronic	2 years after the end of the crediting period	Calculated	
D.2.3.f	Quantity	Average truck capacity for transport	CT_{FF}	Ton/truck	Calculated	Monthly	100%	Electronic	2 years after the end of the	Calculated	

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data Type	Data variable	Symbol	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is the archived data kept?	Comment	Instrument used to record
		of fossil fuel							crediting period		
D.2.3.g	Distance	Average distance for transportation of fossil fuels	D_{FF}	Km/truck	Calculated	Monthly	100%	Electronic	2 years after the end of the crediting period	Calculated	

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

>>

1. Calculate emissions from off-site transport of alternative and fossil fuels.

The emissions from transportation should be calculated as follows:

$LK_{trans} = LK_{AF} - LK_{FF}$ **(10)**

$LK_{AF} = (Q_{AF}/CT_{AF}) * D_{AF} * EF_{CO2e}/1000$ **(11)**

$LK_{FF} = (Q_{FF}/CT_{FF}) * D_{FF} * EF_{CO2e}/1000$ **(12)**

Where:

LK_{trans} = leakage from transport of alternative fuel less leakage due to reduced transport of fossil fuels (tCO_2/yr)

LK_{AF} = leakage resulting from transport of alternative fuel (tCO_2/yr)

LK_{FF} = leakage due to reduced transport of fossil fuels (tCO_2/yr)

Q_{AF} = quantity of alternative fuels (tonnes)

CT_{AF} = average truck or ship capacity (tonnes/truck or ship)

D_{AF} = average round-trip distance between the alternative fuels supply sites and the cement plant sites (km/truck or ship)

Q_{FF} = quantity of fossil fuel (tonnes) that is reduced due to consumption of alternative fuels.

CT_{FF} = average truck or ship capacity (tonnes/truck or ship)

D_{FF} = average round-trip distance between the fossil fuels supply sites and the cement plant sites (km/truck or ship)

EF_{CO2e} = emission factor from fuel use due to transportation (kg CO_{2e}/km) estimated as:

$EF_{CO2e} = EFT_{CO2} + (EF_{T\,CH4} * 21) + (EF_{T\,N2O} * 310)$ **(13)**

Where:

$EF_{T\,CO2}$ = emission factor of CO_2 in transport (kg CO_2/km)

$EF_{T\,CH4}$ = emission factor of CH_4 in transport (kg CH_4/km)

$EF_{T\,N2O}$ = emission factor of N_2O in transport (kg N_2O/km)

21 and 310 are the Global Warming Potential (GWP) of CH_4 and N_2O respectively.

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

>>

Emission reductions by the project activity

Total emission reductions are given by the following formula

$$AF_{ER} = FF_{GHG} - AF_{GHG} - OT_{GHG} - LK_{trans} + OT\_GHG_{FF} + BB_{CH4} + LW_{CH4} - GHG_{PAFO} \quad \textbf{(15)}$$

Where:

FF_{GHG} = GHG emissions from fossil fuels displaced by the alternatives (tCO_2/yr)

AF_{GHG} = GHG emissions from alternative fuels (tCO_{2e}/yr)

OT_{GHG} = GHG emissions from on-site transport and drying of alternative fuels (tCO_{2e}/yr)

LK_{trans} = leakage from transport of alternative fuel less leakage due to reduced transport of fossil fuels (tCO_2/yr)

$OT\text{-}GHG_{FF}$ = emissions from reduction of on-site transport of fossil fuels (tCO_{2e})

BB_{CH4} = GHG emissions due to burning of biomass that is used as alternative fuel (tCO_{2e}/yr)

LW_{CH4} = baseline GHG emissions due to anaerobic decomposition of biomass wastes in landfills (tCO_{2e}/yr)

GHG_{PAFO} = GHG emissions that could be generated during the preparation of alternative fuels outside the project site (tCO_2/yr)

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures* planned for these data, or why such procedures are not necessary.
D.2.1.a	Low	QA/QC procedures are planned in line with the ISO requirements. (JK Lakshmi Cements Limited is an ISO 9001, 14001, 18001 certified company). Weighing feeders shall be calibrated as per manufacturers' specifications in line with national/international standards.
D.2.1.b	Low	QA/QC procedures are planned in line with the ISO requirements. (JK Lakshmi Cements Limited is an ISO 9001, 14001, 18001 certified company). Scale shall be calibrated as per manufacturers specifications in line with national/international standards.

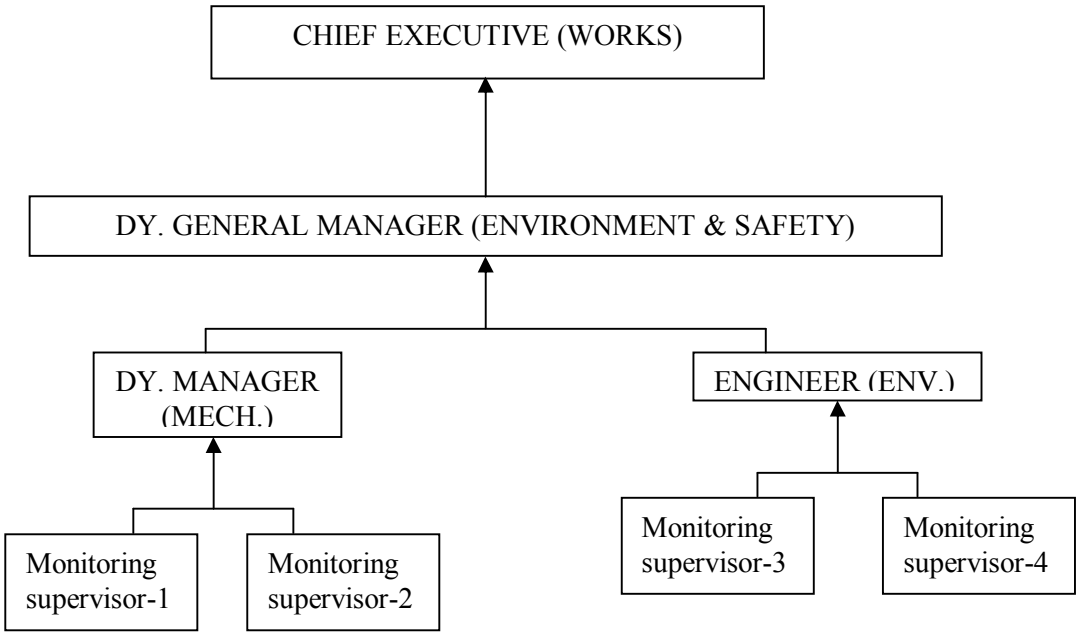
D.2.1.c	Low	QA/QC procedures are planned in line with the ISO requirements. (JK Lakshmi Cements Limited is an ISO 9001,14001,18001 certified company).
D.2.1.d	Low	Data shall be calculated monthly, and reported
D.2.1.e	Low	While IPCC fractions are reliable defaults, the project proponent should validate these default values
D.2.1.f	Low	Data shall be calculated monthly, and reported.
D.2.1.g	Low	Data shall be calculated monthly, and reported
D.2.1.h	Low	QA/QC procedures are planned in line with the ISO requirements. (JK Lakshmi Cements Limited is an ISO 9001,14001,18001 certified company).
D.2.1.i	Low	QA/QC procedures are planned in line with the ISO requirements. (JK Lakshmi Cements Limited is an ISO 9001, 14001, 18001 certified company).
D.2.1.j	Low	JKLCL is an ISO 9001 certified company and has records in place for verifying this data.
D.2.1.k	Low	While IPCC fractions are reliable defaults, the project proponent should validate these default values.
D.2.3.a	Low	QA/QC procedures are planned in line with the ISO requirements. (JK Lakshmi Cements Limited is an ISO 9001,14001,18001 certified company).
D.2.3.b	Low	Data shall be calculated monthly, and reported.
D.2.3.c	Low	Data shall be calculated monthly, and reported.
D.2.3.d	Low	While IPCC fractions are reliable defaults, the project proponent should validate these default values
D.2.3.e	Low	Data shall be calculated monthly, and reported.
D.2.3.f	Low	Data shall be calculated monthly, and reported.
D.2.3.g	Low	Data shall be calculated monthly, and reported.

* QA/QC procedures should cover scope, responsibility, sampling of data, frequency of measurements, assumptions (if any), calibration frequency of instruments used (and status of calibration), and calculation/estimation/testing methods.

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

>>

JKLCL has an established environmental management and monitoring cell. The monitoring activities pertaining to the project would fall under purview of Environmental management cell. Following diagram shows the reporting structure of this cell.



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

>>

JK Lakshmi Cements Limited (JKLCL)

Jaykaypuram, District Sirohi

Rajasthan., India. Pin code – 307019

Fax: +91-2971-244417

JKLCL is also project participant as mentioned in Annexure 1

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

Following are sample calculations. For details, please refer Enclosure-1

1. Heat input from alternative fuels

Biomass fuel will be consumed

Unit-2 = 75000 tonnes

Unit-3 = 75000 tonnes

Heating value of biomass fuel = 0.013 TJ/ton of fuel

$$HI_{AF} = \sum Q_{AF} \times HV_{AF}$$

Where:

HI_{AF} = heat input from alternative fuels (TJ/yr)

Q_{AF} = quantity of each alternative fuel (tonnes/yr)

HV_{AF} = lower heating value of the alternative fuel(s) used (TJ/tonne fuel).

Heat Input from alternative fuel for Kiln-2

$$HI_{AF} = (75000 \times 0.013)$$

= 940.50 TJ/annum

Heat Input from alternative fuel for Kiln-3

$$HI_{AF} = (75000 \times 0.013)$$

= 940.50 TJ/annum

2. Estimate project specific moisture "penalty"

$MP_Y = C_{Pr,y}$ X ($HC_{AF} - HC_{FF}$)

MP_Y = 1386000 X (0.00303 -0.00301)

MP_Y = 31.68 TJ/yr

Where:

MP_Y moisture penalty (TJ/yr) for year y
$C_{Pr,y}$ is the clinker production for year y
HC_{AF} is the specific fuel consumption on project case (TJ/tClinker) in year y
HC_{FF} is the specific fuel consumption in the baseline when only fossil fuel is used, in tJ/tClinker

$$HC_{AF} = \frac{\left(\sum Q_{FF,\mathrm{Pr}} \times HV_{FF}\right) + HI_{AF}}{(C_{\mathrm{Pr}})}$$

Where:

$Q_{FF,Pr}$ is the quantity of fossil fuel used in the project case
HV_{FF} is the lower heat value of the fossil fuel used (TJ/tonne)
HI_{AF} is heat input from alternative fuels (TJ/yr) in project case;
C_{Pr} is the production of clinker in the project case; and

For Kiln-2

$$HC_{AF} = \frac{(95955 X 0.034) + 940.50}{1386000}$$

$HC_{AF} = 0.00303$

$$HC_{FF} = \frac{(122685 X 0.0034)}{(1386000)}$$

For Kiln-3

$$HC_{AF} = \frac{(95955 X 0.034) + 940.50}{1386000}$$

$HC_{AF} = 0.00303$

$$HC_{FF} = \frac{(122685 X 0.0034)}{(1386000)}$$

$HC_{FF} = 0.00301$

$Q_{FF,Ba}$ is the quantity of fossil fuel used in the baseline case

HV_{FF} is the lower heat value of the fossil fuel used (TJ/tonne) used in the baseline (it would be the same as project case if the fossil fuel used in the project case is same as that in the baseline)
C_{Bl} is the clinker production in the base case corresponding to the $Q_{FF,Ba}$

3 Calculate GHG emissions from the use of alternative fuels in kilns:

Being a Carbon neutral fuel GHG emission on fuel burning is **zero**

5. Calculate GHG emissions due to preparation of alternative fuels

Not Applicable

E.2. Estimated leakage:

>>

Leakages have been calculated for emissions due to difference in off site transportation of biomass and the quantity of petcoke replaced (for values refer Enclosure-1). Leakages due to anaerobic decomposition of biomass on disposing at landfill site or due to uncontrolled burning have not been considered in the calculations as per conservativeness approach. The leakages have been reduced for calculating net green house gases emission reductions.

Calculate emissions from off-site transport of alternative and fossil fuels.

The emissions from transportation should be calculated as follows:

$LK_{trans} = LK_{AF} - LK_{FF}$

$LK_{AF} = (Q_{AF}/CT_{AF}) * DAF * EFCO2e/1000$

$LK_{FF} = (Q_{FF}/CT_{FF}) * D_{FF} * EF_{CO2e}/1000$

Where:

LK_{trans} = leakage from transport of alternative fuel less leakage due to reduced transport of fossil fuels (tCO_2/yr)
LK_{AF} = leakage resulting from transport of alternative fuel (tCO_2/yr)
LK_{FF} = leakage due to reduced transport of fossil fuels (tCO_2/yr)
Q_{AF} = quantity of alternative fuels (tonnes)
CT_{AF} = average truck or ship capacity (tonnes/truck or ship)
D_{AF} = average round-trip distance between the alternative fuels supply sites and the cement plant sites (km/truck or ship)
Q_{FF} = quantity of fossil fuel (tonnes) that is reduced due to consumption of alternative fuels.
CT_{FF} = average truck or ship capacity (tonnes/truck or ship)

D_{FF} = average round-trip distance between the fossil fuels supply sites and the cement plant sites (km/truck or ship)

EF_{CO2e} = emission factor from fuel use due to transportation (kg CO_{2e}/km) estimated as:

$EF_{CO2e} = EFT_{CO2} + (EF_{T\,CH4} * 21) + (EF_{T\,N2O} * 310)$

Where:

$EF_{T\,CO2}$ = emission factor of CO_2 in transport (kg CO_2/km)

$EF_{T\,CH4}$ = emission factor of CH_4 in transport (kg CH_4/km)

$EF_{T\,N2O}$ = emission factor of N_2O in transport (kg N_2O/km)

21 and 310 are the Global Warming Potential (GWP) of CH_4 and N_2O respectively.

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

>>

Project emissions = 126 tCO2e/annum

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

>>

Calculate the baseline GHG emissions from the fossil fuel(s) displaced by the alternative fuel(s)

$$FF_{GHG} = [(Q_{AF} \times HV_{AF}) - MP_{TOTAL}] \times EF_{FF}$$

Where:

FF_{GHG} = GHG emissions from fossil fuels displaced by the alternatives (tCO_2/yr)

$Q_{AF} * HV_{AF}$ = total actual heat provided by all alternative fuels (TJ/yr)

MP_{total} = total moisture penalty (TJ/yr)

EF_{FF} = emissions factor(s) for fossil fuel(s) displaced (tCO_2/TJ).

$$FF_{GHG} = [(940.50) - 31.68] \times 100.83$$

For Kiln-2

= 91,639tons CO_2/annum

For Kiln-3

$$FF_{GHG} = [(940.50) - 27.72] \times 100.83$$

= **91,639 tons CO_2/annum**

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

>>

Emission Reduction = Baseline emissions – Project Emissions

Kiln-2 = 91,639 – (126/2)

= 91,576 ton CO_2/annum

Kiln-3 = 91,639 – (126/2)
= 91,576 ton CO_2/annum

The total emission reduction due to project activity would be **183,512**tons of CO_2 per annum.

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

>>

CO2 emission reduction table

Year	**Estimated CER**	
	Kiln 2	**Kiln 3**
2007-08	91,576	91,576
2008-09	91,576	91,576
2009-10	91,576	91,576
2010-11	91,576	91,576
2011-12	91,576	91,576
2012-13	91,576	91,576
2013-14	91,576	91,576
2014-15	91,576	91,576
2015-16	91,576	91,576
2016-17	91,576	91,576
Total estimated reductions (tonnes CO_2 equ.) for each kiln	**915,760**	**915,760**
Total estimated reductions (tonnes CO_2 equ.)	**1,835,120**	
Total no of Crediting Years	**10 years**	
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**183,512**	

SECTION F. Environmental impacts

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

>>

The project activity does not fall under categories both in terms of scope and budget which require mandatory environmental impact assessment study for obtaining clearance from host country. However meticulous examination has been done for assessing the impacts of project activity, if any on environment. There would be no transboundary impacts of the project activity.

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

>>

There would be no significant environmental impact of the project activity. The project activity does not require mandatory environmental impact assessment study for getting approvals from host party.

SECTION G. Stakeholders' comments

>>

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

>>

Stakeholders identified for the project are local people including biomass dealers, local villagers, farmers etc. Project proponent had organised a meeting at its premises in presence of stakeholders including local villagers, representatives of gram panchayat and biomass dealers. Stakeholders were invited by JKLCL personally for this meeting. Officials of JKLCL informed stakeholders present about the project activity and invited comments from them on any issues associated with the project activity. List of the participants and minutes of meeting are available with JKLCL for verification by DOE.

G.2. Summary of the comments received:

>>

Stakeholders have been informed about the project activity by representatives of JKLCL. Stakeholders appreciated JKLCL efforts of using waste biomass for burning in kiln. Questions regarding the calorific value of biomass, mode of transportation and its benefits to local people were raised, which were answered satisfactorily by JKLCL representatives. It was informed that local villagers will get suitable monetary benefits upon lifting of biomass from their fields.

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

>>

Minutes of stakeholder consultation meeting had been prepared (can be verified by DOE). Question regarding the benefits associated with project to stakeholders were answered and it has been assured that villagers would get appropriate money paid for biomass that would be lifted from their fields.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	JK Lakshmi Cements Limited
Street/P.O.Box:	Jaykaypuram
Building:	
City:	District Sirohi
State/Region:	Rajasthan
Postfix/ZIP:	307019
Country:	India
Telephone:	91 2971 242267
FAX:	91 2971 244417
E-Mail:	naveensharma@lc.jkmail.com
URL:	www.jklakshmi.com
Represented by:	
Title:	Dy. General Manager (Environment & Safety)
Salutation:	Mr.
Last Name:	Sharma
Middle Name:	
First Name:	Naveen
Department:	Environment & Safety
Mobile:	+91-9414545739
Direct FAX:	91 2971 244417
Direct tel:	-
Personal E-Mail:	naveensharma@lc.jkmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project activity.

Annex 3
Baseline information

Please refer to enclosure 1 for baseline information.

Annex 4

MONITORING PLAN

Description of the Monitoring Plan

The Monitoring and Verification (M&V) procedures define a project-specific standard (baseline of historical emissions) against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria will be monitored and verified. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emissions with specific focus on specific energy consumption parameters. It also allows scope for review, scrutinize and benchmark all this information against reports pertaining to M & V protocols.

The M&V protocol provides a range of data measurement, estimation and collection options/techniques in each case indicating preferred options consistent with good practices to allow project managers and operational staff, auditors, and verifiers to apply the most practical and cost-effective measurement approaches to the project. The aim is to enable this project have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to direct and support continuous monitoring of project performance/key project indicators to determine project outcomes, greenhouse gas (GHG) emission reductions.

The project activity proposes to employ monitoring and control equipment in the kilns that will measure, report, monitor and control the quantity of alternative fuel used. Further the project activity would measure calorific values and carbon content in the fossil & biomass fuels.

The instrumentation and control system is the key factor for salubrious functioning of any monitoring and verification system of a CDM project activity. Taking these issues into considerations, JKLCL has proposed adequate and apt instruments like weighing feeders for the project activity, to control and monitor various operating parameters for safe, effective & efficient operations of the kiln system.

JKLCL has also proposed arrangements with in house laboratory for quality analysis of the fossil & biomass fuels used in kilns.

The proposed instrumentation system comprises of microprocessor-based instruments like weigh feeders, that adheres the required specifications and of best accuracy levels. The instruments will be calibrated and marked at regular intervals ensuring the accuracy of measurements always. The calibration frequency too is a part of the monitoring and verification parameters.

Project boundary and GHG sources

The Project boundary covers all processes involved in production of clinker. Specific consideration has been given to units involved in pyro processing particularly the kiln for estimation of GHG reduction.

GHG emission sources of the project

Direct on-site emissions

The project use eco-friendly biomass as fuel. The GHG emissions (mainly CO_2) from the biomass combustion process are consumed by plant species during photosynthesis representing a cyclic process. Hence biomass is CO_2 neutral fuel and results in no net increase of CO_2 in the atmosphere.

The biomass contains negligible quantities of other elements like Nitrogen, Sulphur etc., Hence release of other GHGs are considered as negligible. The biomass required would be stored in storage places for short period. Hence there would be no methane emissions associated with storage.

The project activity partially displaces the fossil fuels pet coke in this case by biomass. Hence, the direct on-site emission source of the project is combustion of pet coke in the kiln, which would lead to CO_2 generation. In order to arrive at the actual CERs due to the project activity, the difference in the CO_2 generation from fossil fuel combustion in pre-project & post project scenario is calculated.

Indirect on-site emissions

There would be no indirect on site emissions from the project activity.

Direct off site emissions

The direct off-site emissions of the project activity arise from the biomass transport. The biomass will be transported from near by fields by means of trucks & tractors to the JKLCL's premises. However in the baseline scenario CO_2 emissions would occur during the transportation of pet coke, coal (reduced by the proposed project activity) from the refinery & mines to the same JKLCL's premises. Both these emissions are taken into account.

Key Project parameters affecting emission reduction claims

Quantity and Quality of the biomass used in the kiln as fuel

The biomass received from various farmers & dealers would be stored in the storage depots. The biomass from depots will then be brought to storage areas at plant where it would be fed to the dump hopper and from the dump hopper, the biomass is transferred to the weigh feeders with the help of gravity. The weigh feeder of high accuracy level will measure the quantity of biomass fed to kiln and recorded.

The weighing system needs to be calibrated regularly to ensure the accuracy of the measurement. The data will be recorded for further verification. The amount of biomass purchased, will be based on invoices / receipts from fuel contractors.

The properties of the biomass from ultimate analysis, calorific value, ash composition etc. will be consistent in the region. However, it is proposed to monitor various quality parameters of alternative fuels, by taking samples at random and tested by reputed laboratory as per international practices and data or documents would be kept open for verifiers.

Monitoring

The CDM mechanism stands on the quantification of emission reduction and keeping the track of the emissions reduced. The project activity reduces the carbon dioxide whereas an apt monitoring system ensures this reduction is quantified and helps maintaining the required level. The monitoring system brings about the flaws (if any are identified) in the system and opens up always, opportunities for correction in the CER calculations.

Monitoring Approach

The general monitoring principles are based on:

- Frequency
- Reliability & Maintenance
- Registration and reporting

Frequency of monitoring

The emission reduction units from the project activity are determined by reduction of usage of fossil fuels for clinker burning. It becomes vital for the project activity to monitor the quantity of fossil / biomass fuels used in the kiln. JKLCL has kiln monitoring system, which will continuously measure, monitor and record many parameters like clinker produced, amount of pet coke, coal used etc. The quantity of biomass fuel fed to the kiln are measured individually and reported continuously. The over view of kiln monitoring system is shown below. The quality of the pet coke, coal is monitored daily.

Reliability and Maintenance

The measurement devices of the project activity are weigh feeders of microprocessor based (in case of biomass, petcoke, coal, clinker) with best accuracy, standards and procured from reputed manufacturers

and calibrated. Since the reliability of the monitoring system is governed by the accuracy of the measurement system, the measuring instruments must be calibrated once a year for ensuring reliability of the system. All instruments carry tag plates, which indicate the date of calibration and the date of next calibration.

The quality of fossil /biomass fuels is tested as per international & best practices at reputed labs. Moreover all the fuel purchase figures are audited by the statutory regulations laid by Government of India. These are also reflected in the audited annual balance sheet. The amount of emission reduction units is proportional to the net fossil fuel replaced in the project. Thus, the clinker production and fuel consumed are the key variable for the project. These figures are audited by the statutory regulations laid by Government of India. These are also reflected in the audited annual balance sheet.

The monitoring equipments shall be maintained properly and in line with the best practices to avoid any maintenance related problems during life cycle of the project activity.

Reporting and Data Storage.

Data monitored by monitoring supervisors shall be reported to Engineer-Environment on daily basis. Engineer- Environment shall prepare the report of monitored data on monthly basis, which in turn shall be reviewed by Deputy General Manager (Environment & Saftey) and finally report to Chief Executive (Works). The data monitored during the project cycle shall be stored electronically and kept for at least crediting period + 2 years.

Training

Training programs shall be organised at plant location to educate personnel about green house gases emissions and reduction of emissions by using biomass in the kilns. Specific training programs shall be imparted to fire biomass in pyro processing.

Emergency Plan

There shall be no unintended emissions foreseen due to the project activity. Emergency plan has been prepared by JKLCL in line with ISO procedures to handle situation of emergency breakdowns.

Appendix i

Abbreviation

CDM	Clean development mechanism
CER	Certified emission reduction
CMA	Cement manufacturers association
CO_2	Carbon dioxide
CPP	Captive Power Plant
Distt	District
EIA	Environment impact assessment
Equ	Equivalent
Gcal	Giga calories (10^9 calories)
GHG	Greenhouse gas
IPCC	Inter governmental panel on climate change
IRR	Internal Rate of Return
Km	Kilometer
KWh	Kilo watt hour
MNES	Ministry of Non-conventional Energy Source
MoEF	Ministry of Environment & Forest
MTPA	Million tonne per annum
PDD	Project design document
p.a.	Per annum
INR	Indian rupees
ISO	International Standard Organization
Sp	Specific
UNFCCC	United Nations Framework Convention on Climate Change
JKLCL	JK Lakshmi Cement Limited

Appendix ii

References

Sl. No.	Particulars of the references
1	Kyoto Protocol to the United Nations Framework Convention on Climate Change
2	Website of United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
3	UNFCCC document: 'GUIDELINES FOR COMPLETING CDM-PDD, CDM-NMB and CDM-NMM'-Version 04
4	UNFCCC document: CLEAN DEVELOPMENT MECHANISM, PROJECT DESIGN DOCUMENT FORM (CDM-PDD), VERSION 02 - IN EFFECT AS OF: 1 JULY 2004)
5	Cement Statistics 2005, Cement Manufacturers Association (CMA)
6	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual
7	www.ceaindia.nic

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