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:

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Hot air generation using renewable biomass fuel for spray drying application at H. & R. Johnson (India) Ltd, Kunigal.

Version 03

14/12/2007

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

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H & R Johnson (India) Limited (HRJ) is the largest ceramic tile manufacturer in India. The purpose of project activity is to utilize biomass residues, displace fossil fuel and generate thermal energy (hot air) with Fluidized Bed Combustion (FBC) technology. The measure implemented is a Fluidised Bed Combustion (FBC) system which is termed as Hot air generator (HAG). The hot air generated is supplied in spray drying operation of Tile manufacturing process. The technology implemented operates only on renewable biomass residues. Prior to the project activity (pre-project scenario) liquid fossil fuel - furnace oil (FO) was used in the Hot air generation .The liquid fuel (FO) fired hot air generator (HAG) was placed at the bottom of spray dryer in horizontal orientation. The hot air generated from FO fired HAG was carried to the spray dryer through insulated duct. The technical details of the HAG used in pre-project scenario are given below:

S.No	Description	Pre-Project Scenario FO fired Hot Air Generator (HAG)
1.	Technology provider	L&T
2.	Fuel used	Furnace Oil (FO)
3.	Thermal output capacity	2404 $kW_{thermal}$ ~ 20,67,948 kcal/hr
4.	Output temperature	600-650 °C

In the current scenario, FO fired hot air generator has been dismantled completely and replaced with a fluidised bed hot air generator which is fired with biomass residues.

The project activity primarily utilizes biomass residues (Ground nut shells), however the FBC system is designed to use other renewable biomass residues if required. To estimate surplus availability of biomass residue, HRJK had appointed M/s Tide Consultants[1], Bangalore to survey and assess total surplus availability of biomass residues available for a radius of 50 kms from Tumkur district, where the project activity is located. The result of the survey, risk due to non-availability of biomass residue is averted. Along with HRJK has identified and developed biomass vendors and transporters so that supply of the renewable biomass fuel is continuously available through out the year. The initiative taken by HRJK

[1] An Independent third party consultant report by M/s Tide consultant for surplus availability of biomass residue has been submitted to validator.

substitute's fossil fuel and therefore the project activity reduces Green House Gas (GHG) emissions and also promotes sustainable development. A similar project has been implemented in H.&R. Johnson, Dewas.

As per Kyoto protocol a CDM project activity under taken should demonstrate sustainable development through Social, Economic, Environment and Technology indicators. The contribution to these indicators has been described as under:

1. Social well being:

The project activity displaces fossil fuel with renewable biomass residues available in the nearby regions. Biomass residues are by-products of agriculture crops. Typical biomass residues available abundantly in the area of Kunigal are ground nut husk and rice husk. The annual approximate biomass residue (ground nut shell) requirement of HRJK is around 8000 metric tonnes (MT) for continuous plant operation. This biomass is sourced from nearby areas of Kunigal. As a result farmers, biomass supplier and other ancillary business in the value chain are benefited. The benefit is additional revenues and thus improve income base. Additional to this, the project activity also requires skilled and semi-skilled labour during the implementation and regular operation. This gives the additional benefit to the local stakeholders and reduces migration of people. Therefore the project activity is found to be socially beneficial and sustainable.

2. Economical well being:

The renewable biomass utilized are agro-residues, the normal practise to utilize these residues is burning on farms or open pit dumping of residues. The project activity thus utilizes and provides a sustainable earning source to Farmers, Biomass suppliers, Labour Contractors; Machinery suppliers, consultants and other related persons. Thus HRJK project activity promotes economic well being.

3. **Environmental well being:**

As per UNFCCC, biomass is a carbon neutral fuel and combustion of biomass for hot air generation completely displaces fossil fuel and associated GHG emissions. Therefore activity is an environmentally friendly. Some of the environmental benefits perceived are:

a) Carbon neutral fuel, therefore zero emissions.
b) Conserves fossil fuel.

4. Technological well being:

The project technology implemented is a Fluidized Bed Combustion system is an indigenously developed technology for hot air generation easy to operate and maintain..

Therefore project activity is an environment friendly and GHG emission reduction measure which will help "Host Country" ***India*** to fulfill its goals of promoting sustainable development.

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)
India (Host)	H&R Johnson (India) Ltd, Kunigal (Private entity)	No

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

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

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India

A.4.1.1. Host Party(ies):

>>

India

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

>>

Karnataka

A.4.1.3. City/Town/Community etc:

>>

Kunigal (District: Tumkur)

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

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The tile manufacturing facility and the project activity is located at Kunigal which is 40 kms away from district town Tumkur in the Indian State of Karnataka. The plant site is well connected with National Highway (NH 48) for access and transportation. Nearest domestic and international airport is at state capital Bangalore which is 68 km from the project activity. Location map of the project activity is enclosed below and contact address is provided below:

Project Activity Location details and Address:

Latitude: 12^0 57' 00" N & Longitude: 76^0 53' 15" E

H & R Johnson (India) Ltd.
Plot No. 1 – 12,
KIADB Industrial Area,
Near Anchepalya Village
Kunigal, Dist. Tumkur,
Karnataka – 572 130

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

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As per 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories', the project activity is considered under

Main Category: Type I - ***Renewable Energy Projects***

Sub Category: "C" ***Thermal energy for the user***

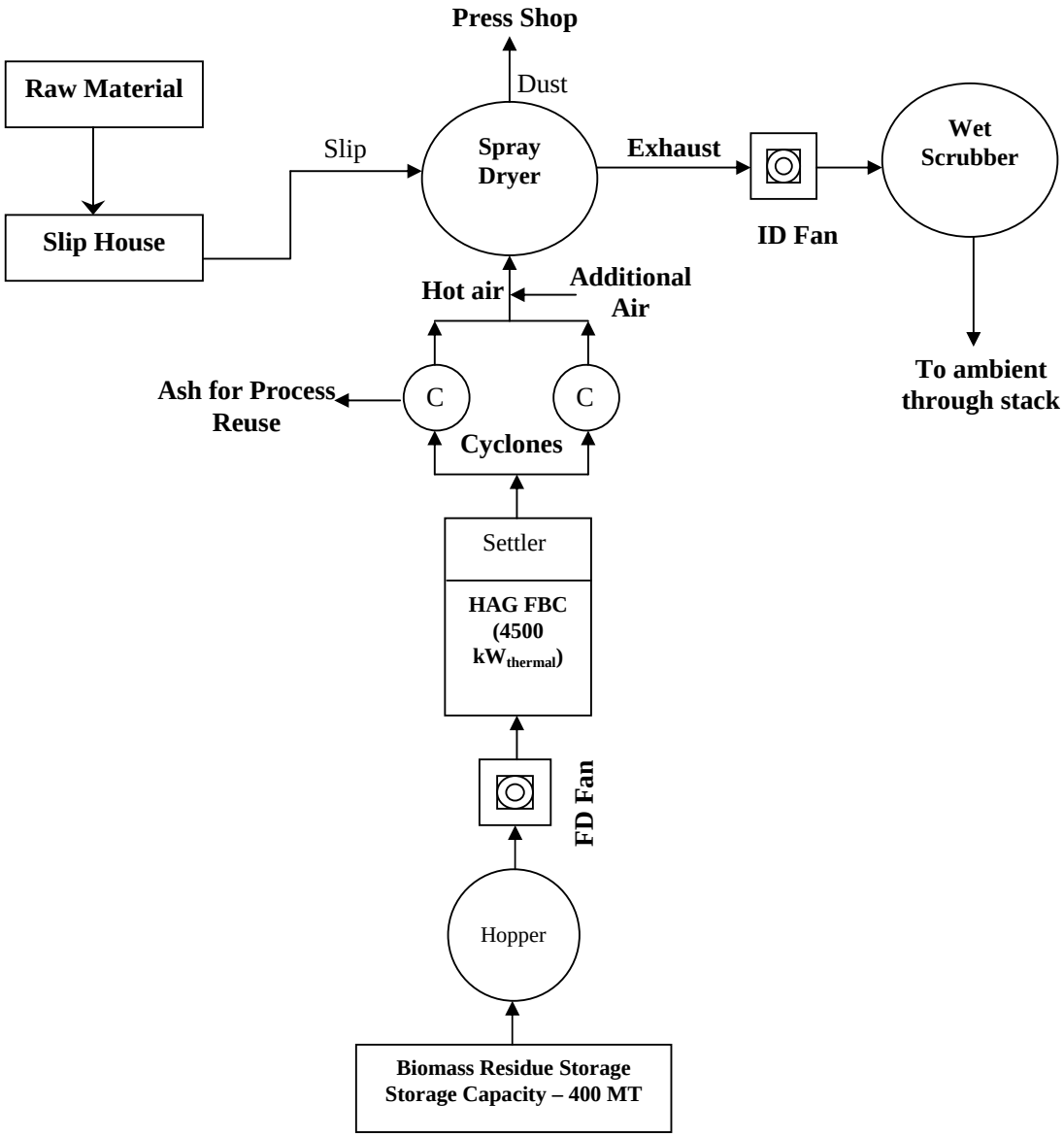
The project activity meets all the applicability criteria of small-scale methodology under Type-I: Renewable Energy Projects (C. Thermal energy for the user) / version 09, 23 December 2006 of the indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories

The project technology implemented is provided by M/s Radhe Renewable Energy Associates. The FBC system implemented for hot air generation is designed for 4500 $kW_{thermal}$ energy generation. The technology only utilizes renewable biomass residues. The FBC system which is the heart of hot air generation project comprises of biomass conveying system (bucket elevator), a combustion unit (fuel hopper, Combustion fans, fuel feeder, combustion chamber) and hot gas handling & separation and cleaning section (settling chamber, cyclone, rotary valves, gas duct line, control panel etc). Biomass is fed to the combustion zone with additional air to maintain fluidization of biomass and complete combustion. Hot air generated is passed and cleaned through settling chamber & cyclone to spray dryer. This avoids interference of foreign particle in spray dryer section. Ash generated in the FBC system is completely utilized as a raw material in tile manufacturing. This reduces potential problems associated with ash management. Therefore the technology implemented is sound and proves to be environmentally safe. Process flow diagram of the technology implemented is presented in Fig.A.4.2.

Technical Specifications of Hot Air Generator

S.No	Description	Hot Air Generator
1.	Technology provider	Radhe Renewable Energy Associates
2.	HAG Model number	RF-4500
3.	Bed Type	Fluidized
4.	Fuel used	Biomass Residues
5.	Thermal output capacity	4500 $kW_{thermal}$ ~ 38,70,000 kcal
6.	Output temperature	600-650 °C

Fig.A.4.2: Process Flow Diagram of Hot Air Generation (FBC) system



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

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Years	Annual estimation of emission reductions in (tonnes of CO_2 e)
2008-09	11,741
2009-10	11,741
2010-11	11.741
2011-12	11,741
2012-13	11,741
2013-14	11,741
2014-15	11,741
2015-16	11,741
2016-17	11,741
2017-18	11,741
Total Estimated Reductions (tCO_2 e)	**1,17,410**
Total no of crediting period	10 years
Annual average over the crediting period of estimated reduction (tCO_2 e)	**11,741**

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

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No public funding is available in this project activity from Annex 1, countries of UNFCCC.

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

According to paragraph 2 of appendix C[2]

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

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

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

Referring to the above-mentioned applicability criteria of de-bundling, HRJK has not implemented any CDM project activity small scale project activity. Besides this there are no CDM projects by HRJ that have been registered in last two years. Also there are no similar projects in the vicinity or within 1 km radius of the project boundary. In this way the project activity is not a part of any of the above points mentioned in Appendix C, therefore can be considered as a small scale CDM project activity and is not a de-bundled component of a large 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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Baseline Methodology: *I.C –"Thermal energy for the user"* in Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities.

Reference: Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities (AMS.I.C / Version 09, 23 December 2006).

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

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Justification for the choice of small scale methodology AMS I.C is because of following technology /measure considered in the project activity

Paragraph 1 : *"comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels"*

Justification 1: The project activity implemented at HRJK is a thermal energy (hot air) technology which utilizes biomass residues renewable in nature and displaces fossil fuel usage. This qualifies the main measure taken.

Paragraph 2: *Where generation capacity is specified by the manufacturer, it shall be less than 15MW.*

Justification 2: The project activity of HRJK is designed for total thermal energy output of 4.5 MW which less the specified limit of 15 MW and therefore this qualifies the applicability criteria.

Paragraph 3: *For co-generation systems and/or co-fired systems to qualify under this category, the energy output shall not exceed 45 $MW_{thermal}$. E.g., for a biomass based co-generating system the capacity for all the boilers affected by the project activity combined shall not exceed 45 $MW_{thermal}$. In the case of the co-fired system the installed capacity (specified for fossil fuel use) for each boiler affected by the project activity combined shall not exceed 45 $MW_{thermal}$.*

Justification 3: The project activity is neither co-generation nor co-firing system, therefore not applicable in the case of HRJK project activity.

Paragraph 4: *In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the added capacity of the units added by the project should be lower than 45 $MW_{thermal}$ and should be physically distinct[3] from the existing units.*

[3] Physically distinct units are those that are capable of producing thermal energy without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

Justification 4: The project activity is newly implemented and is not an addition to the existing capacity, therefore not applicable in HRJK project activity.

As stated above, the project activity under consideration meets applicability conditions of the Category I.C. This justifies the appropriateness of the choice of the methodology in view 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. Therefore the baseline and emission reductions calculations from the project would be based on paragraph 6 of I.C. of Appendix B. The monitoring methodology would be based on the guidance provided in the paragraph 11 (a) of I.C. of Appendix B.

B.3. Description of the project boundary:

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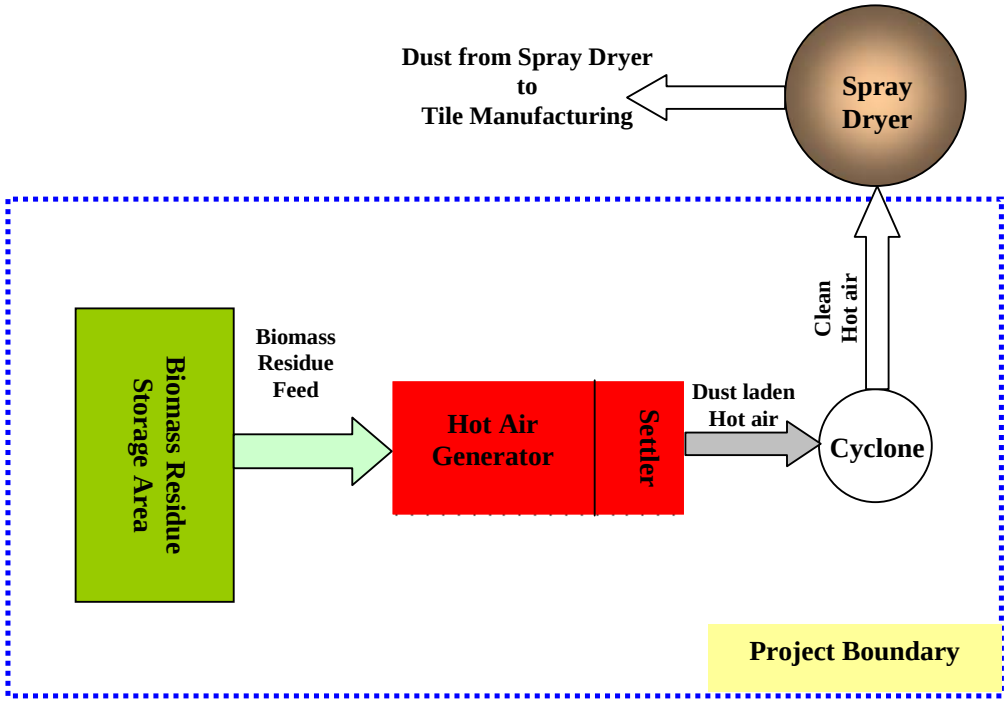
As per methodology AMS I.C, a boundary is defined as "*a physical, geographical site of the renewable energy generation delineates the project boundary*". The boundary encompasses the hot air generation system (FBC) and the biomass storage only. Biomass stored within the project boundary is a well managed activity and no emissions are envisaged because of the storage. Thus, boundary covers fuel storage and FBC. The project participant does not need to account potential CH_4 emissions from the storage of biomass because they are considered to be zero as emission are considered only when biomass is stored longer than one year. Storage facility of biomass for HRJK is for only 15 days. The project boundary is illustrated in figure B.3.

Figure B.3: Boundary diagram of the project activity



B.4. Description of baseline and its development:

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As per small scale methodology AMS.I.C applied Paragraph 6 "*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*"

HRJK has identified plausible project options for baseline scenario, which include all possible courses of actions that could be adopted in order to generate hot air. Further an assessment was conducted for each alternative to project activity with respect to the risks/barriers associated to implementation and their costs involved. The performance of the project activity and its associated emission reductions were evaluated with respect to the baseline scenario.

HRJK has identified the following plausible alternatives to meet hot air requirement. These alternatives are illustrated below:

Alternative 1- Furnace Oil based hot air generation

In absence of CDM project activity, HRJK could have generated hot air with Furnace Oil as fuel to meet its requirement. This alternative is in compliance with all applicable legal and regulatory requirements and was a pre project alternative that was implemented. This pre project facility was dismantled and

scraped. The alternatives were compared with the most plausible alternatives existing during the investment analysis and are presented as a part of baseline analysis scenario.

Therefore the Alternative 1 is considered further for arriving at the baseline scenario.

Alternative 2- Coal based hot air generation

In absence of CDM project activity, HRJK could have generated hot air with coal as fuel in the fluidized bed combustion system to meet its requirement. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline.

Therefore the Alternative 2 is considered further for arriving at the baseline scenario.

Alternative 3- Natural gas based hot air generation

In absence of CDM project activity, HRJK could have generated hot air with Natural gas as fuel, to meet its requirement. This alternative is in compliance with all applicable legal and regulatory requirements. However this alternative would not be a credible and realistic alternative available with HRJK in absence of project activity due to non-availability of natural gas as fuel for hot air generation to the plant.

Therefore the Alternative 3 may be excluded from further consideration.

Alternative 4- Biomass residue based hot air generation

In absence of CDM project activity, hot air could have generated process with biomass residues as fuel in fluidized bed combustion system, to meet its requirement. This alternative is in compliance with all applicable legal and regulatory requirements.

Therefore the Alternative 4 is considered further for arriving at the baseline scenario.

Alternative 5- Liquefied Petroleum Gas (LPG) based hot air generation

In absence of CDM project activity, HRJK could have generated hot air with LPG as fuel, to meet its requirement. This alternative is in compliance with all applicable legal and regulatory requirements. However this alternative would not be a cost economic and realistic alternative available with HRJK in absence of project activity for hot air generation.

Therefore the Alternative 5 may be excluded from further consideration.

The basis of establishing in HRJK project activity is investment analysis. Levelised unit cost analysis of three most plausible alternatives with HRJK has been illustrated in table B.4 (a). Justification to each alternative unit cost analysis can be referred in a separate excel sheet calculation attachment along with the PDD.

Table B.4(a): Assessment of all the real and credible alternatives with HRJK in absence of the project activity

Parameters	Alternative 1. Furnace Oil	Alternative 2. Coal	Alternative 3. Biomass Residue
Levelized Hot air Generation Cost	INR 508/MT of dust	INR 341/MT of dust	INR 450/MT of dust
Other Considerations	1. FO is available through structured price mechanism 2. FO prices shows steep increase in prices trend 3. Sulphur in FO on combustion leads for SO_X formation.	1. Coal is abundantly available through structured price mechanism. 2. Indian coal which is available in plenty has high percentage of sulphur and ash content. There always a high degree of possibility of SO_X formation in hot air generation. 3. Coal on combustion leads to release of 96.1. tCO_2 /TJ when compared to Biomass combustion, therefore high on GHG emissions when compared to Biomass and FO as alternatives	**Unorganized Sector and availability:** Renewable energy (biomass) in India is an un-organized sector with no proper mechanisms to make sure its sustained availability and price. The availability primarily governed by external factors like climatic conditions and rainfall. Further the price mechanism is not structured and fluctuates in wide ranges. The pricing of biomass depends mainly on annual rainfall, farm produce and the demand scenario in that area. Under these circumstances HRJK has taken a challenge to invest in the project activity and use biomass residues to meet its hot air requirement.
Analysis on the basis of economic and regulatory parameters	Hot air generation cost is very High	Hot air generation cost is low	1. Hot air generation cost is medium 2. There are risks associated to availability of biomass and fluctuation in the pricing of biomass residues.
Conclusion	Not a Baseline scenario	This alternative option is the Baseline Scenario	Hence without the CDM revenue, this alternative was not be a feasible option for HRJK to adopt. This alternative option is the not the Baseline Scenario. *Therefore, this alternative is additional since the anthropogenic emissions of greenhouse*

			gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Estimation of emission reductions resulting from the project activity

As per the methodology, the emission reductions resulting from the project activity is calculated as a difference between the baseline emissions and the project emissions. The methodology does not require the project proponent to consider any emission due to leakage[4]. The baseline emissions and the project emissions are quantified as per the guidelines given in the methodology:

Baseline Emissions

The baseline emissions are calculated based on the most appropriate Baseline scenario which would have been coal, therefore in absence of project activity the hot air would be generated by coal. Total coal that would have been combusted in the baseline scenario would amount to **6,807** MT per annum[5]. The baseline emissions have been calculated based on amount of fossil fuel (coal) that would have been used in absence of the project activity. Net calorific values for Biomass and Coal have been considered based on test reports available as well as coal supplier data. NATCOM (India), 1994 value for carbon emission factor 26.13 tC/TJ has been considered conservative over IPCC 2006 value of 26.2 tC/TJ to calculate baseline emissions. All baseline calculations are as per AMS I.C/version 09. Please refer to Section B.6.1 for baseline estimation calculation.

Project Emissions

As the small scale methodology AMS I.C "Thermal energy for the Users" falls under purview of Renewable energy projects and as per UNFCCC definition of biomass, their would be no GHG emissions because of biomass combustion.

Leakages

As per AMS I.C paragraph 10 Leakage is defined as "If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered". Leakages as per clause are not applicable. Transportation leakages from the biomass supplier to the project activity has been neglected as the emissions from the same are negligible and if the same when considered for coal the transport leakages emissions are much higher than that of the biomass. Total capacity of the storage area is not greater 15 days consumption which eliminates any possibility of biomass decay and methane emissions. Therefore the leakage emissions are not considered in the project

[4] Transport leakages in case of coal transport would have been higher than that of biomass transport leakages. Therefore excluded for leakage calculation.

activity boundaryTable B.4 (b) - Tabular representation of key information and data used to establish the baseline scenario and project activity:

No	Key information and data used	Source of information/ data
Baseline		
1	Quantity of hot air supplied to spray dryer	Based on the design data sheet of the equipment supplier.
2	Efficiency of HAG	Based on the designed efficiency of the FBC mentioned in the equipment supplier offer
3	Quantity of fossil fuel (Coal)	Derived on the basis of energy requirement for Hot Air generation and divide the same by NCV of coal.
4	NCV of fossil fuel (Coal)	NCV as per Quotation for coal supply date :20.05.2003 from Swami Yogananda Trading company, Cuddapah, Karnataka
5	Emission factor of fossil fuel (Coal)	NATCOM (India), 1994 guidelines for National Greenhouse Gas Inventories.
6	Oxidation factor of (Coal)	As per IPCC 2006 guidelines for National Greenhouse Gas Inventories for Stationary Combustion
Project Activity		
1	Quantity of hot air supplied to spray dryer	Based on the actual flow measured with the help of pitot tube assembly.
2	Quantity of fossil fuel would have been consumed in absence of project activity(Coal)	Based on energy metered using pitot tube measurement and, divide the same with NCV of coal as mentioned in the baseline scenario.
3	Quantity of biomass consumed	Total biomass quantity input maintained in Enterprise Resource Planning system (ERP-SAP) at HRJK for the year[6]. This data will be used as reference data.

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 accordance with paragraph 7 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in Appendix B is used for a small-scale CDM project activity if project participants are able to demonstrate to a designated operational

[5] The amount of coal that was avoided / substituted annually.

entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Attachment A of Appendix. B. These barriers are:

- Financial barrier
- Technical barrier
- Other barriers

The driving force to this 'Climate change initiative' is avoidance of fossil fuel and generate hot air from renewable biomass residues. The project proponent was aware of the barriers associated with project implementation. Investment barrier remains a principal barrier; along with it the project proponent faced technical barriers during implementation and operation of fluidized bed combustion system based hot air generator. Availability of carbon finance against sale consideration of carbon credits generated due to project activity may help to overcome these barriers primarily financial (Hot air unit cost). Some part of the fund may also help in CDM training, energy management and environment management activities, thus developing resource toward the project activity and way to sustainable development. Some of the key barriers are discussed below:

Financial Barriers:

Biomass residue based hot air generation project activity was a new activity when implemented. The investment required for the implementation of the project activity involved equipment cost, civil cost, other mechanical, instrumentation and operation and maintenance cost. We have considered unit cost analysis to demonstrate higher hot air generation cost when compared with baseline scenario. A levelized unit cost analysis includes fuel cost, equipment cost, operation and maintenance cost and manpower cost.

Levelized Hot air unit cost analysis

We have considered levelized hot air generation cost as a basis to prove the financial barrier with hot air generation using FO, Coal and renewable biomass.

Source	**Unit Cost (INR/MT)**
Hot Air generation using fossil fuel (FO)	508
Baseline Scenario	
Hot Air generation using Coal	341
Project Scenario	
Hot Air generation using Renewable biomass	450

[6] Total biomass residue consumed can be traced through ERP-SAP system whose working and data retrieval can be done through project site or from H&R Johnson head office in Mumbai.

The levelized cost analysis of the above alternatives, indicate that the hot air generation cost with biomass is higher than baseline scenario with coal. Considering the higher unit cost for hot air generation, the proponent has gone ahead and has opted for biomass based hot air generation.

Technical barrier:

Before implementation of the HRJK project a similar project has been implemented at Dewas. The project in Dewas is located in a different state of India i.e. Madhya Pradesh. CDM registration process for Dewas project has been initiated and the same project is under validation. Although FBC technology is proven for steam and power generation it was very uncommon for using the FBC in hot air generation application particularly specific to spray drying application. At the time of project implementation the system was second application in the organised ceramic industry after Dewas project activity. The section here describes challenges and hurdles faced during the implementation of the project activity at Kunigal as below.

System synchronization: One of prominent risk faced and that an always remains a risk in the project activity operation is synchronization of the complete system ie; FBC based HAG and spray dryer. In normal operation Spray dryer operates on negative pressure in the range of -5 mmwc to -8 mmwc. With FBC based HAG spray dryer needs to be operated with much higher negative pressure -50mmwc to -60 mmwc. This high negative pressure changes the end product characteristics and hampers granulometry of the end product. This is most critical and an important technical barrier faced during and post implementation of project activity. HRJ has managed to reduce this barrier by adjusting up stream and down stream parameters & training personnel's associated with the project.

Clinker Formation : Clinker formation is a very common phenomenon in FBC. Clinker formation happens due to temperature increase that would melt minerals present in the biomass residues reaching their fusion temperature. As oxygen is added into combustion bed, it enhances the reactions of combustion which are exothermic, thus increasing the temperature. Baxter *et al*. (1998) mentioned that alkali metals, especially potassium,in biomass, tend to react with silica to form alkali silicates melting at temperatures above 700 °C. This leads to unwarranted shutdown of the system hampering production target and schedule. Clinker formation in FBC happens due to the presence of impurity in biomass. These impurities having very low ash fusion temperature and this enhances clinker formation.

Increased operation and maintenance cost : Biomass residue fired in FBC generally has low density. As a result of this the ash generated during biomass combustion has a tendency to adhere in the combustion chamber, cyclone, as well as in the roof of the FBC chamber. Eroding nature of the ash attacks the cyclone surface very fast. It also damage the chamber roof and causes temperature variation

and resulted shocks. Replacement of cyclone and repairing of roof of the furnace increases operation and maintenance time and cost.

Feed channel jam : In rainy season, biomass feed channel gets jammed very frequently, this is primarily happens due to feeding of wet biomass which is having very poor mobility.

Other Barriers:

Ash Management: Managing & disposal of the ash generated from the biomass residue combustion was hurdle for management. The rate of ash generation is about 10% of fuel used thus amounting to about 3 tons/day which was a point of concern. This challenge was overcome by utilizing ash in the ceramic body formulation. The formulation had to be thus adjusted accordingly to accommodate the ash without altering the product properties, functional as well as aesthetic.

Manpower Training: Earlier in the pre-project scenario FO was used for Hot air generation and the manpower was accustomed and trained, however to train the manpower for biomass residue based hot air generation system required additional training with respect to biomass handling and HAG operation & maintenance. This barrier would otherwise delay the implementation and operation of HAG and thus would have resulted in production losses.

It can therefore be established from the above barrier analysis that the project activity faced numerous barriers in its implementation and successful operation. Some of these barriers have the potential to even disrupt the operation of the biomass hot air generation activity thereby damaging the commercial viability of the project activity.

Impact of project registration as CDM project :

It is clear from the above discussion that the project activity faced several barriers in its implementation and post successful operation period. Some of these barriers have the potential to even disrupt the daily operation and affect the economics of the project activity and tile manufacturing facility. The management of project proponent considered all risk aspects associated with the implementation of the project activity during the project inception.

Though the technology implemented was relatively new technology in Ceramic and Tile manufacturing industry, investing in unfamiliar technology (which is not prevalent in India) for this industry was a non standard and involve significant business risk. However, thinking out of the box concept HRJK also envisaged the revenues from the CDM project could help the project promoter to strengthen facilities. Some of the beneficial impacts foreseen because of CDM project funds would be:

1. The CDM funds would enable financing new energy conservation measures across HRJ, Kunigal plant which would reduce energy foot print of the industry and thus lower its GHG emissions.
2. The CDM revenues would enable to strengthen biomass price fluctuations and a percentage can be utilized in reducing maintenance cost and shut down costs.
3. Further a share of the revenues will help in improving technical expertise and training in CDM.

Overall, the impact of CDM revenues will prove to positive source of making the project feasible and additionally should help reducing uncertainties associated with the project.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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The procedure followed for estimating the emissions reductions from this project activity during the crediting period are as per the following steps which corresponds with AMS I.C / version 09, 23 December 2006.

<table>
<tr><th>Steps</th><th>Description</th><th>Equation Used</th><th>Methodological Choices</th></tr>
<tr><td>1.</td><td>Procedure followed for calculation baseline emissions (BE,y)</td><td>The baseline emissions are calculated as per simplified baseline approach which was fossil fuel that would have been consumed in absence of the project activity. The equation is represented as:
$$(BE) = \left[(Q_{coals}) x \frac{NCV_{coal} \, x \, 4.1868 \, x 10^3}{10^9} \, x \, EF_{coal} \, x \frac{44}{12} \, x \, OF_{coal} \right] - -1$$
<table>
<tr><td>Q_{coal}</td><td>Annual quantity of fossil fuel (coal) utilized in MT</td></tr>
<tr><td>NCV_{coal}</td><td>Net calorific value of coal in kcal/kg</td></tr>
<tr><td>EF_{coal}</td><td>Emission Factor of coal as per NATCOM (INDIA) , 1994 guidelines for GHG emission factor, 26.13 tC/TJ</td></tr>
<tr><td>44/12</td><td>Conversion factor from tC to tCO_2</td></tr>
<tr><td>OF_{coal}</td><td>Oxidation Factor of coal in (%) as IPCC 2006 guidelines for Stationary combustion</td></tr>
<tr><td>4.1868</td><td>Conversion factor from kcal to KJ</td></tr>
</table></td><td>The baseline emissions will be calculated on the basis paragraph 6. of AMS I.C which states the fuel consumption of the technology that would have been used in absence of the project activity times an emission factor of fossil fuel displaced. NATCOM (INDIA), 1994 emission factor is used in calculation as a conservative approach.</td></tr>
</table>

1.	Contd…	Where, $Q_{coal} = \frac{\lfloor Q_{HA}\ x\ c_{p_{HA}}\ x (T_{HA} - T_{Ambient})\ x\ (Annual\ \ Operating\ \ hrs) \rfloor}{NCV_{coal}} \quad --2$ 0.83	

Q_{HA}	Quantity of Hot air generated, kg/hr
c_{pHA}	Specific heat content of Hot air, Kcal/kg°K
T_{HA}	Temperature of Hot air generated, °C
$T_{Ambient}$	Temperature of Ambient air, °C
0.83	HAG efficiency (%)

Where,

$Q_{HA} = F\ x\ \gamma \quad ---3$

F	Flow of hot air, m3/hr , measured once in a shift with the help of pitot tube assembly
γ	Density of hot air at measured temperature in deg C , temperature measured once in a shift with the help of thermocouple fitted in the pitot tube assembly, same used for calculating air density using below formula

$$HotAir\ Density(\gamma) = \frac{273 x 1.293}{273 + T_{HA}} \quad ---4$$

Based on these equations (1 to 4), we calculate the baseline emission in absence of the project activity. Therefore the baseline emissions are:

Baseline emissions (B.E)[7] = 11,741 tCO_2 e

[7] In point no.1 of TableB.6.1, equations 2,3,4 and 5 are to be referred from Bureau of Energy Efficiency (BEE) Guide book- Chapter 3.5-Fans & Blowers, Pages;106-109.

3.	Procedure followed for estimating leakage (L,y)	Transport emissions (leakages) in case of the project activity are negligible and when compared to the transport of coal would be higher than of Biomass. Therefore excluded. **Leakages (L.E) = 0 tCO_2 e**	If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.
4.	Procedure followed for calculating Emission Reductions (ER,y)	The equation used to calculate emission reductions per annum are Emission reduction = B.E – P.E – L.E **Emission Reductions (ER) = 11,741 tCO_2 e** **Estimated Total Emission Reductions for fixed crediting period of 10 years will be 1,17,410 tCO_2 e**	-

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

>>

Data / Parameter:	NCV_{coal}
Data unit:	kcal/kg
Description:	Net calorific Value of coal
Source of data used:	NCV as per Quotation for coal supply date :20.05.2003 from Swami Yogananda Trading company, Cuddapah, Karnataka
Value applied:	4300
Justification of the choice of data or description of measurement methods and procedures actually applied :	The NCV data will be validated once during the validation.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$NCV_{biomass}$
Data unit:	kcal/kg
Description:	Net calorific Value of biomass residues
Source of data used:	NCV test report dated - 21.03.2003 from Essen & Co, Bangalore, Karnataka
Value applied:	3880
Justification of the choice of data or description of measurement methods and procedures actually applied :	The NCV data will be validated once during the validation .
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	EF_{coal}
Data unit:	tC/TJ
Description:	Emission Factor of Coal
Source of data used:	NATCOM (INDIA), 1994 values for Carbon Emission factor
Value applied:	26.13
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission factor data will be validated once during validation .
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	OX_{coal}
Data unit:	Not applicable
Description:	Oxidation factor of Coal
Source of data used:	IPCC 2006 guidelines for National Greenhouse Gas Inventories for Stationary Combustion
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Oxidation factor data will be validated once during validation primary source of the data being IPCC guidelines 2006

Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	D
Data unit:	Meter
Description:	Diameter of hot air duct.
Source of data used:	Hot air duct area connecting HAG and spray dryer at Kunigal
Value applied:	1.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Diameter of duct will be validated once during validation.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	Efficiency of FBC based HAG
Data unit:	%
Description:	Designed combustion efficiency of FBC based HAG
Source of data used:	Based on the efficiency proof from Radhe Renewable Energy Development P Ltd & Ashutosh Engg.consulting. 83% is the maximum efficiency as mentioned in the offer of Ashutosh Engg.consulting as compared to 81% as mentioned by Radhe.
Value applied:	83
Justification of the choice of data or description of measurement methods and procedures actually applied :	Designed efficiency data will be validated once during validation.
Any comment:	Data will be kept for crediting period + 2 years.

B.6.3 Ex-ante calculation of emission reductions:

>>

S.No	Description	Units	Calculation	Data Source
A	**BASELINE**			
1	Hot air flow from HAG to spray dryer	kg/hr	25000	Details are sourced from the design data sheet included in Detailed offer provided by FBC manufacturer Radhe Renewable Energy P Ltd, Rajkot - Direct HAG
2	Specific heat of hot air at 650 deg C	kcal/kg°C	0.266	Technical Memento-Thermax / Any standard thermal engineering reference book
3	Hot air Temperature	°C	650	Reference provide is Design data sheet for Direct Hot air Generator.
4	Ambient Temperature	°C	35	Average ambient Temperature of Kunigal Region
5	Energy supplied to Spray dryer	kcal/hr	4089750	Calculated
6	Annual operating days	days	330	1. From past operating experince and good management practises (which considers maintanence and shutdown period) we have considered 330 days as conservative figure for estimation. 2. Monitoring plan will justify actual days and no of hours of operation
7	Operating hours per day	hrs	18	
8	Annual Energy supplied to Spray dryer	kcal	2.4293E+10	Calculated
9	Net calorific value of Fossil fuel (coal)	kcal/kg	4300	NCV as per Quotation for coal supply date :20.05.2003 from Swami Yogananda Trading company, Cuddapah, Karnataka
10	Annual quantity of Coal consumed	MT	5650	Calculated

11	FBC HAG system efficiency	%	0.83	Based on the efficiency proof from Radhe Renewable Energy Development P Ltd & Ashutosh Engg.consulting. 83% is the maximum efficiency as mentioned in the offer of Ashutosh Engg.consulting as compared to 81% as mentioned by Radhe.
12	Net Annual Quantity of fossil fuel (coal)	MT	6807	Calculated
13	Total energy content from coal	TJ	122.54	Calculated
14	Emission factor of coal	tC/TJ	26.13	As per NATCOM (INDIA) 1994, Chapter 2 - GHG inventory information, Page:37.
		tCO_2/TJ	95.81	Calculated by multiplying 26.13 with 44/12 to derive 95.81
15	Oxidation Factor		1.0	As per IPCC 2006 guidelines for National Greenhouse Gas Inventories for Stationary Combustion
16	Emission Coefficient of coal	**tCO_2/MT of coal**	1.72	Calculated
	Baseline Emissions from coal	**tCO_2**	**11,741**	Calculated
B	**PROJECT**			
	Project Emissions from Biomass	**tCO_2**	**0**	Calculated
C	**Leakages**			
	Leakages	**tCO_2**	**0**	Calculated
	Emission reductions	**tCO_2**	**11,741**	Calculated

Note:

1. Moisture is an integral part of any substance. Change in moisture content of biomass residues also change biomass residue consumption annually. The project proponent has compared the moisture content with the most plausible alternative coal in absence of project activity. Test reports analyzed show higher presence of moisture content in coal when compared to biomass residues. This method provides a pragmatic approach for eliminating moisture as a parameter for monitoring and removing complication.
2. Electricity consumption in pre-project and project scenario is same and therefore, we have not considered in Baseline estimation

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

>>

Year	Estimated Project Activity Emissions (tonnes of CO_2e)	Estimated Baseline Emissions (tonnes of CO_2e)	Estimated leakage (tonnes of CO_2e)	Estimated Emission Reduction (tonnes of CO_2e)
2008-09	0	11,741	0	11,741
2009-10	0	11,741	0	11,741
2010-11	0	11,741	0	11,741
2011-12	0	11,741	0	11,741
2012-13	0	11,741	0	11,741
2013-14	0	11,741	0	11,741
2014-15	0	11,741	0	11,741
2015-16	0	11,741	0	11,741
2016-17	0	11,741	0	11,741
2017-18	0	11,741	0	11,741
Total	**0**	**1,17,410**	**0**	**1,17,410**

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

>>

Monitoring methodology approach is based on the paragraph 11 of small scale methodology AMS I.C version 09, scope 01, 23 December 2006. As per AMS I.C baseline methodology monitoring is proposed to be carried out on basis of paragraph 11 (a) by "Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient".

The following sections (B.7.1 & B.7.2) provides a detailed description of the application of the monitoring methodology and description of the monitoring plan, including identification of the data to be monitored and the procedures that will be applied during monitoring.

B.7.1 Data and parameters monitored:

Data / Parameter:	$Q_{biomass}$
Data unit:	MT
Description:	Quantity of Biomass annually procured
Source of data to be used:	SAP
Value of data applied for the purpose of calculating expected emission reductions in section B.5	7,992

Description of measurement methods and procedures to be applied:	Monitoring: 1. Total biomass quantity for annual consumption will be verified from SAP system of HRJK. Weigh bridge is used for measuring quantity of biomass entering in HRJK premises. Subsequently this data is entered into the SAP system by Stores person. Data type: Measured and archived Archiving procedure: Paper and Electronic Recording Frequency: As and when procured. Responsibility: CDM co-ordinator with Officer (Stores) would be responsible for monitoring and checks for regular calibration of the weigh bridge. Calibration Frequency: o Weigh bridge are calibrated once in a year. o Calibration test report is conducted by Government of India, Department of Weights and Measurements laboratory. o Accuracy is 0.1 % of weigh bridge reading.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project activity site.
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	F
Data unit:	M3/hr
Description:	Flow of hot air in cubic meter per hour
Source of data to be used:	Measured on the downstream side of FBC duct before spray dryer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	65370
Description of measurement methods and procedures to be applied:	Monitoring: Through digital pitot tube assembly Data type: Metered Archiving procedure: Paper and Electronic Recording Frequency: Once in a shift (8hrs) Responsibility: CDM co-ordinator would be responsible for measurement and monitoring. Calibration Frequency: Digital Manometer calibration will carried once in a year by external agency. Accuracy and Uncertainties levels: Pitot flow - Accuracy ±3% of reading ± 10m3/hr Pitot Tube - Accuracy >1% for ± 10 deg alignment to the fluid flow

	Digital Manometer - Accuracy ± 0.5 of reading and ± 1 mm H_2O
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project activity site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	t_{ha}
Data unit:	°C
Description:	Degree celsius
Source of data to be used:	Measured on the downstream side of FBC duct before spray dryer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	650
Description of measurement methods and procedures to be applied:	Monitoring: Thermocouple Data type: Measured Archiving procedure: Paper and Electronic Recording Frequency: Once in a shift (8hrs) Responsibility: CDM co-ordinator would be responsible for measurement Calibration Frequency: Calibration will be carried out once in a year. Accuracy and Uncertainties levels: Digital Thermo couple - Accuracy - ± 0.5 of reading and ± 0.8 deg C
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project activity site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	$Gas\ Density(\gamma)$
Data unit:	kg/m^3
Description:	Density of hot air at test condition (650 deg C)
Source of data to be used:	Calculated on the basis of Gas Density formula given in Table B.6.1
Value of data applied for the purpose of calculating expected emission reductions in section B.5	$Gas\ Density(\gamma) = \frac{273 x 1.293}{273 + T_{HA}}$ = 0.382 kg / m3
Description of measurement methods and procedures to be applied:	Monitoring: based on the formulae Data type: Calculated Archiving procedure: Paper and Electronic Recording Frequency: Once in a shift (8hrs) Responsibility: CDM co-ordinator would be responsible for calculation.

	Calibration Frequency: Not Applicable
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project activity site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	Tam
Data unit:	Deg C
Description:	Average ambient temperature at Kunigal
Source of data to be used:	Average temperature data recorded in the plant.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	35
Description of measurement methods and procedures to be applied:	Monitoring: Thermometer Data type: Measured Archiving procedure: Paper and Electronic Recording Frequency: Once in a shift (8hrs) Responsibility: CDM co-ordinator would be responsible for measurement Calibration Frequency: Calibration will be carried out once in a year. **Accuracy and Uncertainties levels:** ± 1 deg C
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project activity site
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	c_{pHA}
Data unit:	Kcal/kg°C
Description:	Specific heat of hot air
Source of data used:	Based on the hot air temperature required at spray dryer (Thermax Momento Handbook or Standard Thermodynamics reference book)
Value applied:	0.266
Description of measurement methods and procedures to be applied:	Monitoring : Reference data based on the Thermax momento handbook or standard thermodynamics reference book Data type: Calculated Archiving procedure: Paper and Electronic Recording Frequency: Once in a shift (8hrs) Responsibility: CDM co-ordinator would be responsible for Calculation Calibration Frequency: Not applicable
QA/QC procedures to be applied:	Yes, Quality Management System will be used and

	the same procedures would be available at the project activity site
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	Annual operating days
Data unit:	Days
Description:	From past operating experience and good management practices (which considers maintenance and shutdown period) we have considered 330 days as conservative figure for estimation.
Source of data used:	Average
Value applied:	330
Description of measurement methods and procedures to be applied:	Monitoring : Actual spray dryer and HAG log book data. Data type: Calculated Archiving procedure: Paper and Electronic Recording Frequency: Once in a day Responsibility: CDM co-ordinator would be responsible for calculation Calibration Frequency: Not applicable
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project activity site
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	Operating hours per day
Data unit:	Hour
Description:	Daily operating hours of HAG and spray dryer
Source of data used:	From past operating experience and good management practices (which considers maintenance and shutdown period) we have considered 18 hours as conservative figure for estimation.
Value applied:	18
Description of measurement methods and procedures to be applied:	Monitoring : Actual spray dryer and HAG log book data. Data type: Calculated Archiving procedure: Paper and Electronic Recording Frequency: Once in a shift (8hrs) Responsibility: CDM co-ordinator would be responsible for calculation Calibration Frequency: Not applicable
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project activity site
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	Annual surplus biomass assessment report
Data unit:	Not applicable
Description:	Annual biomass surplus assessment study will be carried out once in a year to establish surplus biomass availability in and around Kunigal. One third party independent agency would be engaged in this process to conduct the study.
Source of data to be used:	Independent survey will be carried out by an independent agency to establish the surplus quantum of biomass available in the region.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Not applicable
Any comment:	Data archived: Crediting period + 2 yrs

Note:
As per AMS I.C small scale methodology, monitoring shall be carried out using paragraph 11(a), which is metering the energy produced by a sample of the systems is where the simplified baseline is based on the energy produced multiplied by an emission coefficient.

In the case of HRJK project activity, the energy produced is in form of hot air, which will be monitored. Considering the high temperature in the range of 600 – 700 deg C and the nature of dusty hot air, it was not technically feasible to install any flow meter for online measurement. Therefore it was decided to meter the hot air flow with the help of Pitot tube assembly. The method is one of the most primary techniques to measure velocity pressure and derive energy content in the thermal energy source medium. Equations provide in Table B.6.1, will further help in deriving the energy content carried to the spray dryer annually. Rate of production in the spray dryer is almost constant, therefore their on significant variation in the parameter like hot air temperature and flow.

B.7.2 Description of the monitoring plan:

>>

HRJK has developed elaborate monitoring procedure along with formats for data collection to suit SAP system and Pitot Tube based biomass consumption monitoring. Methodology has been described for collection of each of the parameter in monitoring and proper training is being provided to concerned personnel's. To understand uncertainties and accuracy instruments like weighing bridge scales and related monitoring instruments are calibrated regularly. Checking and maintaining the tests, measurements and data captured shall be carried out by CDM co-ordinator.

Procedures identified for Calibration of Monitoring equipment and its maintenance:

Pitot tube, digital differential pressure gauge/ temperature gauge/digital flow indicator, thermocouple, and mercury thermometer, weigh bridge should be calibrated as per defined calibration frequency. In case any of failure of any of these measuring devices same should be repaired or replaced immediately as per the need.

The annual monitoring report should be worked out with the help of the CDM co-ordinator and will be submitted to DOE during verification. The report will be archived to make it available for the external audit & verification purposes.

Procedures identified for dealing with possible monitoring data adjustments and uncertainties:

Differential pressure data should be recorded at least once in a shift with the help of pitot tube assembly. Other associated data like temperature of flue gas would be also recorded once in a shift. In case of any abnormalities reported in the data, will be cross check again. Shift wise energy consumption data will be also verified with shift wise biomass consumption data. Same practise should be followed for weekly / fortnightly / monthly / quarterly / half yearly and yearly energy consumption data and biomass consumption data.

Daily monitoring report should be circulated to General Manager (O) and Sr. Vice President (O). Biomass consumption data will be also crosschecked with biomass issue data from stores and biomass procurement data from purchase department.

Procedures identified for internal audits of GHG project compliance with operational Requirements as applicable:

In order to check the project's compliance with operational requirements, internal audit will be carried out for parameters mentioned in the monitoring table. For this purpose, a team has been formed under the supervision of the Sr.Vice President (operations).

Procedures identified for day-to-day record handling (including what records to keep, storage area of records and how to process performance documentation):

Procedures identified for day-to-day record handling are as follows:

1. Daily records of quantity of the biomass used should be maintained properly in the format provided.
2. Daily shift wise records of data monitored for Pitot tube assembly / number of hours of operation / HAG output temperature etc. logging of the same in log book and electronic form.

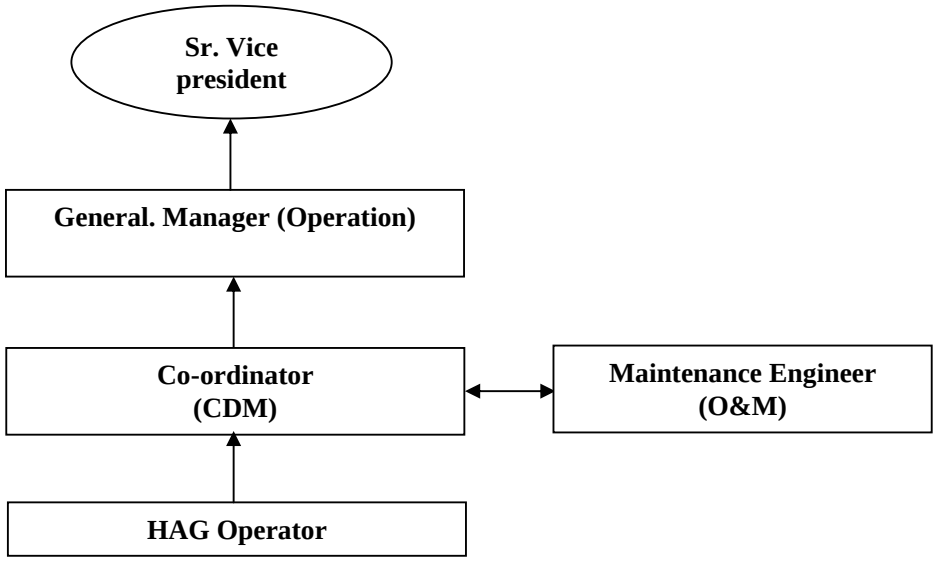
Procedures identified for training:

Training procedures identified are as follows:

1. Initial training on operation and maintenance was given to the project operators to create awareness about the project activity.
2. Detailed training was given to the project operators including:
- Information about data to be collected / monitored and its quality
- Proper data collecting/ monitoring procedures
- Correct data entry procedures
- Maintenance of data records in logbook and spread sheet
- Proper storage of data records
- Emission reduction calculation as provided in the emission calculation workbook
- Checking whether the emission reduction is as per the monitoring methodology or not
- Preparation of annual monitoring report

Both during the project activity and SAP implementation the third party implementer have provided training for O&M and data collection and monitoring. This will help CDM project activity personnel's to monitor exact carbon credits.

Monitoring hierarchy:



Sr. Vice President (Operation)

1. Ensuring implementation of monitoring procedures lay down.
2. Performs reviews of internal audits
3. Performance conformance reviews.

General .Manager (Operation)

1. Organizing and conducting training program on CDM and related activities for staff.
2. Implementing all monitoring procedures
3. Maintenance and calibration of equipment relating to biomass quantity and heat requirement.
4. Reviewing records and monitored data.
5. Internal audits
6. Overall responsibility for closing NOC and implementing corrective actions before verification.

Co-ordinator (CDM):

1. Supervision of HAG and provide training to HAG operator
2. Record maintenance and monitoring measurements and reporting.
3. Assisting General Manager (Operation) in checking and review of records and during internal audits.

HAG Operator

He will be responsible for monitoring and measurement of all activities.

Maintenance Engineer (O&M)

Assist in preventive and scheduled maintenance with CDM coordinator

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 and monitoring methodology:

14/12/2007

Name of person/entity determining the baseline:

Mr.D.R.Kulkarni
H & R Johnson (India) Ltd.
Plot No. 1 – 12,
KIADB Industrial Area,
Near Anchepalya Village
Kunigal, Dist. Tumkur,
Karnataka – 572 130

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

>>
10 years and 0 months

C.1.1. Starting date of the project activity:

>>
04/07/2003 – Purchase order date for Biomass HAG

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

>>
20 years

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

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:

>>
10 years and 0 months

C.2.2.1. Starting date:

>>
01/03/2008 or date of registration which ever is later.

C.2.2.2. Length:

>>
10 years and 0 months

SECTION D. Environmental impacts

>>

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

>>

The Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S.O. 60(E) dated 27/01/94 has listed a set of industrial activities in Schedule I of the notification which for setting up new projects or modernization/ expansion will require environmental clearance and will have to conduct an Environment Impact Assessment (EIA) study.

The project activity implemented at H&R Johnson (India) Limited, Kunigal - Generation of hot air in spray dryer using renewable biomass fuel at H&R Johnson (India) Limited, Kunigal, was commissioned and does not require any EIA to be conducted as the activity is not included in Schedule –I. The project activity consists of using renewable biomass residue fuel and thus avoids usage of fossil fuel (coal) to generate hot air HAG for spray drying process in tile manufacturing at HRJ, Kunigal..

HRJ has obtained necessary clearance from:

- No Objection certificate Karnataka state pollution control board.
- Consent to operate Karnataka state pollution control board
- Certificate from of Factory Safety Inspectorate.

As per ISO 14001, the CDM co-ordinator has identified aspect-impacts of the project activity. Article 12 of the Kyoto Protocol requires that a CDM project activity contributes sustainable development of the host country. Assessing the project activity, ***positive*** impacts on the local *environment* and on *society* are evident.

The project activity:

1. Reduces CO_2 emissions that would have been released into atmosphere by combustion of fossil fuel (Coal)
2. Reduces the use of finite fossil fuels and contributes to sustainable development

Possible environmental impacts from combustion of biomass residues in HAG will result in suspended particulate matter (SPM) are controlled by air pollution control devices like settlers (for particulate mater > 50 μm) and cyclone (for particulate mater < 10 μm) in order to meet air quality requirement in the rural area setting. During the period of project activity conception and commissioning there were no state or

sectoral policies presented or promoted that required use of renewable biomass based thermal energy generation projects.

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:

>>

Prior to the project activity implementation, the assessment carried out could show different impacts on the environment. These are tabulated below:

S.No	Environment Paramater	Impact
	Pre-project Scenario	
1.	Air Pollution	Earlier in the FO based HAG system, chances of in-complete combustion were more. As a result, soot along with SPM were released through stack and used to damage internal and external environment. SO_x and NO_x formation was more in case of LDO based HAG.
2.	Land Pollution	FO is liquid fossil fuel, which was used earlier in absence of the project activity. Incidences of spillage would have harmed the land, thus causing land pollution
	Project Scenario	
1	Pollution Abatement and Management systems in place	• The project activity has implemented all possible pollution control measures to resduce SPM emissions • Their no SO_X formation since it uses biomass residues. • Their no NO_X formation since the combustion temperature in FBC is low (up to 900 deg)
2	NO GHG emissions	The project activity enables to reduce the carbon foot print of H&R Johnson (India) Ltd., Kunigal as the project utilizes biomass residues renewable

		in nature. Thus the project is environment friendly by reducing GHG emissions in environment.
3	Energy Resource Utilization	The biomass utilized is an agriculture waste/residue which is generally burnt or thrown on street side. However this project activity utilizes this biomass residue for energy generation in form of hot air in tile manufacturing. This activity prevents wasting of biomass any possible methane emission.

Thus it was found that project activity implemented is a proactive effort for environment protection and reduction of GHG emissions. Thus, the project activity was found to create NO significant impacts.

SECTION E. Stakeholders' comments

>>

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

>>

H&R Johnson (India) Limited, at Kunigal has implemented renewable energy source biomass based hot air generation plant. The project will use biomass available of nearby region of Tumkur district as the fuel. The GHG emissions of the combustion process, mainly CO_2 are sequestered by the plantation, representing a cyclic process. So the project leads to zero net GHG on-site emissions.

The stakeholders identified for the project are as under.

- ✓ HRJ Employees
- ✓ Local governance representative
- ✓ Local community - Farmer
- ✓ Contractor – Manpower provider
- ✓ Non-Governmental Organizations (NGOs)

Summary of comments from different stakeholders is given in section E.2.

E.2. Summary of the comments received:

>>

Above identified stakeholders were communicated for feedback and comments on project. A meeting was held which was attended by different stakeholders who had direct or indirect relation with this project. A brief discussion was held between HRJ and stakeholders to make understand concepts and benefits of Clean Development Mechanism.. An extract/summary of the interviews is available with the validating agency.

Summary of the comments are given in tabulated form below.

S.No	Respresentative/Stakeholder	Comments
1.	Mr.Prakash Madiwalar HRJ Employee Operator – Slip House and Spray dryer department	Mr.Madiwalar said he understands the objective of this mechanism to reduce GHG emissions and thus help in reducing damages to the environment. As the project implemented utilizes biomass for thermal energy generation, this reduces GHG emissions. Also

		the project activity facilitates a healthy environment in the company. Previously we used to have frequent health concerns, however due to complete avoidance such health problems are not found. The ash we generate would have been otherwise disposed which would require solid waste management compliance, however our production process utilizes the ash and thus we do not required to dispose it outside and thus it is proving beneficial to the environment.
2.	Mr.G.N Chandrashekhar HRJ Employee EMS – Core group member	Mr.Chandrashekar is happy to know about the renewable energy project and he takes special role in integrating parameters related to CDM in EMS system. Further to this he added that CDM will help HRJ to reduce the GHG emissions. The project will help in creating a good environment for the local as well as global stakeholders. It gives a green image to the company. The company gets better publicity for environment friendly projects. Disposal of fly ash was a big concern for us earlier which has been solved using R&D. Overall the project is a good initiative and will help HRJ is sustainable development.
3.	Mr Chandrappa, Member of the Panchayat (Local Government), Anchepalya Village.	A member of 15,000 communities who are inhabitants in and around Ancheplaya village. Mr.Chandrappa, who is a farmer too says, earlier all raw material used to be purchased from outside. Several trucks used to be lined up for discharging. Now, all such practices have stopped. Most of the material now comes from surrounding areas of village. It helps benefit the local people, their standard of living and it benefits the company also. Earlier, when the company used oil as a fuel, we used

		to witness a lot of carbon soot in the atmosphere and used to deposit in the nearby buildings and fields. This was not good for environment and health of people. However the project has proved to be beneficial reducing pollution to zero. Lastly when the company started using agricultural residues, all the farmers, who supply biomass, have been getting an additional income. Overall the locals are happy and indebted to the company. They feel there will be more growth and employment.
4.	Mr.Abdul Majid Farmer	After H.&R Johnson (India) Limited, came here, a lot of people have been benefited. Several people are working here and are happy. They also work in the farm. Even when the rains are not good, they still get a steady income from this employment. So they are able to maintain their families. We are not entirely dependant on rains now. People have been employed here. That is the biggest benefit. Many factories followed your company here. So employment in all these factories has benefited us the biggest Now it is very good. Business has grown very well. There is more work, now with Employment situation is better. Because of the project activity there has been good development. The company should continue like this. We are happy.

5.	Mr.Akram, Labour Contractor.	Nearly 200 people were employed on contract every day during the project implementation with my contribution to the temporary of 60 persons. Some of our people were involved in the project stage and now, they are also involved in the operations. Several

		workmen study during the day and work later. So, they are able to support themselves. Some workmen work in the farm also. Earlier, people were entirely dependant on the monsoons for a good crop to make their living. They are happy. They get paid well for their work. People need employment. The project activity has benefited the local people very much. Overall we are seeing a good development.
6.	Mr.Veerabhadraiah- NGO – Lecturer and Social Worker	We expect the organization to conduct some awareness camps about such projects to enlighten the local people regarding the benefits and advantages. HRJ has already taken this comment worked forward on this area.

Thus, it implies that the project will not cause any adverse social impacts on the local population but helps in improving the quality of life for them.

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

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Positive feed backs and comments have been received from different stakeholders listed above for HRJ project. However as per UNFCCC requirements, the project design document (PDD) will be kept on the website for global stakeholder comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	H&R Johnson (India) Limited.
Street/P.O.Box:	Corporate & Registered Office, Windsor, 7 th Floor,C. S. T. Road , Kalina Santacruz (East),
Building:	--
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 098
Country:	India
Telephone:	91-22-26547300
FAX:	91-22-30647400
E-Mail:	kulkarni.devavrata@milanobath.com
URL:	http://www.hrjohnsonindia.com
Represented by:	
Title:	Sr. Vice President
Salutation:	Mr.
Last Name:	Kulkarni
Middle Name:	--
First Name:	Devavarata
Department:	Project
Mobile:	--
Direct FAX:	--
Direct tel:	--
Personal E-Mail:	--

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding received for the project activity.

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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