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

CONTENTS

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:

>>
"Switching fossil fuel in an industrial facility" by The Kerala Ceramics Ltd, Kerala
Version 01
Date: 28/08/2007

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

>>
The Kerala Ceramics Limited (TKCL), Kundara belongs to public sector; the plant manufactures KAOLIN – the commercial name of Aluminium Silicate – predominantly used by paper mills. The plant is located at Kanjirakode, Mulavana Village, Kundara, Quilon Taluk and District, Kerala State.

The installed capacity of TKCL is 24,000 MT of Kaolin production per Annum uses both thermal and electrical energy for its process requirements. Electric power requirements are met from KEB supply while thermal energy is sourced from combustion of High Sulphur Diesel (HSD).

HSD is fired in an INDAID make, Direct Mixing Type, Horizontal, Cylindrical, and Balanced Draught Furnace. Atmospheric Air is mixed with flue gas at appropriate ratio for achieving a temperature of about 400°C. This flue gas is used for Spray Drying of Kaolin Slurry (moisture > 40 %) to Kaolin Powder (moisture < 1 %).

It is proposed to install a Biomass (Empty Palm Fruit Bunches) fired Hot Air Generator for supplying hot air to the Spray Drier which displaces use of HSD as fuel. The project activity results into reduction in GHG emissions associated with HSD burning.

Project's contribution to Sustainable Development

Social well being:

The project activity helps in reduction of GHG emissions which otherwise would have generated from HSD burning in Draught Furnace. It also helps in conservation of fossil fuel resources i.e. HSD contributing towards energy security of the nation to some extent.

Social and economic benefits by generating employment for the deprived segment of the society at the rural level (which is major concern in India) for collection, processing and supply of the biomass

Economic well being:
Since this project activity is first of its kind to be started in a Kaolin industry, successful implementation will encourage similar kind of projects and funding for R&D of technological improvements.

The project has opened up business opportunities for the local agro-based industries and biomass suppliers.

Environmental well being:

Activities during construction & operation did not affect the bio-diversity in the region. There is no impact on soil, water quality, due to the project. Use of biomass in place of fossil fuel has also helped in conservation of the natural resource. Avoidance of HSD as a fuel helps in reduction of Greenhouse gas emissions.

The project thus is an environmentally friendly initiative.

Technological well being:
Technologically the project install a Biomass (Empty Palm Fruit Bunches) fired Hot Air Generator for supplying hot air to the Spray Drier. This technology is innovative, environmentally friendly and can be implemented with local technological know how, though it is not widely practiced in the industry. The project developer has successfully implemented the technology at their chemical plant and hopes that this will encourage others to adopt similar environment friendly technology. The project would thus enable promotion of sustainable development.

Thus the project is in accordance with interim approval criteria suggested for sustainable development by the DNA in India i.e. Ministry of Environment & Forest, Government of India for CDM projects.

A.3. Project participants:

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Name of Party involved (*) ((Host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ministry of Environment and Forest, Government of India (Host Country)	The Kerala Ceramics Limited (Private Entity, Project participant)	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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A.4.1.1. Host Party(ies):

>>
India

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

>>
Kerala State

A.4.1.3. City/Town/Community etc:

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Kanjirakode, Mulavana Village, Kundara, Kollam Taluk & District

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

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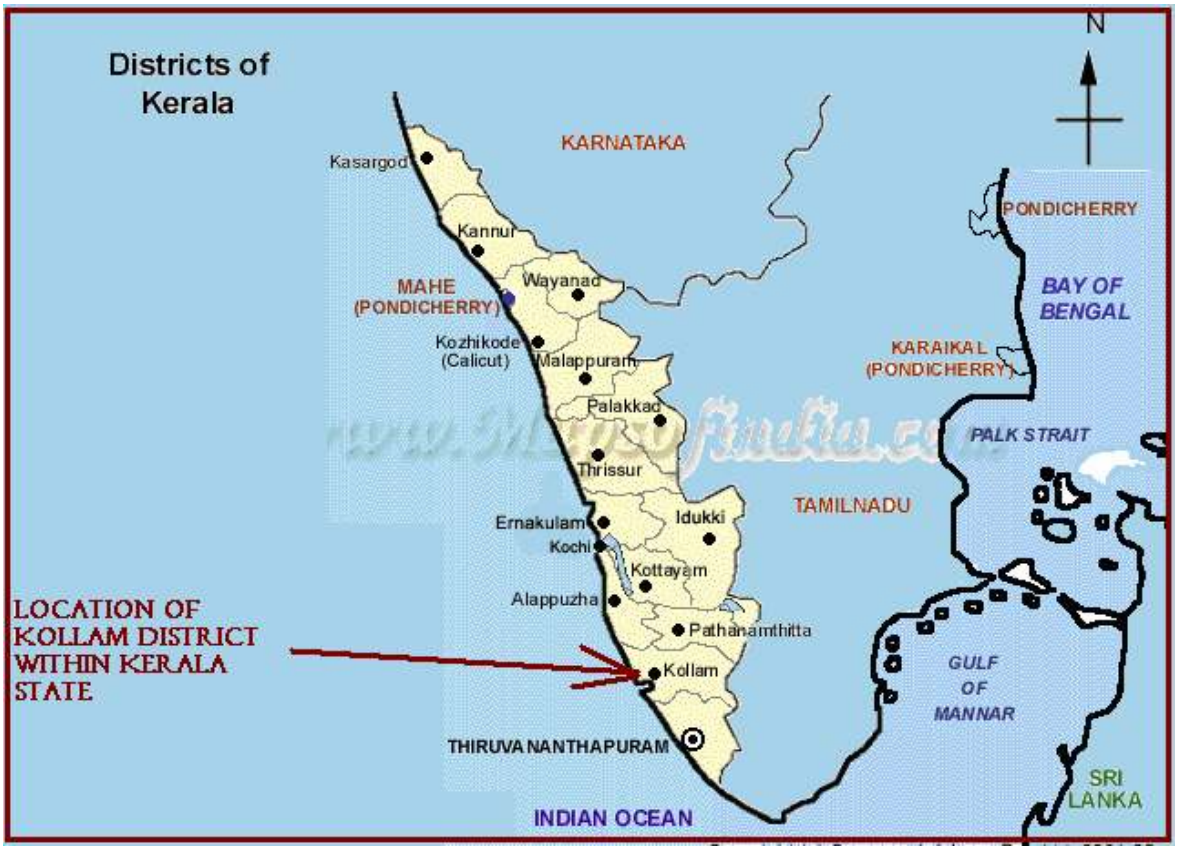
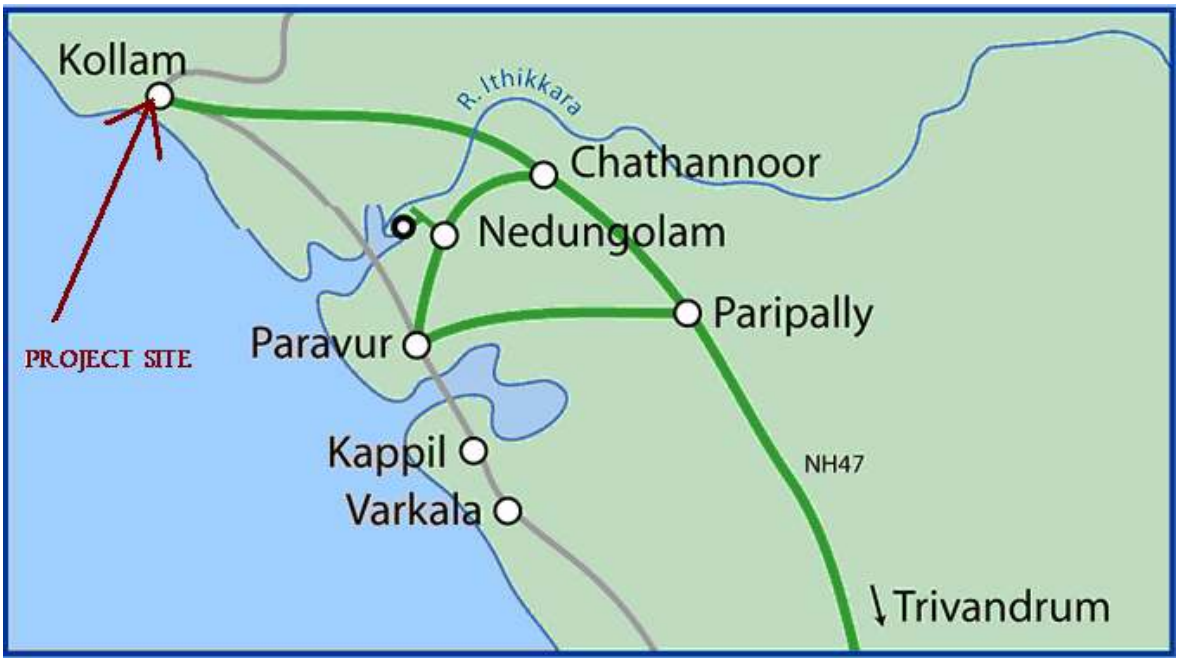
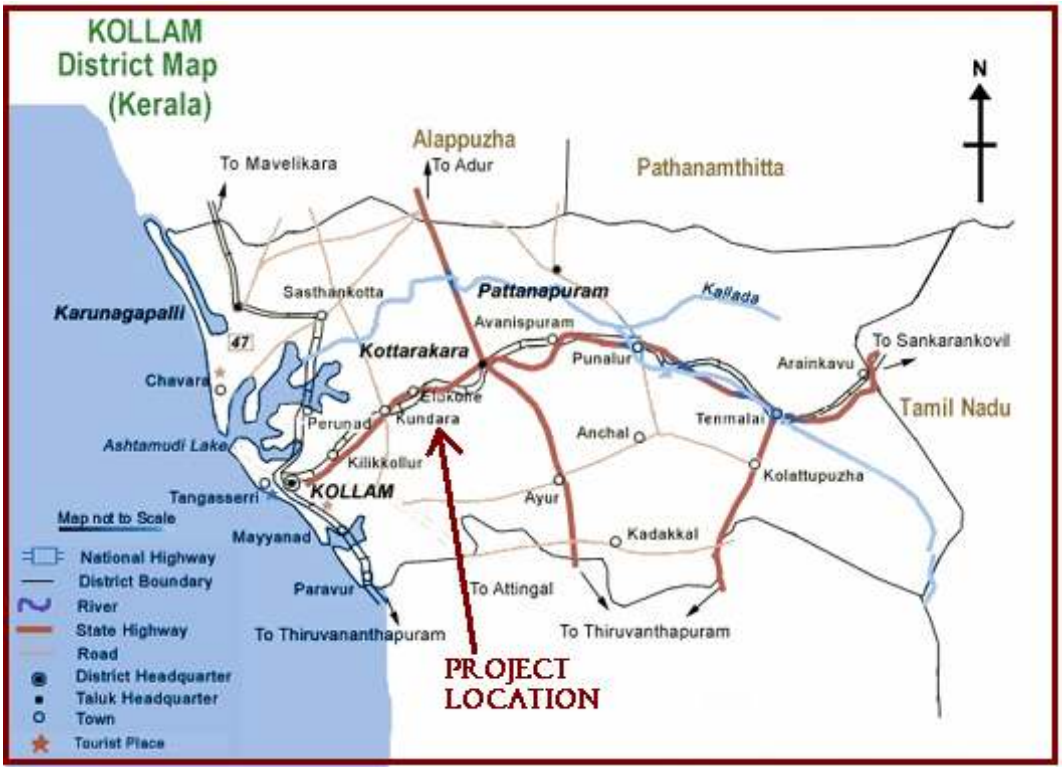
Type of road passing through the site – Kollam-Thirumangalam NH-205
Distance from the National Highway - 2 km
Nearest Railway Station and Distance - Kundara, 2 km
Nearest Port and Distance - Kochi, 160 km
Latitude and Longitude of the location: 8.54N and 76.38E







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

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Type and Category

The proposed CDM project activity implemented by TKCL is, "Switching of fossil fuel from High Sulphur Diesel (HSD) to Biomass for thermal energy generation at The Kerala Ceramics Ltd. at Kanjirakode, Kerala" implemented in the utility area of the Kaolin production factory is a fuel switching measure primarily aimed at reducing the GHG emissions. The project activity applies the approved baseline methodology as defined in Appendix – B of the Simplified modalities & procedures for Small-scale CDM project activities

Project Type: I – Renewable Energy Projects
Project Category: C – Thermal energy for the user with or without electricity, Version: 11 (EB 32)

Technology description

TKCL is prepared for setting up of 1 No. of biomass based Hot Air Generator to cater the process requirement of The Kerala Ceramics Ltd (TKCL), Kundara. It is proposed to install a Biomass (Empty Palm Fruit Bunches) fired Hot Air Generator for supplying hot air to the Spray Drier. The Empty Palm Fruit Bunches (EPFB) is available as process waste at Oil Palm India Ltd., (OPIL) Punalur located near TKCL.

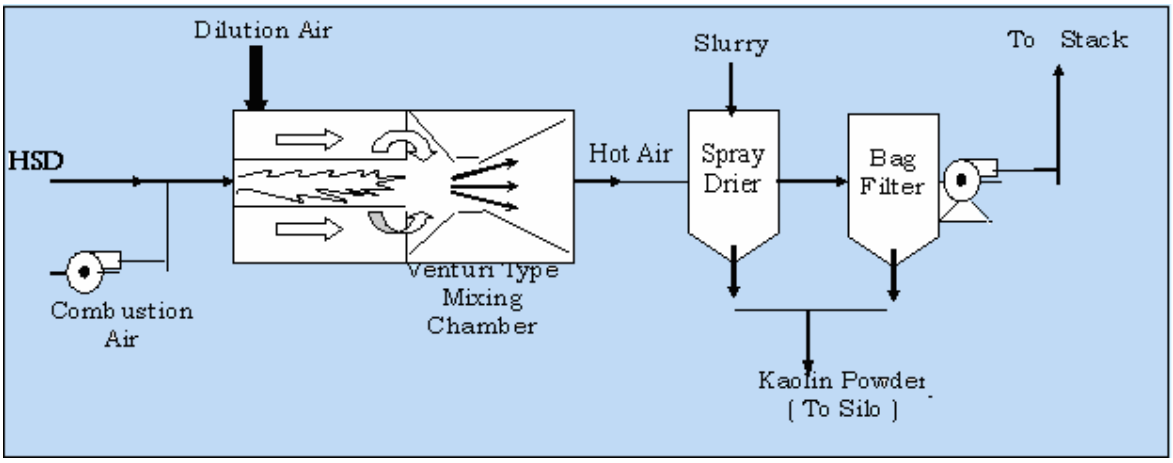
Existing method of Hot Air Generator:

TKCL employs a HSD fired, Direct Mixing type, Hot Air Generator for spray drying Kaolin slurry. The plant has 1 number of INDAID make, Direct Fired Hot Air Generator capable of generating 35,000 kg / h of hot flue gas at 400°C

The Hot Air Generator essentially consists of two concentric shells and a Venturi type mixing chamber. The inner chamber is lined with refractories and acts as a Combustion chamber. A Wesman make oil burner fires directly in the inner chamber producing hot flue gas. Dilution air is provided through the annular space of the concentric shell for mixing up with the products of combustion at the Venturi type mixing chamber.

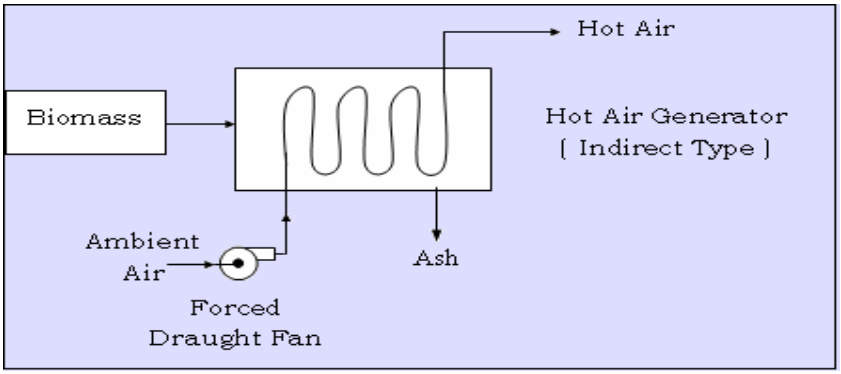
The Hot Air mixed with the flue gas is then conveyed to the Spray Drier. Provision for letting out the products of combustion during the initial lighting up period has been made with a short stock of chimney (Provided with Damper) located at the outlet of the Hot air generator.

The schematic of the existing HAG is depicted below:



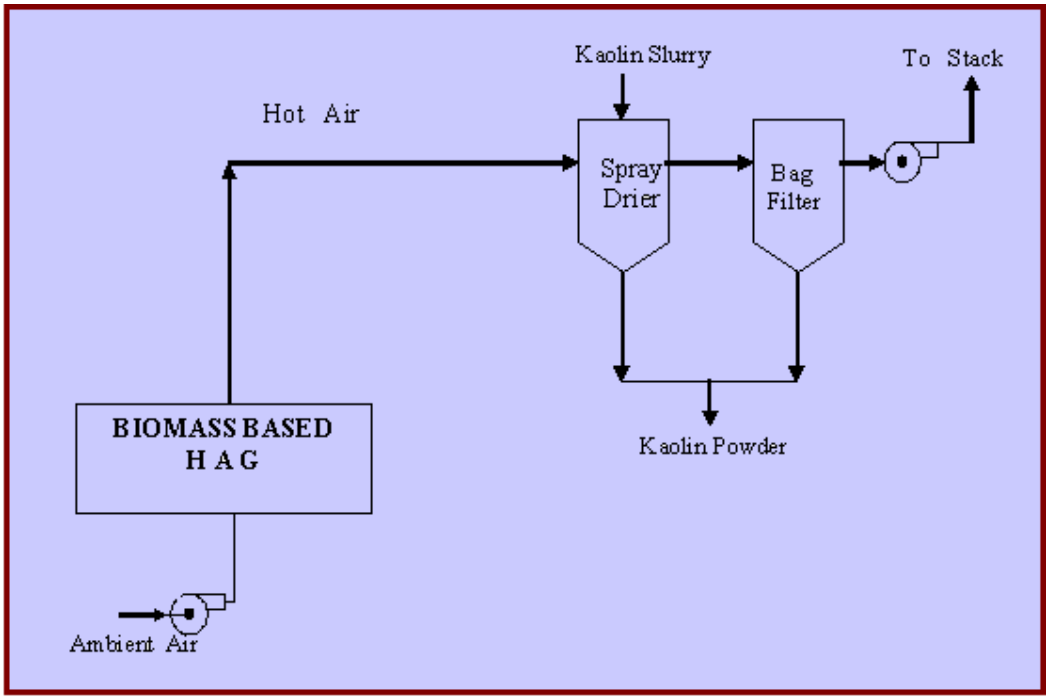
Proposed System for Hot Air Generation

In order to offset the fossil fuel emissions and to minimize the presence of contaminants in flue gas, it is envisaged to adopt a Biomass Fired, Indirect Type, and Hot Air Generator. The schematic of the proposed system is shown below:



Details of proposed project:

- Adoption of Biomass based Hot Air Generator replacing HSD based system
- Biomass Proposed: Empty Palm Fruit Bunches
- Operation: Generation of hot air through Heat Exchanger with the hot gas produced in Agro Fuel fired furnace
- Rating : 2.5 million kcal / h
- Quantity of Hot Air : 35,000 kg / h
- Inlet Air Temperature : 30°C
- Required Outlet Temperature: Upper limit: 450°C - Lower Limit: 350°C



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

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The total emission reductions by the project activity over the fixed crediting period (10 years) are expected to be as under:

Years	Annual estimation of emission reductions in tonnes of CO2 e
2008	5,270
2009	5,270
2010	5,270
2011	5,270
2012	5,270
2013	5,270
2014	5,270
2015	5,270
2016	5,270
2017	5,270
Total estimated reductions for the crediting period	**52,700**
Total number of crediting years	**10y-0m**
Annual average over the crediting period of estimated reductions (tones of CO2 e)	5,270

In the above table, the year 2008 corresponds to the period starting from 01.01.2008 to 31.12.2008. Similar interpretation shall apply for remaining years.

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

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No public funding, as part of project financing from the parties included in Annex I of the convention, is involved in the project activity.

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

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According to Appendix C of the simplified modalities and procedures for small-scale CDM project activities, the TKCL small-scale renewable energy project is not part of a larger emission-reduction project. This affirmation is based on the fact that the project participants have not registered or operated any other project in the region surrounding the project boundary.

The project activity is not a debundled component of a large project activity, as the project proponents have not registered or applied to register any other small-scale project activity:

- in the same category, and
- with the same project participants;
- within the previous 2 years;
- whose project boundary is within 1 km of the project boundary of the proposed small scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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Please refer to the UNFCCC CDM web site for the most recent list of the small-scale CDM project activity categories contained in Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

The project activity applies the approved baseline methodology as defined in Appendix – B of the Simplified modalities & procedures for Small-scale CDM project activities
Project Type: I – Renewable Energy Projects
Project Category: C – Thermal energy for the user with or without electricity, Version: 11 (EB 32)

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

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Justification for the choice of the applicable baseline methodology

Paragraph1 of Type-I.C- Thermal energy for the user with or without electricity of appendix B of the simplified M&P for small-scale CDM project activities states that:

"This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass-based co-generating systems that produce heat and electricity are included in this category".

At this project site, thermal energy is the major utility in the plant, which is generated by combustion of GHG emitting fossil fuel (HSD). Through this project activity, HSD is displaced by biomass called Empty Palm Fruit Bunches, which will reduce the anthropogenic GHG emissions. As the project has incorporated renewable energy technology which provides thermal energy to the industrial facility and displaces usage of fossil fuels hence it meets the applicability condition of the methodology.

The choice of methodology is appropriate for the project activity and is justifiable as it meets the applicability conditions which are demonstrated as follows:

Where thermal generation capacity is specified by the manufacturer, it shall be less than 45MW.	The thermal energy generation capacity of the project activity is 2.907 MW. So, the project activity meets this applicability criterion.
For co-fired systems the aggregate installed capacity (specified for fossil fuel use) of all systems affected by the project activity shall not exceed 45MWth. Cogeneration projects that displace/ avoid fossil fuel consumption in the production of thermal energy (e.g. steam or	As the project activity utilizing only biomass as fuel and only thermal energy is generated so, it is not applicable.

process heat) and/or electricity shall use this methodology. The capacity of the project in this case shall be the thermal energy production capacity i.e. 45 MWth.	
In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should be lower than 45 MWth and should be physically distinct from the existing units.	As the project activity is a green-field project so, it is not applicable.

As stated above, the project activity meets applicability conditions of the Category I.C. This justifies the appropriateness of the choice of the methodology in context of the project activity and its certainty in leading to a transparent and conservative estimate of the emission reductions directly attributed to the project activity.

B.3. Description of the project boundary:

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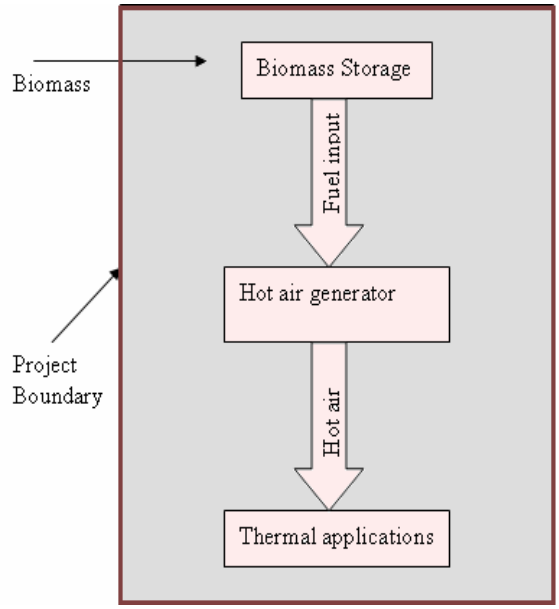
As mentioned in the Appendix B of Simplified Modalities & Procedures for Small-scale projects, the project boundary encompasses the physical, geographical site of the renewable energy generation. "The project boundary is the physical, geographical site where the thermal energy generation affected by the fuel-switching measure occurs."

As the project activity involves GHG minimization in thermal energy generation, therefore project boundary includes thermal energy generation area. GHG emissions, with and without the proposed project, are shown below:



B.4. Description of baseline and its development:

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As per the methodology AMS.I.C "baseline for renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used".

According to the methodology the renewable energy technology displaces technologies using fossil fuel and also in absence of the project activity the project proponent would have continued meeting its thermal energy requirement by utilizing HSD for hot air generation. Thus, the baseline emission comprises emissions emanating from usage of HSD for hot air generation.

Estimation of Baseline Emissions

In the absence of project activity, emissions in the baseline would generate due to combustion of HSD for thermal energy generation. In the project activity, TKCL is using biomass as fuel displacing use of the HSD.

Therefore baseline emissions are the emissions from the consumption of HSD, which are computed based on the following formulae:

$$\mathbf{BE_y = Q_{HSD} * COEF_{HSD}}$$

Where:

BE_y=Baseline emissions in the year y, tCO2e/y

Q_{HSD}=Quantity of HSD saved on account of biomass burning in the year y, KL

$COEF_{HSD}$=Carbon emission factor of HSD, tCO2e/KL

$$\mathbf{Q_{HSD} = Q_{Biomass} * NCV_{Biomass} / NCV_{HSD}}$$

Where;

Q_{HSD}= Quantity of HSD saved on account of biomass burning in the year y, KL

NCV_{HSD}= Net Calorific value of HSD, kcal/lit

$Q_{Biomass}$= Quantity of Biomass utilized in the year y, Tonnes

$NCV_{Biomass}$=Net Calorific value of Biomass, kcal/kg

$$\mathbf{COEF_{HSD} = NCV_{HSD} * K * OXID * EF_{HSD} / 1000 / 1000}$$

Where;

$COEF_{HSD}$=Carbon emission factor of HSD, tCO2e/KL

NCV_{HSD}= Net Calorific value of HSD, kcal/l

K=Conversion factor = 4.187, kJ/kcal

OXID= Oxidation factor for HSD, 1

EF_{HSD}=Emission factor for HSD, tCO2e/ TJ

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:

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In absence of the proposed CDM project activity, the plant would have continued use of HSD in the hot air generator, which would have continued emission of GHG gases (CO_2, CH_4 and N_2O). In this project, displacing fossil fuel by biomass reduces emission of GHG gases.

The proposed project activity is additional (using attachment A to appendix B of the simplified M&P for small-scale CDM project activities) because the project activity would not have occurred anyway due to the following barriers:

The main driving force to this 'Climate change initiative' is: - substitution fossil fuel quantities on account of generation of thermal energy with renewable biomass. However, the project proponent was aware of the various barriers associated to project implementation. But it is realized 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:

Prior to the project activity the plant was running on HSD for meeting its thermal energy requirement. The management was also in dilemma during the time of conception of the project due to drastic increase of HSD price and also there was a considerable uncertainty regarding not only the continuous availability of biomass but also for increasing price trend of biomass. The project proponent also faced the investment risk w.r.t the capital cost while retrofitting existing facilities with new equipments like installation of gasifier system for new HAG unit including fuel/ash handling systems along with its accessories is a major barrier for them as it resulted in huge additional investment.

To execute the biomass based aforesaid project activity TKCL had incurred huge investments. The hot air generators have been specially designed for burning biomass as the primary fuel. As TKCL is required to maintain huge inventory of biomass (as the biomass requirement for the plant is very large) investments were made in acquisition of land and construction of storage house for biomass storage. The project proponent had to invest in acquisition of land especially for storing biomass resulting into additional capital investment. Due to this TKCL had to incur an additional cost due to storage, transportation and supervision of biomass (the cost comprises of unloading in the warehouse/ yard, loading on trucks, transport from yard to factory and supervision in the yard).

Under these circumstances it was an ordeal to raise capital for the initial investments required by this project. The TKCL management chose to take up the additional investment risk in anticipation of financial support from the CDM revenue.

Technological barrier:

TKCL even before the implementation of the project activity had anticipated hurdles that would delay or possibly restrict the biomass HAG implementation. Some of the barriers technical in nature are mentioned, which were faced during the implementation process.

- Biomass has low density. As a result of this the ash generated during biomass burnings has low density due to which it has a tendency to adhere in the combustion chamber, thereby creating ashes. This may lead to several shut down which cause production losses. This also invite for increase in operation and maintenance.
- During rainy season the biomass gets wet, it blocks the primary air lines at the time of feeding and thereby the plant efficiency and profitability is badly affected.

- Production Quality: Any ash / particulate contamination can result in production of poor quality Kaolin. Hence adoption of biomass in place of HSD proved ineffective in meeting the stringent quality requirements of Kaolin. This was biggest concern envisaged during the implementation of the project activity.

A less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

Less advanced technological alternative to the project activity is to continue with HSD, which involves much lower risk as performance certainty is very high on these fossil fuels because the hot air generator is operating on this fuel since many years. GHG emissions are higher with HSD. Market share of proposed technology is very low however HSD is well-accepted fuel in industry and its availability is also quite certain. Biomass (Empty Palm Fruit Bunches) usage for hot air generation is comparatively new concept. Risk due to hindrance in operation because of unavailability of biomass is high as compared to that for HSD. If proper care is not taken and inventory of raw material & biomass is not planned then interruptions due to short supply of biomass may occur any time throughout the year.

Stable and reliable combustion of Biomass in Hot Air Generator is problematic due to its low calorific value, presence of particulate matter, moisture in biomass carried over from the scrubbing system which further lowers its calorific value and fluctuation in biomass pressure at HAG inlet. There have been instances of erratic operation of the system due to this inconsistency in the quality of biomass and has led to problems of poor flame control in the burner and at times flame getting switched off at low pressure etc. The problem of erratic supply of biomass adds to the system under performance. Due to uncertain quantity and quality of biomass based hot air generator plant operation suffers leading to production problems. On the other hand use of HSD poses no such problems to plant operations making it the natural choice for use as fuel in Hot Air Generator.

TKCL had one HSD based direct fired HAG prior to the project activity. This HAG was not suitable to run on biomass as fuel and therefore TKCL installed a new biomass fired indirect HAG which could run on biomass in the project activity. So, TKCL could very well continue with its earlier operation on HSD based HAG and there was no other reason for installing new HAG but for using biomass, for this reason it is an additional payment for the promoter.

Barrier due to prevailing practice:

Prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions; Prevailing practice in the region is to use HSD/LDO or coal for steam generation. Barrier due to technological acceptance, prevailing practices and regulatory circumstances would have led continuation of HSD usage, which emits higher GHG emissions.

The use of fossil fuel was well established in the plant and the industry. A change to biomass as fuel resulted in higher maintenance and operational costs, like biomass storage operations, biomass handling operations, hiring of new workers, training of operators and maintenance technicians.

The project activity is the first of its kind within Kaolin industries of Kerala State and is not a common practice adapted for thermal energy generation till date in India. Added to that TKCL's plant is one of the

very few industries in the state of Kerala to seek registration under the CDM. This shows that the project is not a common prevailing practice in the state.

Other barriers

Managerial barriers
TKCL had to overcome managerial barriers by imparting special training to the operators for operating the biomass fuelled system. The project proponent had to develop an infrastructure in terms of manpower and financial resources, in order to ensure continuous fuel supply. This is a daunting task for the project proponent to fulfill the hot air generation requirement.

Crop Pattern and Nature Influence
Availability of biomass depends predominantly on the cultivation of Palm fruit. If there is a change in the growth pattern the availability gets affected. Availability also depends upon the vagaries of the nature.

Fuel Prices
The Renewable energy (biomass) in India is an un-organized sector with no proper mechanisms to make sure its sustained availability and price. Factors that govern the biomass availability are:
1. Climate: Uncertainty exists due to annual rainfall in that particular area.
2. Pricing: No fixed pricing mechanism and therefore fluctuates in wide range.

The viability of the project depends on acquiring the biomass at a reasonable price. The prices are subject to fluctuations based on the demand and selling mechanism prevailing in the region.

It has been clearly established from the above discussion that the project activity faces several barriers in its implementation and successful operation. Some of these barriers have the potential to even disrupt the operation of the biomass based hot air generation thereby severely affecting the economics of the project activity. The management of project proponent considered all risk aspects associated with the implementation of the project activity during the project inception.

These barriers would prevent potential project proponents from carrying out the project activity, if it is not registered as a CDM activity, as CDM funds will provide additional coverage to the risk due to failure of project, shutdown of plant and loss of production if any. CDM fund will encourage other similar companies to undertake GHG reduction projects.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The project activity involves renewable biomass to generate hot air for spray drying unit and replacing fossil fuel for the same purpose. The emission reduction from the project activity during the crediting period will be estimated as per the following steps which correspond with AMS – I.C. / version 11.

The applicability of the above mentioned methodology can be explained in the following given arguments:

- There is a fuel switch from HSD to biomass in the existing industrial facility of TKCL
- There was a nominal improvement in the efficiency as well
- The fuel switch was primarily aimed at reducing emissions by shifting to a cleaner fuel

- This measure reduces anthropogenic emission by sources.

The CDM project activity undertaken by the project proponent involves switching of fuel from HSD to biomass in their Kaolin processing unit in Kerala. In the absence of the project activity the most favorable alternative would have been to continue the burning of HSD in the system.

Estimation of Baseline Emissions
In the absence of project activity, emissions in the baseline would generate due to combustion of HSD for thermal energy generation. In the project activity, TKCL is using biomass as fuel displacing use of the HSD.

Therefore baseline emissions are the emissions from the consumption of HSD, which are computed based on the following formulae:

$\mathbf{BE_y = Q_{HSD} * COEF_{HSD}}$
Where:
BE_y=Baseline emissions in the year y, tCO2e/y
Q_{HSD}=Quantity of HSD saved on account of biomass burning in the year y, KL
$COEF_{HSD}$=Carbon emission factor of HSD, tCO2e/KL

$\mathbf{Q_{HSD} = Q_{Biomass} * NCV_{Biomass} / NCV_{HSD}}$
Where;
Q_{HSD}= Quantity of HSD saved on account of biomass burning in the year y, KL
NCV_{HSD}= Net Calorific value of HSD, kcal/lit
$Q_{Biomass}$= Quantity of Biomass utilized in the year y, Tonnes
$NCV_{Biomass}$=Net Calorific value of Biomass, kcal/kg

$\mathbf{COEF_{HSD} = NCV_{HSD} * K * OXID * EF_{HSD} / 1000 / 1000}$
Where;
$COEF_{HSD}$=Carbon emission factor of HSD, tCO2e/KL
NCV_{HSD}= Net Calorific value of HSD, kcal/l
K=Conversion factor = 4.187, kJ/kcal
OXID= Oxidation factor for HSD, 1
EF_{HSD}=Emission factor for HSD, tCO2e/ TJ

Project emissions:
The project activity results in zero GHG emission within the project boundary as renewable biomass which is carbon neutral fuel (as per UNFCCC) being used for hot air generation in the process. The GHG emissions due to biomass burning are negated by the sequestration during its growth thus the fuel is carbon neutral.

The emission from transportation of biomass (within the project boundary) is not considered. The baseline emission for HSD transportation to the plant site is countered by the project emission arising from the biomass transportation to the project site.

Leakage emissions:

As mentioned in the methodology AMS - I.C. the leakage due to project activity is considered "If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity".

As per the Attachment C to Appendix B of Indicative simplified baseline and monitoring methodologies of SSC, project has to identify potentially significant sources of leakage from renewable biomass. The project participant shall evaluate if there is a surplus of the biomass in the region of the project activity, which is not utilised.

Demonstration of use of the biomass will not result in increase of fossil fuel consumption elsewhere: The biomass resource assessment was conducted by the project promoter- to study the biomass resources availability, their consumption and the surplus biomass availability.

The Empty Palm Fruit Bunches (EPFB) is available as process waste at Oil Palm India Ltd., (OPIL) Punalur located near TKCL which is around 40 kms radius. The basic objective of the study was to assess the biomass (EPFB) resources availability from OPIL, their consumption and therefore, the surplus biomass availability.

The quantity of biomass (EPFB) available from OPIL in the region = 10,000MT/ annum
Annual requirement of EPFB for Kerala Ceramics Ltd = 5000 to 7000 MT/annum
Abundant surplus of the Empty Palm Fruit Bunches
in the region of the project activity which is not utilized = 3000 MT/annum

Hence the available biomass in the region is more than 25% over and above that quantity which is utilized. Therefore implementation of the project activity will not divert the biomass from other users to the project plant. Therefore the source of leakage can be neglected.

Emission Reductions:
The emission reduction due to the project activity is the difference of baseline emission and project emission. As the project emission and leakage in this case is zero therefore,
ERy = BEy

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

(Copy this table for each data and parameter)

Data / Parameter:	NCV_{HSD}
Data unit:	Kcal / Lit
Description:	Net calorific value of HSD
Source of data used:	Lab test records for HSD
Value applied:	9,783
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurement method: Estimated Recording Frequency: Yearly Archived data to be kept for crediting period + 2 years
Any comment:	Lab test data for HSD

Data / Parameter:	$NCV_{Biomass}$
Data unit:	Kcal / Kg
Description:	Net calorific value of biomass
Source of data used:	Lab test records for Biomass
Value applied:	3,429
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurement method: Estimated Recording Frequency: Yearly Archived data to be kept for crediting period + 2 years
Any comment:	Lab test data for Biomass

Data / Parameter:	EF_{HSD}
Data unit:	tCO2e/KL
Description:	Emission Factor of HSD
Source of data used:	IPCC default value
Value applied:	2.939
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurement method: Estimated Recording Frequency: Yearly Archived data to be kept for crediting period + 2 years
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

>>

Estimation of Baseline Emission

In the absence of project activity, emissions in the baseline would generate due to combustion of HSD for thermal energy generation. In the project activity, TKCL is using biomass as fuel displacing use of the HSD. Sample calculation for baseline emission based on formulae described in section E of this document is as follows:

$$\mathbf{BE_y = Q_{HSD} * COEF_{HSD}}$$

Where:

BE_y=Baseline emissions in the year y, tCO2e/y

Q_{HSD}=Quantity of HSD saved on account of biomass burning in the year y, KL

$COEF_{HSD}$=Carbon emission factor of HSD, tCO2e/KL

$$\mathbf{Q_{HSD} = Q_{Biomass} * NCV_{Biomass} / NCV_{HSD}}$$

Where;

Q_{HSD}= Quantity of HSD saved on account of biomass burning in the year y, KL

NCV_{HSD}= Net Calorific value of HSD, kcal/l

$Q_{Biomass}$= Quantity of Biomass utilized in the year y, Tonnes

$NCV_{Biomass}$=Net Calorific value of Biomass, kcal/kg

$COEF_{HSD}=NCV_{HSD} * K * OXID * EF_{HSD} / 1000/ 1000$
Where;
$COEF_{HSD}$=Carbon emission factor of HSD, tCO2e/KL
NCV_{HSD}= Net Calorific value of HSD, kcal/l
K=Conversion factor = 4.187, kJ/kcal
OXID= Oxidation factor for HSD, 1
EF_{HSD}=Emission factor for HSD, tCO2e/ TJ

As mentioned in the methodology, the Project activity emissions are those emissions related with the use of fossil fuel after the fuel switch. No fossil fuel after the fuel switch will be employed and therefore no emissions from the project activity are anticipated. Hence project activity emissions are zero.

As mentioned in the methodology, No leakage calculation is required, therefore leakage is zero.

$ER_y=BE_y – PE_y – L_y$
ER_y = Effective Reduction in emissions in year y
BE_y = Emissions in baseline scenario in year y
PE_y = Emissions in project scenario in year y
L_y = Leakages in project activity in year y

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

>>

Years	Baseline emissions (tCO2e)	Project emissions (tCO2e)	Leakage (tCO2e)	Emission reductions (tCO2e)
2008	5,270	0	0	5,270
2009	5,270	0	0	5,270
2010	5,270	0	0	5,270
2011	5,270	0	0	5,270
2012	5,270	0	0	5,270
2013	5,270	0	0	5,270
2014	5,270	0	0	5,270
2015	5,270	0	0	5,270
2016	5,270	0	0	5,270
2017	5,270	0	0	5,270

In the above table, the year 2008 corresponds to the period starting from 01.01.2008 to 31.12.2008. Similar interpretation shall apply for remaining years.

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:	$Q_{Biomass}$

Data unit:	Tonnes
Description:	Quantity of Biomass consumed
Source of data to be used:	Plant records
Value of data	7,844
Description of measurement methods and procedures to be applied:	Monitoring: Measured and monitored by Weigh bridge at the plant gate data can be cross verified with the purchase records Data type: measured Archiving procedure: Paper and Electronic Recording Frequency: Daily Responsibility: Project Manage would be responsible for regular calibration of the machine. Calibration Frequency: Weigh bridge will be calibrated frequency as per the norm
QA/QC procedures to be applied:	The data will be collected as part of normal plant level operations. QA/QC requirements consist of cross- checking these with company report. Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	Q_{HSD}
Data unit:	KL/year
Description:	Quantity of HSD consumed in the baseline
Source of data to be used:	Plant records
Value of data	1,793
Description of measurement methods and procedures to be applied:	Measurement method: Calculated from the biomass consumption in the plant operations; The data will be archived for crediting period + 2years
QA/QC procedures to be applied:	The data will be collected as part of normal plant level operations. QA/QC requirements consist of cross- checking these with company report.
Any comment:	-

B.7.2 Description of the monitoring plan:

>>

TKCL maintains all production/purchase/sales records in their plant. TKCL has procedures in place for operation and maintenance of the plant machinery, equipments and instruments and it maintains data on maintenance & calibration of the equipments. The equipments used for CDM project are also part of these procedures and document on maintenance and rectification done on all the monitoring equipments are maintained.

Organizational Structure:

A CDM project team is constituted with participation from relevant departments. People are trained on CDM monitoring plan. This team is responsible for data collection and archiving. This team meets periodically to review CDM project activity, check data collected, emissions reduced, etc. On a monthly basis, the monitoring reports are checked and discussed by the team. In case of any irregularity observed

by any of the CDM team member, it is informed to the concerned person for necessary actions. On a periodic basis, these reports are forwarded to CDM project director.

The operational and management structure basically consists of two levels:

A. Project Manager
B. Project Operator

A. Project Manager:

His specific responsibilities:

1. Appointment of Project Operators
2. Ensure that Project Operators have undergone initial training to create awareness about the process
3. Submission of the annual monitoring report for verification to the Designated Operational Entity (DOE)

B. Project Operators:

Their specific responsibilities:

1. Collect the necessary data as required by the monitoring methodology
2. Store the collected data in logbook (paper) and spread sheet (electronic)
3. Keep the record of collected data in a logbook for at least three years and in a spread sheet for at least ten years
4. Ensure that the data is entered properly and to take proper care to avoid any loss of information
5. Prepare the annual monitoring report
6. Check that CER calculation is carried out as per the monitoring methodology
7. Submit the annual monitoring report to the Project Manager

Monitoring Approach:

The general monitoring principles are based on:

- Frequency
- Reliability
- Registration and Reporting

Frequency: As the emission reductions from the project activity is determined by the reduction in the amount of HSD consumed in the hot air generator it becomes important for the project to monitor the biomass consumption in real time basis and its equivalent HSD replacement.

Reliability: The amount of emission reductions unit is proportional to the amount of HSD consumption reduction in the hot air generator. Therefore from the project side, the volume of the biomass going into the process is the final value. Therefore the system ensures that the fuel input value i.e., volume of biomass, which is used to calculate the HSD consumption figure, is highly reliable. Since the reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the result all input and output parameter measuring instruments are calibrated as per the norms for ensuring reliability of the system.

Reporting: The biomass consumption data are recorded automatically and archived electronically. Monthly reports are prepared stating the biomass consumption, calculated HSD replacement and GHG reductions.

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 completing the final draft of this baseline section *(DD/MM/YYYY)*: 17th August 2007
Name of person/entity determining the baseline: The Kerala Ceramics Ltd. and their consultant

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/01/2006

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

>>
20y-0m

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:

>>
Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/01/2008 (or from the starting date of registration)

C.2.2.2. Length:

>>
10y-0m

SECTION D. Environmental impacts

>>

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

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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.

The project activity – *Fuel Switch from fossil fuels to Renewable (biomass) for generation of heat* does not require any EIA to be conducted as the activity is not included in Schedule I. The project activity consists of replacing fossil fuel to renewable fuel to produce hot air for internal applications of TKCL.

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

The project activity:

- → Reduces the emissions of nitrogen oxides (NOx), sulphur dioxide (SO2), carbon monoxide (CO) and hydrocarbons that would be released into atmosphere by burning / combustion of fossil fuels like HSD
- → Reduces the use of finite fossil fuels and contributes to sustainable development
- → Reduces pollution related to spillage of HSD on land

In the present environmental scenario, the need for using non - conventional fuels rather than fossil fuels needs to be overemphasized mainly on two counts.

Firstly, this helps not only to maximize the use of non - fossil fuels including biomass fuels but also places a check on the rate of exploitation and consequent depletion of fossil fuel sources. Secondly, there is an incidental benefit of minimizing the all - round environmental degradation and stress associated with mining, processing and transportation as in the case of conventional fuels. From this perspective, the proposed biomass based Hot Air Generator can be considered as one of the most environments - friendly options available.

Not withstanding the above, the operation of any plant produces air emissions, waste water and solid wastes, such as ash.

The possible environmental impacts from the proposed biomass HAG system typically are controlled by pollution control measures in order to meet the requirements of the company. The major sources of pollution from the

- Ash
- Flue gas containing Suspended Particulate Matter (SPM), traces of Sulphur Dioxide (SO), Oxides of Nitrogen (NO_x) etc.
- Fugitive dust generated during solid fuel handling and processing

The release of the above pollutants, if unchecked, can lead to a negative impact on the environment. Hence, it is planned to minimize the impact of the plant on the physical and socio - economic environment through proper siting and implementation of appropriate pollution control measures as discussed in the following paragraphs.

POLLUTION CONTROL MEASURES

Air Pollution

Flue Gas
Multiclone Dust Collectors (MDC) shall be installed at the exit of HAG to limit the Suspended Particulate Matter (SPM) in the flue gas to less than 100 mg / nm^3. This is well below the KPCB norms of 250 mg / nm^3.

Fuels used in the HAG have low sulphur content. The ground level concentration of SO_2 emitted by the plant shall be kept within permissible limits (<400 mg / nm^3) by providing a stack of sufficient height for proper dispersion of exit gases.

Formation of NO_x and CO is closely linked to furnace design and combustion control system. Emission levels of these pollutants are expected to be contained by adopting suitable design.

Dust Suppression
For open yard operations, provision shall be made to spray water to reduce the dust generation during handling operation. Besides, around the fuel storage and handling area, adequate green belt shall be provided to contain the effects of fugitive emissions, if any.

Ash handling
Fuels used in the HAG are predominantly woody biomass with very low ash content. The maximum annual generation of ash from the HAG operation is estimated around 260 tons. Both fly ash and furnace bottom ash shall be collected and disposed at abandoned mined areas / sold to farmers as fertilizers.

Thermal Pollution

Heat constitutes a form of pollution, if it is above acceptable levels. Therefore control measures become necessary to minimize thermal pollution. Plant building shall be designed for adequate air circulation through natural ventilation. Man coolers shall be installed at hot work spots.

Noise Pollution

The plant and equipment shall be designed and specified with a view to minimize noise pollution. Rotating equipment shall be statically and dynamically balanced. Noise producing static / dynamic equipments shall be equipped with silencers. Pipelines shall be suitably sized for low velocities. Wherever necessary, insulation shall be provided for reducing heat loss and noise pollution. In effect, the abatement measures shall ensure that noise levels are kept below 85 db at a distance of 1 m from the rotating equipment. Employees in high noise areas shall be provided with ear protection devices.

Green Belt Development

Green belt shall be developed all around the plant, fuel storage area, administration building etc. The waste water from the plant shall be used for green belt development within the plant premises.

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:

>>

As per the host party regulations, the Environment Impact Assessment is not required for the project activity. The project activity is not polluting and the impacts associated with the project activity are insignificant.

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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As per the statutory requirement of CDM projects to take the opinion of the concerned stakeholders on the fuel switch-over to biomass for thermal energy generation at The Kerala Ceramics Ltd, stakeholders' consultative meeting was organized by the industry on 9th July, 2007 at the industry premises. The meeting was invited by the personal invitation to the residents of villages around the project activity to present their views on the CDM project initiatives taken by TKCL.

The project proponent identifies the following as stakeholders to keep the transparency in the operational activity and thereby meeting local/ environmental regulations.

- Local residents
- Plant representatives

Mr Devakinandanan, Chariman and MD chaired the meeting introducing him and requested all the participants to introduce themselves accordingly. Mr. Devakinandanan in his presentation focused on aim of this project, the role of the project proponent, Kyoto Protocol, Clean Development Mechanism (CDM) and impact of this project. He also explained about the CDM project approval process to India and informed that the aforesaid project, the technology used in the project is firing biomass (Empty Palm Fruit Bunches) in Hot Air Generator and also explained the scope of applying this technology in similar kind of industries in India.

E.2. Summary of the comments received:

>>

The management of TKCL apprised the local representatives of the village about the project activity. The Villagers appreciated the Clean Development Mechanism concept and its benefits. They encouraged this initiative made by TKCL.

The salient details are as follows:

Stakeholder Concern/question/comment	Answer/outcome
How long it will take to implement the project?	After getting all statutory clearances from local bodies it may take another month to implement the project.
What is the Carbon Trading Concept and How does it work?	It's the concept of financing a developing country to reduce GHG emission by any developed country, which will give the credit of reducing GHG emission for their country.
Is there any scope for other projects to be included in CDM project?	Yes. Any project utilizing renewable fuel for either thermal or electricity generation, exporting or displacing power from the grid, energy efficiency and landfill etc., can be eligible for CDM
How is it environmental friendly?	Project is replacing the fossil fuel with

	renewable biomass. Avoidance of fossil fuel helps in reduction of Greenhouse gas emissions into atmosphere. Before the implementation of this project the proposed biomass was simply dumped into solid waste disposable sites which would lead to methane emissions in to atmosphere. Now with this project environment is safe both by means of avoiding methane emissions from decay and as well from the fossil fuel.

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

>>

No negative comment was reported from stakeholders.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	The Kerala Ceramics Ltd.
Street/P.O.Box:	Kundara
Building:	
City:	
State/Region:	Kerala
Postfix/ZIP:	691 501
Country:	India
Telephone:	+91 474 2526158
FAX:	+91 474 2522344
E-Mail:	
URL:	
Represented by:	
Title:	Chairman & Managing Director
Salutation:	Mr.
Last Name:	
Middle Name:	
First Name:	Devakinandanan
Department:	
Mobile:	+91 9447115336
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This is a unilateral CDM Project Activity undertaken by the project proponent for which no public funding has been used.

Annex 3

BASELINE INFORMATION

Please refer to section B.4 for baseline and its development for the project activity.

Annex 4

MONITORING INFORMATION

Please refer to section B.7, B.7.1 and B.7.2 explains the monitoring methodology and description of monitoring plan.

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