CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

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>.

SECTION A. General description of the small-scale project

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

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Title of project activity : RREPL-14MW Rice Husk Power Project

CDM document version No : Version 06

Date of the CDM document : 02 September 2011

Revision History of the PDD

Version No	Date of revision made	Remarks
04	07 August 2006	Registered PDD
05	18 November 2010	Revision of PDD requesting notification of changes.
06	02 September 2011	Revision of PDD after the completeness check review query

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

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purpose of the project activity

The purpose of the project activity is to generate electricity using Biomass like rice husk for generation of power to achieve better energy efficiency, produce eco-friendly power; achieve sustainable development of the industry by reducing CO2 emission and other GHG emissions due to degeneration and uncontrolled atmospheric burning of biomass. In the proposed project activity biomass shall be combusted in the boiler for producing high pressure steam which will be fed into a turbine generator to generate 14 MW electricity. However right from the inception of this project, a Turbo Generator of capacity 15 MW is installed. the project proponent had placed an order for supply of 14 MW generator set to the equipment supplier, accordingly in Project Design Document 14 MW Generator set was mentioned. However due to easy and ready availability the supplier has supplied 15 MW generator set in place of 14 MW. Therefore at the Project Activity 15 MW Generator has been installed in place of 14 MW Generator, as mentioned in registered PDD. This generated electricity is sold to or through CSEB grid who are the only state wide grid in Chhattisgarh state for distribution of electricity.

The fuel proposed is biomass like rice husk which is abunduntantaly available in Raigarh District and adjoining areas of Chhattisgarh and Orissa state where the project activity is situated. As the farmers in the state grow two crops of rice in a year as the state receives rains from both the monsoons; the rice husk availability is through out the 12 months of the year. Other biomass which can be used are like wood chips; agricultural residues; bushes, de-oiled cakes of Sal seed and Dori seed and other de-oiled cakes which do not have any economically valuable use other than combustion.

Rice Husk quality procured for generation of electricity may not be consistent and hence it is proposed to use small percentage of fossil fuel like coal to ensure consistent generation of electricity. We estimate that maximum 10% fossil fuel is likely to be co-fired. *The Ministry of Non-conventional Energy sources (Power Group) has given the provision for using fossil fuel upto 25% along with primary fuel biomass.*

RREL generates electricity and supplies to or through CSEB grid which meets the demand of its consumers for electricity by producing and importing electricity from power stations generating electricity based on fossil fuel. Hence the project activity displaces the

electricity from grid distribution system that would have otherwise been supplied by fossil fuel fired power generating units. Hence achieves reduction in GHG emissions indirectly.

The main activity of RREL is be to produce electricity and sell it to or through Chhattisgarh state electricity board (CSEB) as CSEB is the only available state wide grid network and statutory agency to distribute power within Chhattisgarh state.
A power supply Agreement was signed with CSEB by RREL for supply of 13.23 MW power to or through CSEB.

The main carbon benefit to the project arises from the replacement /displacement of an equivalent amount of electricity which would have been generated in the absence of this project activity. The grid electricity has high carbon intensity as major part of power generated in grid is coal based.

The total emission reduction for the entire crediting period of 10 years have been calculated as 554720 Tonne CO_2 –equivalent. The other benefits being reduction of GHG emissions considering global scenario, Sustainable development through better energy efficiency and also leads to improvement of local environment.

The Project activity achieves the following goals.

- Utilisation of Biomass like rice husk which would be wasted otherwise and allowed to either decay and/ or burn in open or partially used inefficiently to generate heat in small or mini industries.
- Generation of eco friendly green power
- Meet the power requirement, even though in small way, of CSEB which has power shortage and CSEB has to import electricity from other sources
- Helps CSEB to become eco friendly and become less dependant on fossil fuel generated electricity.
- Upgraded technology to achieve sustainable Industrial growth in State.
- Conserve natural resources and environment.
- Reduce the disparity between demand and supply of grid electricity.
- Reduction of CO2 emissions and other GHG emissions.
- Reduces the fugitive-uncontrolled combustion of Rice Husk at Sporadic location, which cause local environmental problem.
- Fetches fair economic return to the farmers and National Economy, otherwise waste biomasses which are not fetching any value economically.

View of project participant towards the contribution of the project activity to sustainable development.

The project activity will lead to sustainable development and promote sustainable Industrial growth by conserving natural resources like coal and producing green power which is the most important requirement for growth of economy.

Reduces the fugitive-uncontrolled combustion of Rice Husk at Sporadic location, which cause local environmental problem.

SOCIAL BENEFIT TO STATE
The small farmers who grow paddy have made India self sufficient in food .But due to rising price of input like of fertilisers; seeds etc the farmers do not realise proper returns for their efforts.

The project activity adds income to the farmers by providing added economic value to the produce of farmers by procuring rice husk from the rice mills, which they would have otherwise burnt or left in open to natural decay. This will definitely help the millers to pay better price to the farmers for their paddy crop. This will lead to overall development of

society in economic health; education etc.

At procurement price of rice husk @ Rs.1200/Tonne and procured quantity of rice husk of 89745 tonnes will make significant contribution to the income of farmers.

The rice husk transportation to site will provide employment opportunities to a number of trucks and other similar vehicles will be making trips to project site throughout the year. This will increase the transport related income and employment.

The transportation earning of biomass which involves about 8975 trips of 100 kilometer average distance is likely to generate income.

At current consumption rates, CSEB projects Power deficiency between generating capacity and demand in supply of electricity from grid leading to import of power from central grid and others. The project shall enable the CSEB to satisfy more consumers leading to more employment for skilled and professional people in the state,

The project activity shall provide direct employment to many temporary workers during project execution. After commissioning, it will provide employment to unskilled, skilled workers and to professionals.

Economical Benefits to State.

The sale agreement between RR ENERGY and CSEB shall provide for 100% generated power to be sold to or through CSEB at the rate of Rs.2.67 per unit (these rates have been raised from Rs.2.25/KWh at present and shall be applicable to the project). This is substantially lower than CSEB charges for their HT customers. Hence the economical benefit will be available to state.

The project activity investment is about 424.92 million rupees in green field project. This will lead to overall economic growth of state economy and also state will earn by way of sales tax and other applicable levies.

Environmental Benefit:

The Power generation in India / Chhattisgarh is mainly fossil fuel Coal based.

The Project activity is `Biomass based Power Plant and thus effectively saving environment of CO_2;NO_X;CH_4 emission.

Reduces the fugitive-uncontrolled combustion of Rice Husk, at Sporadic location, which cause local environmental problem.

The adoption of new advanced air cooled technology for cooling and condensing of turbine exhaust steam will help to save water resources and reduce water wastage.

Reduction in T & D Losses of Power

CSEB State grid has almost 37%T & D losses. The Power generated by Project activity is much nearer to industrial belt of Chhattisgarh state where power demand is maximum. This will enable CSEB to cut down T&D losses by supplying power received from this project activity to near by area consumers.

Reduction in Waste Water .
The Water consumption and Waste Water generation will be minimised by using the advanced Air Cooled condenser system. The generated waste water will be used for in house activities like fire fighting, road sprinkling for fugitive dust emission control, and green belt development etc.

Reduction in SPM level in the environment and additional Economic benefit.
ESP (Electrostatic Precipitator) provided shall arrest the ash which will be collected in Ash hoppers. This Ash will be given free of cost to cement plants & brick manufactures for further Economic benefit.

Use of Ash in Cement making will save the Natural limestone resources. Similarly production of Ash bricks will help to reduce the fertile soil consumption, used in clay brick making.

Saving of foreign exchange
The project activity does not involve any imports involving foreign exchange since most capital equipment is manufactured in India. This contributes to national policy of self reliance.

Indian industry growth
The project activity is green field project and hence investment of 424.92 million rupees involves capital equipment purchase of 361.30 million rupees from all India level and hence will lead to growth of capital equipment manufacturer adding employment opportunities to professionals and workers.

Technology up gradation
The project activity uses the latest technology in the equipment design construction and specifications.

A.3. Project participants:

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Name of the Party Involved (host) host party	Private and/or Public entity (es) Project Participant as applicable	Kindly indicate if the party involved wishes to be Considered as project participant (Yes/ No)
India (host) Ministry of Environment and Forest	Public entity	No
	RR ENERGY LIMITED - Private Entity	Yes

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

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

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A.4.1.1. Host Party(ies):

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India

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

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Chhattisgarh State

A.4.1.3. City/Town/Community etc:

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Garh Umaria , Darramuda ; Raigarh District, Chhattisagarh state

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

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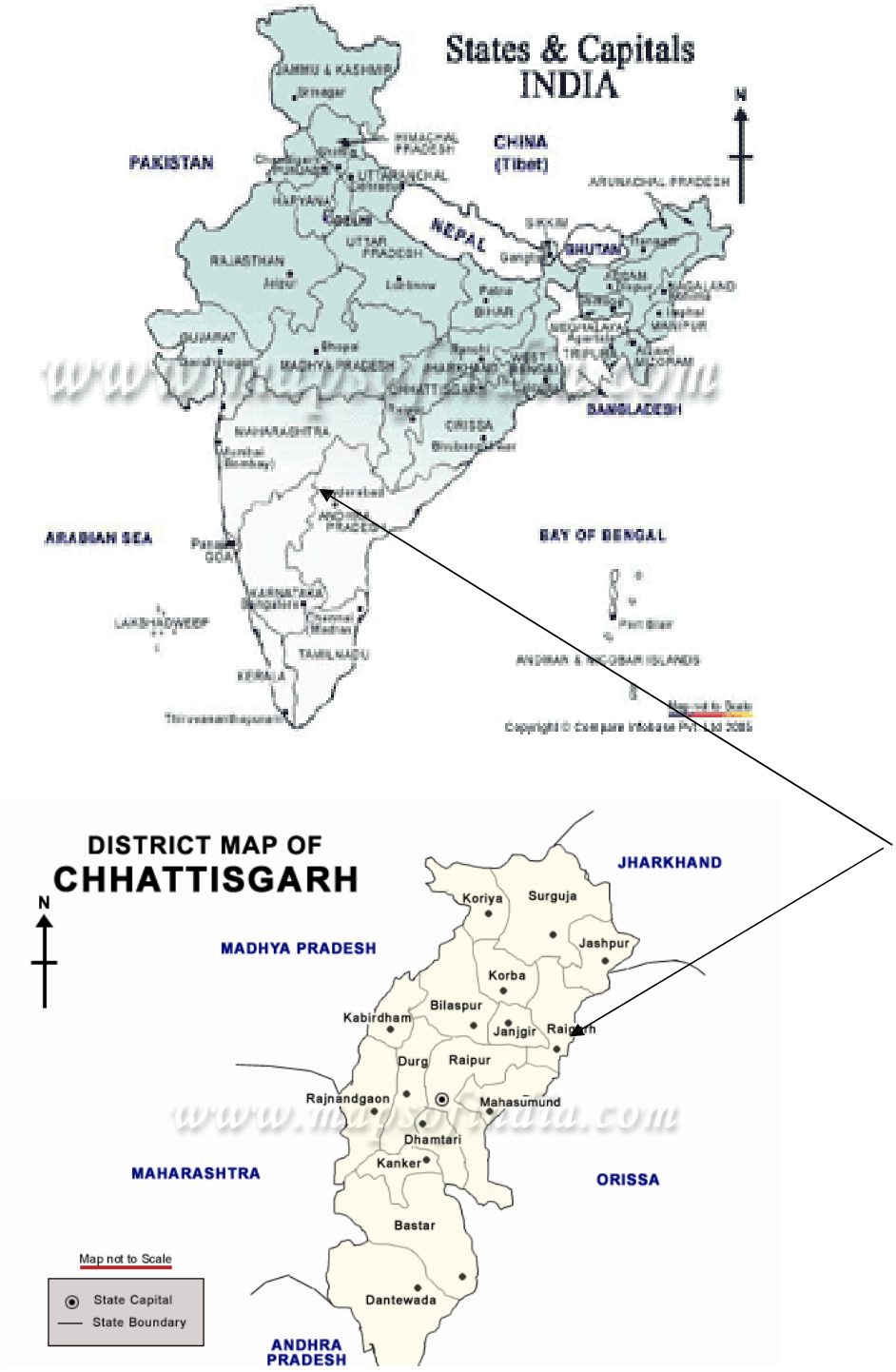
Physical location :

Project activity is located at Village-Garh Umaria , Darramuda; Raigarh District of Chhattisagarh State at about 8 Kilo meters from Raigarh city on the Jharsuguda Road.

Unique identification :

Longitude 85 degree 24.5 minutes East ; Latitude 21 degree 51.2 minutes North. This is the only major industry located in the village Garh Umaria, Tahsil- Raigarh, District- Raigarh, which is located 8 Km away from the Raigarh on Raigarh- Jharsuguda connecting Hi-way. There is no other major plant or Industrial unit in this village. The Kirodimal Institute of Technology is located at about 1 Km distance before the project site.


States & Capitals
INDIA
PAKISTAN
CHINA
(Tibet)
NEPAL
BHUTAN
BANGLADESH
ARABIAN SEA
BAY OF BENGAL
DISTRICT MAP OF
CHHATTISGARH
JHARKHAND
MADHYA PRADESH
MAHARASHTRA
ORISSA
ANDHRA
PRADESH
Koriya
Surguja
Jashpur
Korba
Bilaspur
Kabirdham
Janjgir
Raigarh
Durg
Raipur
Rajnandgaon
Mahasumund
Dhamtari
Kanker
Bastar
Dantewada
Map not to Scale
State Capital
State Boundary

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

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In line with paragraph 6I of decision 17/CP.7 on the modalities and procedures for the CDM, and 'Appendix B' of the simplified modalities and procedures for small-scale CDM project activities; "Indicative simplified base line and monitoring methodologies for small-scale CDM project activity categories" of Annexure II to decision 21/ CP.8 . The applicable type and category is :

Type-I RENEWABLE ENERGY PROJECTS
Category I.D. Grid connected renewable electricity generation
I.D./ Version 08 Scope ## 03 March 2006

1. This category comprises renewable energy generation units, such as photovoltics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and /or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generation unit.
2. If the unit has both renewable and non renewable components; the eligibility limit of 15 MW for a small-scale CDM project activity only applies to the renewable component. If the unit added co fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.
3. Biomass combined heat and power (co-generation) system that supply electricity to and/or displace electricity from a grid are included in this category. To qualify under this category, the sum of all forms of energy output shall not exceed 45 $MW_{thermal}$. E.g. for a biomass based co-generating system the rating for all the boilers combined shall not exceed 45 $MW_{thermal.}$
4. Project activities adding renewable energy capacity should consider the following cases:
    1) Adding new units;
    2) Replacing old units for more efficient units.

   To qualify as a small scale CDM project activity, the aggregate installed capacity after adding the new units (case 1) or of the more efficient units (case 2) should be lower than 15 MW.
5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.

How the project activity conforms with the project type and category selected

1. Project activity proposes to generate 14 MW electricity using renewable biomass like rice husk
2. Project activity is to sell the 13.23 MW electricity generated to or through CSEB grid electricity distribution system which distributes electricity generated from fossil fuel based power plants to the extent of 85%. CSEB generates 62% of the electricity distributed in Electricity distribution system from CSEB owned three coal based generating plants and balance power is imported from other sources which are also mainly fossil fuel fired generation units.

3. Rice Husk quality procured for generation of electricity may not be consistent and hence it is proposed to use small percentage of fossil fuel like coal to ensure consistent generation of electricity. We estimate that 10% fossil fuel is likely to be co-fired. However electricity generated from the project activity will not exceed 14 MW.
4. Project activity is only for renewable electricity generation and not co-generation type.
5. Project activity is a new unit, green field project activity and the project activity does not seek to retrofit or modify any existing facility.
6. Hence our project activity confirms to type I.D. and in accordance to point No.3 under technology/ measure of approved methodology.

Hence the small-scale project activity conforms to selected project category

Demonstrate that capacity of the project activity will not increase beyond 15 MW

RREL will ensure that capacity of the proposed small scale project activity will not go beyond 15 MW due to following reasons:

1. A board resolution passed by the Board of the Directors of the company restricts that the capacity of the plant will not be increased beyond 15 MW during the entire credit period. This will be binding RREL not to enhance its power generation capacity.
2. The licensed capacity sanctioned by CREDA of Chhattisgarh government is only for 15 MW. Any increase requires fresh sanction/ licence, which may not be available due to commitment of RREL.
3. Technologically, installed equipment like boiler and steam turbo generator have the capacity to generate 15 MW power and hence, it will not be possible to generate more than 15 MW power .
4. The generated electricity is sold to or through CSEB grid and the units sold are monitored by CSEB grid who are government agency and pay for the electricity received at fixed rate per unit of electricity i.e KWh and hence the electricity generated and sold is easily monitored by government sanctioning authorities. The present agreement for power selling with CSEB grid is for 13.23 MW and hence additional power generation will need fresh agreement with CSEB.
5. RREL has put in place a very reliable and transparent monitoring of electricity generation in line with small scale CDM monitoring methodology.

Technology of small scale project activity

The biomass is mainly rice husk. However the boiler is designed to take other type of biomasses like crop residues and bushes.

The electricity generating system comprises of

1. Stroker fired furnace
2. Fluidised bed type boiler
3. Steam drum
4. Super heater
5. 15 MW STG electromagnetic induction type
6. Air cooled condensers

7. De-mineralised water plant
8. Fuel handling system
9. Ash handling system
10 Air dryer etc.
11. Air preheater and Economizer.

Table: Specifications of Boiler, Turbine and Generator

Sl. No.	Actual installation at site since start of project activity	Supplier Name & Address
1	Steam Turbine (14 MW, Steam Temperature: 490-495 degree C, (Design/Maximum) Steam Pressure: 6.485/6.809 Mpa)	Greenesol Power System Pvt. Ltd. No. 11/23, "SURYADEV" 20th Main Road, 1-R Block Rajajinagar, West of Chord Road, Bangalore – 560 010 India
2	Boiler (70 T/hr of steam at 66 kg/ cm2 pressure and 495±5^{0}C temperature)	Thermax Babcock & Wilcox Limited, D-1 MIDC, R. D. AGA Road Chinchwad PUNE –411019
3	Generator (15 MW) 3 phase synchronous generator)	Greenesol Power System Pvt. Ltd. No. 11/23, "SURYADEV" 20th Main Road, 1-R Block Rajajinagar, West of Chord Road, Bangalore – 560 010 India

The biomass is burnt in fluidised bed boiler where sand is used as inert bed to produce 62 T/hr of steam at 66 kg/ cm^2 pressure and 495±5^{0}C temperature.
The boiler is controlled to supply the steam requirement of 62 T/hr to produce 14 MW of electricity as the capacity of steam turbine is 14 MW.

Rice Husk quality procured for generation of electricity may not be consistent and hence it is proposed to use small percentage of fossil fuel like coal to ensure consistent generation of electricity. We estimate that 10% fossil fuel is likely to be co-fired.
The outlet box of the FBB leads to ESP to remove SPM from exhaust gases. The exhaust gas temperature is kept at 160^{0}C or lower.
The steam from boiler at 66 kg/cm^2 pressure and 495±5^{0}C temperature is taken to high efficiency extraction cum condensing multi stage Steam Turbine (14 MW) and Generator (15 MW) operated to generate Electricity.
Ash collected from hoppers & ESP is conveyed to Ash Silo. The ash is given free to cement plants and brick manufactures as well as to the farmers, who also use it as Soil amelioration agent.
Other system used is circulating water, Demineralised water plant, Instrument Air Compressor; air dryer.
Steam from FBB passes through steam turbine rotor and exhausted in water cooled condenser and water is cooled in air cooled heat exchanger.
Only Demineralised water is used in FBB to avoid Scale formation on boiler tubes. Make up DM water is de-aerated.
Total Waste water is recycled and reused after treatment.
The 14 MW power is generated at 11 KV and is boosted to 33 KV to synchronise with the CSEB grid power. The entire 14MW power after using a part of for in-house consumption for equipment is sold to or through CSEB grid who will further distribute to their consumers.
The technology is environmentally safe and abides all legal norms and standards for SPM, emissions.
The project activity will be working 330 days in a year .
The project activity uses environmentally safe and sound technology by providing the following features during the project stage only

1. Air cooled heat exchanger is used to cool the circulating water. This reduces water

wastage and losses that would have occurred in water based cooling tower.

2. The conveying of biomass in the plant to boiler is done through closed type conveying system.

3. The ash generated is collected and conveyed to the closed silo so that no ash will be affecting the environment.
4. The boiler uses latest technology and controls so that maximum heat isrecovered.
5. ESP is provided to control point sources emissions below accepted standards
6. The waste water is used for green belt irrigation.

There is no know-how transfer involved to the host party as all equipments and technology is indigenous.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small- scale project activity, taking into account national and/or sectoral policies and circumstances:

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The project activity will generate 14 MW power using the biomass based steam generating system and sold to or through CSEB grid who will supply this power to their consumers. In the absence of Project activity, the equivalent power would be generated in fossil fuel based power plants connected to CSEB grid. The grid power is 85% thermal; that is fossil fuel based . As the project activity generates power based on renewable biomass and the power generated is actually and effectively reducing the demand on CSEB grid electricity, the CO_2 emission reduction is achieved in reduction of corresponding CO_2 emission in CSEB Grid, and hence in Western Regional Grid of which CSEB grid is a part.

This project activity is carried out by RREL while there exists no legal binding for power generation to use biomass which otherwise would have been allowed to decay or burnt as waste or may be used by some consumers in utilising the heat in most inefficient manner for purposes other than electricity generation. The project activity is over and above national or state requirement.

The project activity is carried out by RREL by overcoming the barriers explained in section B 3

However, in spite of all the barriers, RREL has decided to conduct the project activity BIOMASS based power plant.

The project activity will generate an estimated annual average of 55472 tonnes CO_2 emission reduction.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

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Chosen credit period = 10 years.

2006-2007	55472
2007-2008	55472
2008-2009	55472
2009-2010	55472
2010-2011	55472
2011-2012	55472
2012-2013	55472
2013-2014	55472
2014-2015	55472
2015-2016	55472
Total estimated reduction	554720
Total numbers of crediting years	10
Annual average over the crediting period of estimated reduction	tonnes CO_2 e 55472

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

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No public funding from parties included in Annex-I is available for the project activity

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

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As per appendix "C" to the simplified modalities and procedures for small scale CDM project activities, debundling is defined as fragmentation of a large project activity in to smaller parts. A small scale project activity that is a party of large project activity is not eligible to use simplified modalities and procedures for small scale CDM project activities

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

* With the same project participants
* in the same project category and technology / measure.
* Registered within the previous 2 years;
* whose project boundary is within 1 KM of the project boundary of the proposed small-scale project activity at the close point.

This small scale project activity does not fall under the de-bundled category as:

1 . RREL is not having any other registered CDM activity any where and also they have not applied for Registration for CDM project activity as a party of any other large project activity for any other project activity.

2. There is no biomass based electricity generating unit within 1 kilometer of this small scale project activity.

3. This project activity is totally green field and RREL is established with the aim of producing 14 MW electricity from rice husk and to sell electricity generated to or through CSEB grid.

Hence this project activity is not a de-bundled component of larger project activity.

SECTION B. Application of a baseline methodology:

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

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Applicable baseline methodology

In line with paragraph 6(c) of decision 17/CP.7 on the modalities and procedures for the CDM, and 'Appendix B' of the simplified modalities and procedures for small-scale CDM project activities; "Indicative simplified base line and monitoring methodologies for small-scale CDM project activity categories" of Annexure II to decision 21/ CP.8 .

Type-I RENEWABLE ENERGY PROJECTS
Category I.D. Grid connected renewable electricity generation I.D./ Version 08
Scope ## 03 March 2006

B.2 Project category applicable to the small-scale project activity:

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In line with paragraph 6(c) of decision 17/CP.7 on the modalities and procedures for the CDM, and 'Appendix B' of the simplified modalities and procedures for small-scale CDM project activities; "Indicative simplified base line and monitoring methodologies for small-scale CDM project activity categories" of Annexure II to decision 21/ CP.8 . The applicable type and category is :

Type-I RENEWABLE ENERGY PROJECTS
Category I.D. Grid connected renewable electricity generation
I.D./ Version 08 Scope ## 03 March 2006

Justification of the choice of applicable baseline calculation for the project category:

In paragraph 9 of the above methodology, the baseline is defined as follows:

The base line is the KWh produced by renewable generating unit multiplied by an emission coefficient calculated in transparent and conservative manner as:

a) the average of approximate operating margin and build margin where

a1) the average emission is the weighted average of all generating sources serving the system; excluding hydro; geothermal; wind; low cost biomass; nuclear and solar generation

. a2) the build margin is the weighted average emissions of recent capacity additions to the system, which capacity additions are defined as greater of most recent 20% of existing plants or 5 of the most recent plants

OR

b) The weighted average emissions in current generation mix.

c) Approximate operating margin emission factor and the weighted average emission factor can be calculated using either of the two following data vintages for years(s) y;

- Option 1:
  A-3 year average, based on the most recent statistics available at the time of PDD submission.
- Option 2
  The year in which project generation occurs, if emission factor is updated based on ex post monitoring.

d) Build margin emission factor can be calculated using either of the following data vintages for years(s) y:

- Option 1
  Most recent information available on plants already built at the time of PDD submission.
- Option 2
  For the first crediting period, emission factor is updated based on ex-post monitoring. For subsequent crediting periods, Emission factor should be calculated ex-ante, as described in option 1 above.

The baseline described above is applicable to the small- scale project activity, as it is electricity generation using bio-mass, which are carbon neutral as the emission would have occurred any way as the biomass will be dumped and/or allowed to decay and or burnt in un-controlled manner for purposes other than electricity generation. Hence the 14 MW power generated and connected to CSEB grid, which is a part of Western Region Electricity Board, would be considered as carbon neutral and electricity delivered to grid by the project would otherwise been generated by the operation of grid connected power plants and or by the addition of new generation sources which are fossil fuel fired thermal power plants.

Hence the project activity displaces the GHG's emissions of the Western grid electricity distribution system. This demonstrates that selection of the applicable baseline as above is justified for small scale project activity. The calculation of grid emissions is explained in section **B.5.**

Basic assumptions of baseline methodology and how the project activity meets the applicability conditions

We explain below the basic assumptions of the base line methodology.

1. Project activity generates electricity and connected to CSEB grid.
2. Project activity is based on biomass based boiler and STG to generate 14 MW electricity which is sold to or through CSEB grid who will further supply electricity to their consumers.
3. The biomass used is mainly rice husk and wood chips. If required there is provision to use other agricultural residues like crop residues, non-edible oil cakes and bushes.
4. Rice Husk quality procured for generation of electricity may not be consistent and hence it is proposed to use small percentage of fossil fuel like coal to ensure consistent generation of electricity. We estimate that 10% fossil fuel is likely to be co-fired.

5. In the absence of project activity, the biomass is dumped and /or allowed to decay and burnt in uncontrolled manner for non electricity generation.
6. In the absence of Project activity, the electricity requirement of CSEB consumers to the extent of 14 MW would be met by CSEB grid by drawing power from fossil fuel based power plants.
7. There is no legal binding that biomass shall be used for small power generation plants. The Project activity is being implemented as an economic activity.
8. The project activity will not generate more than 14 MW electricity during the entire crediting period of CDM project.
9. The project activity generates renewable electricity. This activity is not a co-generating type.

Hence it is established that the project activity meets the conditions set out in the approved methodology

How methodology is applied in the context of project activity.

The approved methodology is applied as follows

1. Small-scale project activity generates electricity based on renewable biomass
2. Project boundary considered will be the physical; geographical site of renewable electricity energy generation source
3. The base line is the weighted average emission in kg CO2 equ. / KWh of the current Western grid generation mix, in line with Option (b)
4. As no energy generating equipment is transferred from another activity or no existing equipment is transferred to another activity leakage considered as zero
5. Monitoring shall consist of the electricity generated by the renewable technology. The co-fired fossil fuel consumption as well as the renewable biomass consumption is monitored.

Key information and data used for biomass availability

[A] As per official records of Chhattisgarh State and Orissa State:

As per the official records available from the Agriculture department and other related departments of Chhattisgarh Govt. The following Data is available regarding the cultivated area of different crop and their potential yield during the year 2004-05 and for the future years.

These data reveal the following facts:

I. Cropping Pattern in the adjoining area of the Project in Chhattisgarh State

PADDY 2004-05

	District	Khariff Season		Productivity Kg/Hect.
		Total Yield		
		Production In thousand tonnes	**Cultivation Area** In thousand Hect	
	Raigarh	370.70	212.00	1749.00
	Janjgir Champa	459.67	227.00	2025.00
	Jashpur	260.00	152.00	1711.00
	Korba	180.98	95.00	1905.00
	Total ::	1271.35	686.00	

The total Paddy production in the area is 1271350 tonnes/years in Kharif Season. There is about 20000 Hectare in Rabi crop also in Chhattisgarh State. This rabi crop yields about 61750 tonnes of Paddy in this Rabi Season. Thus the total annual paddy production in this area is about 1333100 tonnes. Considering the Husk generation of 22% the total husk production in the region is 293282 tonnes. In addition to this it is reported that about 2% of the crop harvested by the farmers generates immature or seed less Pods, which is called "Badara" in local language. The farmers have not been collecting this material, as there is no economic value or return to them. Whereas these pod, have as good or the better heating value than the Rice Husk. On commissioning of this plant, the likely collection of this crop waste also will take place. The likely collection of this crop waste @ 2% of the total Paddy production, hence this area has the potential to generate 26662 tonnes of Badara (Immature Paddy) also.

Thus the total Rice Husk available in the above mentioned area of Chhattisgarh State within 100 KM of the project site can be considered as 319944 Tonnes/Years.

In addition to the above the availability of Paddy and Rice Husk from the adjoining districts (within 100 KM Radius) of Orissa State namely Bargarh, Sambalpur and Jharsuguda also is very large. Because in the district of Sambalpur, Jharsuguda and Bargarh the major crop is Paddy, which is grown twice in a years and some farmers also grow thrice in a year. This has been possible because of Mahanadi Reservoir and Irrigation facility created in that region. The reported Paddy Production in these three districts of Orissa are given below (during 2002-03) only.

Kharif Season:

S.No.	District	Total Yield in Tonnes	Area (Hectare)
1)	Bargarh	589450.00	305850.00
2)	Jharsuguda	64140.00	61310.00
3)	Sambalpur	236100.00	138830.00
	Total ::	889690.00	505990.00

The Rice Husk generation from 889690 tonnes of Paddy @22% husk will be 195731.8 tonnes/year only in Kharif. The data for Paddy production in winter and summer crop is not available from official sources.

With the above facts, the availability of Rice Husk to more than 515675.8 tonnes/year, while project activity only requires 89745 tonnes/year.

CHARACTERISTICS OF RICE HUSK

%	Rice Husk
Carbon	36.67
Hydrogen	4.57
Oxygen	32.88
Moisture	9.44
Sulphur	0.18
Ash*	15.01
Nitrogen	1.25
GCV (kcal/kg)	3275

* Ash has 92 – 95 % silica.

Calculation of Rice Husk requirement

Requirement of steam turbo generator to produce 14 MW Power	:	62000 Kgs/hr At 64.8 Kg/cm^{2}g and 490^{0}C.
Steam generated in Boiler	=	62000 Kgs/hr At 66.0 Kg/cm^{2}g and 495^{0}C
Enthalpy to be provided for generating Steam at 66 Kg/cm^{2}g and 495^{0}C temperature = enthalpy of steam at 66 KG/cm^2 & 495^{0}C – Enthalpy of boiler feed water as 66 KG/cm^2 & 150^{0}C	=	2766.075 KJ/Kg) = 660.6656 K Cal/Kg
Total Enthalpy to be added	=	40961271.72 K Cal/hr.
Calorific value of Rice Husk	=	3275 K Cal/Kg
Rice Husk required	=	12507.25854 Kgs/Hr Or 12.507 Tonnes/Hr
Boiler efficiency	=	82.90%
Rice Husk Required	=	15.0871635
Rice Husk required per Annum (to produce 14 MW power in 100% PLF)	=	15.0871635 Tonnes/hr. X 330 day X 24 hrs
	=	119490.3349 Tonnes/Annum considered
Rice Husk required per Annum (at 75% PLF)	=	89617.75117 Tonnes/Annum.
Available Rice Husk	=	515675.8 Tonnes/Annum,

Hence it is established that the rice husk is abundantly available in the area.

Procurement of Rice Husk & Other Biomasses:

Rice husk is procured from rice mills spread across the study area of 100 KM. The purchase contracts are signed for major quantity with rice mills for ensuring the continuous supply of rice husk. Other biomasses if required have to be sourced from wide spread area as availability is un-organised and hence special efforts have to be made to procure the other biomasses as and when required.

Storage

Since the Rice Husk is available from the Rice Mills throughout the year. Because most of the Mills operate throughout the year due to the Double cropping of Paddy in the Area. A huge quantity of Paddy is also available to these Rice Mills from the adjoining area of Orissa from Sambalpur, Jhasuguda, Sundargarh and Bargarh area, where the Paddy cultivation is even taken up in three crops. The area has intensive Paddy cultivation due to the irrigation facility from Mahanadi Reservoir at Sambalpur. Thus huge storage is not required.

It is proposed to store 10 day requirement of rice husk in sheds (approx. cap : 5000 MT). Open area also will be used during non-monsoon months as biomass storage.

B.2.3 Key Information and data used to determine the baseline scenario.

1. Western Region data are used, which are sourced from following sources:

S.No.	Parameter	Source
1	Individual Plant Capacity & Generation, Fuel consumption and Auxiliary consumption	1) Western Region Annual Report 2004-05 2) Review of Performance of Thermal Power Station 2004-05, 2003-04, 2002-03, 1997-98 of CEA. 3) Review of Performance of Hydel Power Station 2003-04, 2002-03 of CEA 4) General Review of 2005 & 2002-03 CEA. 5) Nuclear Power Corporation Report 6) Tariff Order for TPC-FY 2003-04 & FY 2004-05 for Trombay Power Station
2	Net Calorific Value (NCV) for Coal/ Lignite	Review of Performance of Thermal Power Station 2004-05 and General Review 2005 and General Review 2002-03 of CEA.
3	EF_{CO2}, OXDi and NCV for Gas, Diesel, Lignite (Lignite for 2004-05 only)	IPCC Guidelines.

2. **Section B.5** totally describes how the methodology tools are used to decide the baseline emissions.

3. The Project activity therefore successfully affects emission reductions through the displacement of grid based power generation source in the supply of electricity which would have otherwise been supplied by grid under baseline scenario in the absence of project activity.

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

>>

It is required to describe how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of registered small-scale CDM activity. The proposed small-scale CDM project activity is designed to generate power from the biomass only. The biomasses are considered as carbon neutral, as if not used in electricity generation would have been dumped and or allowed to decay and burnt in an uncontrolled manner for purposes other than electricity generation and this will have same carbon dioxide emissions as in electricity generation using biomass. The electricity generated by the project activity is sold to or through CSEB grid electricity distribution system, who will supply this power to their consumers. Where as in the absence of the proposed small-scale project activity this electricity requirement would have been met by drawing the power from CSEB Grid power which is mainly generated from GHG gas emitting Fossil Fuel (Coal) based Thermal Power generation sources. Hence small-scale CDM project activity displaces the electricity from grid and thus reducing CO2 emissions from the fossil fuel based grid power.

It is required to show as per attachment A to Appendix B; the project activity would not have occurred anyway due to at-least one of the following barriers;

a. Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions

b. Technological barrier: a less technologically advanced alternative involves lower risk 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.

c. Barrier due to prevailing practice or existing regulatory policy requirement would have led to implementation of a technology with higher emissions

d. other barriers: without the project activity, for any specific reason identified by project participant, such as institutional barriers; or limited information, managerial resources, organizational capacity, financial resources or capacity to absorb new technologies, emission would have been higher

a. Investment Barrier.

1. The variable cost of transportation and collection of rice husk is estimated at Rupees 500 per tonne and procurement cost will be Rs.700 per tonne and hence landed cost of rice husk will be Rs. 1200 per tonne as compared to coal landed cost of Rs.900 per tonne.

The rice husk prices are likely to be increase due to the demand generated by more rice husk based projects which are likely to come up in the area, as the market price always moves up once the requirement is firm. In comparison the coal prices will remain firm as the prices are normally under control as the established companies are operating the coal mines and the Coal deposits are not as limited as Rice Husk.

2. The cost of fluid bed type boiler is 5 % more than conventional boiler.

3. Hence it can be seen that biomass based power plant has more capital investment and higher fuel procurement cost.

4. RREL has to bear this additional costs compared to coal based plant. Hence the investment in biomass based power plant faces higher investment barrier.

5. The coal based electricity generation will be more attractive investment wise but coal based electricity generation will lead to additional GHG emissions

The Biomass based power plants do not have any additional major financial incentives other than the CDM benefits in comparison to Coal based Power Plants, whereas the Coal based power plants have the basic advantage of secured long term supply of coal from various Central Government owned Coal mines through linkage and from the private coal mines, as well as by procuring the surplus coal from various industries located in the area. In addition to these the coal based plants can also procure the industrial coal waste such as Char/ dolochar from nearby Sponge Iron plants and Coal middlings and washery rejects from nearby Coal Washeries, at much-much lower rates. Hence the natural profitability is in built with the coal based power plants due to the abundance of coal and reject coal at much cheaper rates than the Biomass. In view of this any Power plant promoting entrepreneur will have natural choice for the coal based power plants.

The other advantage available to a Biomass power plant is only by way of the priority to purchase the power by CSEB at the predetermined rates. The Board was offering Rs.2.25 per KWh to the Biomass Power which has now been revised to Rs.2.67 per KWh. The power purchase rates are fixed by the Regulatory Commission based on the Tariff Petition filed by the Board (CSEB). This also creates an uncertainty in the mind of the promoters about the possible variation in the Tariff. Whereas the coal based power plant can file the Tariff Petition before the regulatory commission and get their tariff fixed according to the fixed norms of the coal consumption, fixed by CEA and in accordance to the variation in coal prices, whereas there is no provision for accommodating the increase in Biomass purchase price while fixing the Tariff of Biomass Power Plant. Whereas a coal based power plant can fetch a better power tariff also than the Biomass based power plant, as it is evident from the CSEB approved Tariff.

We give below the comparative cost of project and IRR (internal rate of return) for various options, which proves that coal based power plant without CDM is most attractive option.

S.No.	Item	Cost of Project (Rs. in Million)	IRR (over 20 years)
1	Coal Based power	394.49	22.39%
2	Biomass power with CDM	424.98	14.89%
3	Biomass power without CDM	419.98	8.48%

b Technological Barrier

1. The renewable energy based power generation constitutes 4.97 % of total power generation in India and Actual biomass based power generation would be less than 1%.

2. Hence the experience on biomass based power plant is limited when compared to coal based power plants.

3. At present only 2 to 3 Rice husk based power plants are in operation in the area. Hence the availability of trained personnel, having experience in rice husk based power plant is difficult. This acts as technological barrier.

4. Rice Husk Ash has higher Silica percentage than Coal and this is more abrasive than the Coal Ash. Thereby, causing higher abrasive impacts on Bed Tubes and other Boiler parts exposed to it. This requires special technology to manufacture Boiler to withstand to Rice Husk as Fuel.

5. Rice Husk has comparatively lower volatile matter than normal coal used in Power Plants. Thereby making it's full combustion a greater technology barrier and challenge. To over come this also it requires specially designed combustion system.

6. The less technological advanced alternative will be coal based power generation where this barrier will not exist as it is most widely used technology. The coal based electricity generation will be more attractive investment due to the familiarity with the technology, however coal based electricity generation will lead to additional GHG emissions.

c. ***Barrier due to Prevailing Practice.***

1. Historically the power generating plants are coal based as coal is easily available. The project site is in declared coal belt area and as per CSEB projection the coal available in the area is capable of generating 61000 MW electricity.

2. Historically biomass is burnt or allowed to decay as the biomass collection, and transportation is financially not attractive. The reason being the biomass is dispersed in large area and in much larger quantity, than the project requirement.

3. Biomass based power in CSEB grid electricity distribution system is only 2 million KWh while coal based power generation is more than 12000 million KWh

Electricity distribution by CSEB grid	=	12283 million KWh
Power generation from CSEB grid own coal base	=	7974 million KWh
Biomass based power plant owned by CSEB grid	=	Nil
Private owned power supply coal based	=	2467 million KWh
The biomass based generation	=	2 million KWh

Hence coal based power generation is the option selected overwhelmingly, the biomass based power generation is negligible.

OTHER BARRIERS

Operational Barrier:

1) Any natural calamity like draught or flood or windstorm may affect the rice husk availability. This may result into lower capacity of the plant.

Regulatory Barrier:

1) RREL has to sell its generated 14 MW power to or through CSEB grid, who being government owned agency are the main distributing grid to distribute power in the state of Chhattisgarh.
2) Any agreement with state owned CSEB grid has inbuilt procedural and bureaucratic related barriers involving time and documentation.
3) The agreement is totally in favour of CSEB as grid owner takes no liability for any mishap/losses. Any future/present actions involving all risks /losses to be borne by project participant for any failure of the grid and related back lash on the plant machinery.

Barrier due to being the first project of the Company:

RREL is a new company established to generate electricity, this is their first project, and hence the establishment of generating plant with biomass will be having many barriers as explained above. All these, would present a challenge to the management as it would have been much easier to establish a coal based power plant.

The above barriers would not have allowed the project activity to occur as the coal based electricity generation would face no such barriers. The Small-scale project activity is being carried out inspite of these barriers.

Hence the project activity is clearly a small –scale CDM project activity.

Due to all these factors and uncertainties in rates and availability of Biomass the Bankers have their own reservation to extend the finance to the Biomass Power Project.

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

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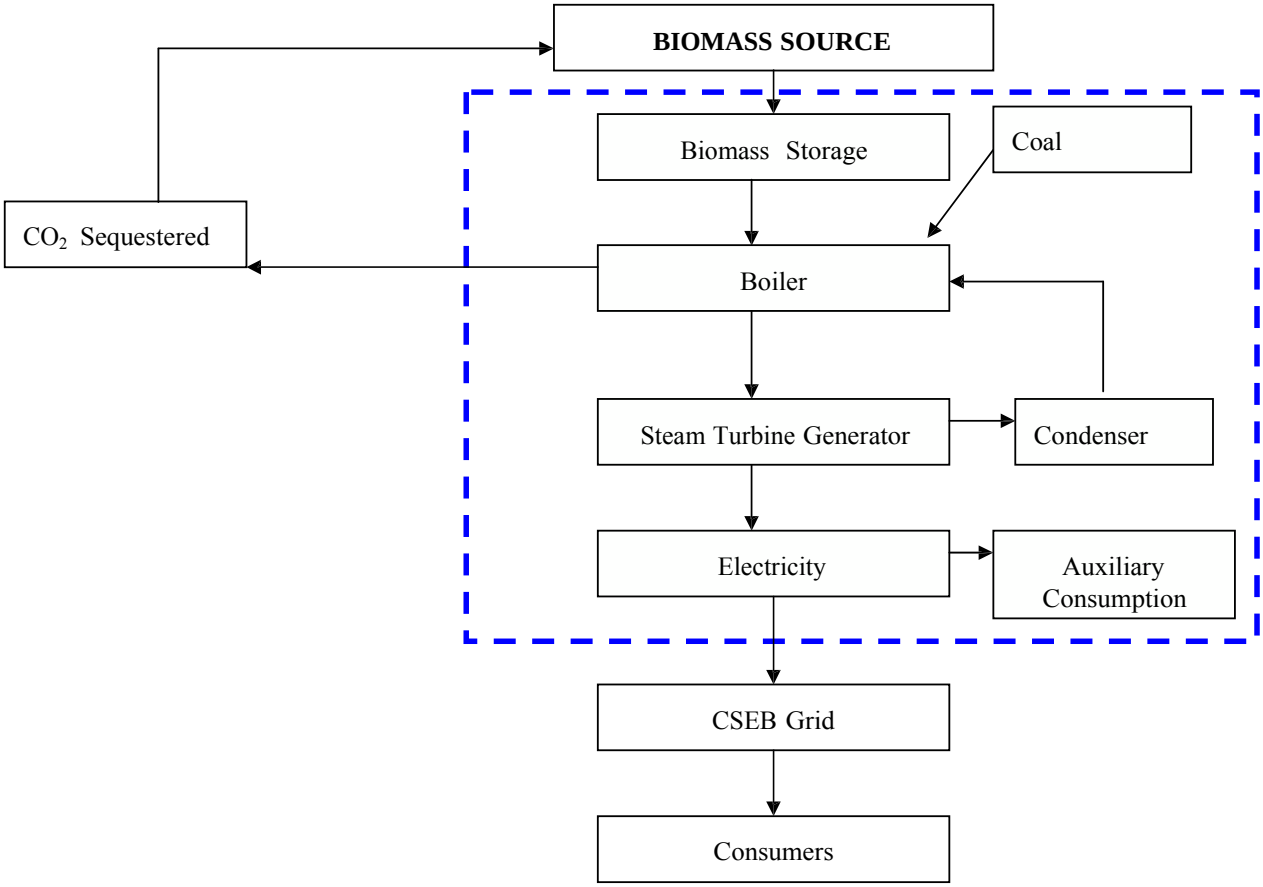
In line with methodology the project boundary encompasses the physical, geographical site of the renewable energy generation source; that is

1. Biomass based fluidised bed boiler to produce steam along with other boiler auxiliary equipment
2. Steam turbine generator and other auxiliary equipment.
3. Power synchronising equipment required for connecting to grid
4. Other equipment which are part of project activity within the physical boundary of site
5. Co-fired fossil fuel consumption of project activity.

Overview on emissions sources included in or excluded from the project boundary.

	Source	GHG Gases		Justification / Explanation
Baseline	Grid electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	In line with approved methodology
		N_2O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources.
Project Activity	On-site fossil fuel consumption due to the project activity (stationary or mobile)	CO_2	Included	co-fired fossil fuel consumption.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass	CO_2	Excluded	In line with the methodology
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Combustion of biomass for electricity and/ or heat generation	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	In line with approved methodology
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small.
	Biomass storage	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. Since biomass is stored for not longer than one year, this emission source is assumed to be small.
		N_2O	Excluded	Excluded for simplification. This emissions source is assumed to be very small.

PROJECT BOUNDARY



B.5 Details of baseline and its development

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Baseline as per approved methodology: **(Para 9)**

The base line is the KWh produced by renewable power generating unit multiplied by an emission coefficient calculated in transparent and conservative manner as:

a) the average the approximate operating margin and build margin where

a1) the average emission is the weighted average of all generating sources serving the system; excluding hydro; geothermal; wind; low cost biomass; nuclear and solar generation

. a2) the build margin is the weighted average emissions of recent capacity additions to the system, which capacity additions are defined as greater of most recent 20% of existing plants or 5 of the most recent plants

OR

b) The weighted average emissions in current generation mix

c) Approximate operating margin emission factor and the weighted average emission factor can be calculated using either of the two following data vintages for years(s) y;

- Option 1:
  A-3 year average, based on the most recent statistics available at the time of PDD submission.
- Option 2
  The year in which project generation occurs, if emission factor is updated based on ex post monitoring.

d) Build margin emission factor can be calculated using either of the following data vintages for years(s) y:

- Option 1
  Most recent information available on plants already built at the time of PDD submission.
- Option 2
  For the first crediting period, emission factor is updated based on ex-post monitoring. For subsequent crediting periods, Emission factor should be calculated ex-ante, as described in option 1 above.

Project activity emission reduction will be calculated by the above method "a" based on ex-ante monitoring.

Definition of Electricity System:

The project activity supplies generated electricity to or through CSEB grid. However CSEB grid is a part of Western Regional Electricity Board. We have considered Western Regional Grid Electricity as electricity system for our baseline calculations.

We are required to calculate the baseline emission co-efficient EFy in a transparent and conservative manner as explained under baseline. We calculate EFy by following the option "a" of para 9.

The emission factor Simple EF_{OM} for Coal, Gas and Naptha have been calculated using formulae provided in ACM002. The emission factor for Simple EF_{OM} for Hydel and Nuclear Power is taken as 0 tonnes CO_2 equ./MWh.

The calculated weighted average emission factor in tonnes CO_2 equ./ MWh ($KgCO_2$/KWh) is 0.971898054 tCO_2 eq./MWh. The details are provided in Annexure-3.

Determination of KWh produced by the project activity ;net electricity supplied to grid(EGy)

Installed generation capacity	=	14 MW (though it is rated for 15 MW, only 14 WW of generated power is considered)
ASSUMED PLF	=	0.75
Generated power/annum	=	14 x 330 x 24 x 0.75
	=	83160 MWh
auxiliary consumption	=	10%
net power made available to grid	=	83160 x 0.9 = 74844 MWh

Calculation Of CO_2 Baseline Emissions From Grid

$ER_{electricity,y} = EG_y \cdot EF_y$

Where:

$ER_{electricity,y}$ are the emission reductions due to displacement of electricity during the year y in tons of CO_2

EG_y is the net electricity supplied to or through CSEB grid = 74844 MWh

$EF_{electricity,y}$ is the weighted average emission factor in current generation mix for the electricity displaced due to the project activity during the year y in tons CO_2 / MWh. ,= 0.9664 t CO2/ MWh

Thus $ER_{electricity,y}$ = 74844 X 0.9664 = 72329 t C02/anum

LEAKAGE

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 . as the small-scale project activity is green field project, all the energy generating equipmensts are procured from original equipment manufacturers.

Hence leakage considered as zero (Ly = 0)

Date of Completion of the baselinet 24/12/2005

Name of Entity for contact information

Preparation of this documents has been done by; Indus Technical and Financial Consultants Ltd., whose address is

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Indus Technical and Financial Consultants Ltd is not a project participant

Details of the Project Participant are as given below:

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Salutation	Mr.
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Middle Name:	
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Mobile:	98932-88002
Direct FAX:	
Direct Tel:	
Personal E-mail	None

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

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20 Years / 20 Years

C.1.1. Starting date of the small-scale project activity:

>>

01 /11/2004

C.1.2. Expected operational lifetime of the small-scale project activity:

>>

20 Years and 0 months.

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

>>

Fixed crediting period

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:

>>

Fixed crediting period is 10 years.

C.2.2.1. Starting date:

>>

From the date of CDM registration of project activity./ 01 September 2006 (expected date of commercial production)

C.2.2.2. Length:

>>

10 years 0 months

SECTION D. Application of a monitoring methodology and plan:

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

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Applicable baseline methodology

In line with paragraph 6(c) of decision 17/CP.7 on the modalities and procedures for the CDM, and 'Appendix B' of the simplified modalities and procedures for small-scale CDM project activities; "Indicative simplified base line and monitoring methodologies for small-scale CDM project activity categories" of Annexure II to decision 21/ CP.8 . The applicable type and category is :

Type-I RENEWABLE ENERGY PROJECTS
Category I.D. Grid connected renewable electricity generation
I.D./ Version 08 Scope ## 03 March 2006

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

>>

The approved methodology

	Methodology Steps		Project Activity
1)	Limits to electricity generation from biomass to 15 MW	:	Project activity generates 14 MW from biomass mainly Rice Husk with some amount of co-firing of fossil fuel i.e. coal for consistency in electricity generation.
2)	Covers grid connected electricity generation		Project activity will sell the generated electricity to or though CSEB grid
3)	the base line is the KWh Power produced by renewable generating unit multiplied by an emission coefficient calculated in transparent and conservative manner as 3.a. the average the approximate operating margin and build margin where a1. the average emission is the weighted average of all generating sources serving the system; excluding hydro; geothermal; wind; low cost biomass; nuclear and solar generation a2 the build margin is the weighed average emissions of recent capacity additions to the system, which capacity additions are defined as greater of most recent 20% of existing plants or 5 of the most recent plants		We have opted for option "3 a" (para 9 a of methodology) We have considered the Western Regional Electricity Grid as baseline and grid generation. The data and parameters regarding the baseline emission factor for the Western Regional Grid was obtained only once during validation and will be used for ex-ante calculations We have also opted for ex-ante monitoring.

	OR 3.b the weighted average emissions in current generation mix 3c) Approximate operating margin emission factor and the weighted average emission factor can be calculated using either of the two following data vintages for years(s) y; • Option 1: A-3 year average, based on the most recent statistics available at the time of PDD submission. • Option 2 The year in which project generation occurs, if emission factor is updated based on ex post monitoring. 3d) Build margin emission factor can be calculated using either of the following data vintages for years(s) y: • Option 1 Most recent information available on plants already built at the time of PDD submission. • Option 2 For the first crediting period, emission factor is updated based on ex-post monitoring. For subsequent crediting periods, Emission factor should be calculated ex-ante, as described in option 1 above.		
4)	Leakage is to be considered only if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity.		The project activity is green field project with new energy generating equipment bought from equipment suppliers specifically as per requirement of the project activity. Hence leakage considered as Nil.
5)	monitoring shall consist of the electricity generated by renewable technology. In the case of co fired plants; the amount of biomass and fossil fuel input shall be monitored,.		The monitoring will be inline with this concept by monitoring the electricity generated by renewable technology. This is biomass based project activity with co-firing of fossil fuel to the extent of 10%, fossil fuel will be monitored for the quantity & quality.

D.3 Data to be monitored:

ID No.	Data Type	Data Variable	Data unit	Measured, (m) calculated (c) estimated (c)	Recording Frequency	Proportion of data to be monitored	How the data will be achieved electronic / data	For how long is achieved to be kept (Year)	Comment
1. E_{GEN}	Quantitative	Total electricity generated **Location** i) At generating plant	MWH /month	Online measurement (m)	Continuously/ month	100%	Electronic /Paper	12	Monitoring location:CSEB export meter at plant and DCS will measure the data. ces
2. E_{AUX}	Quantitative	Auxiliary electricity Consumption Location i) At generating plant	MWH /month	Online measurement (m)	Continuously/ month	100%	Electronic/ Paper	12	Monitoring location: CSEB export meter at plant and DCS will measure the data. .
3. E_{NET}	Quantitative	Net electricity generated from small-scale project activity	MWH /month	Calculated	Continuously /month	100%	Electronic /Paper	12	Calculated from the above measured parameters. Algorithm for project emission calculation given in baseline methodology. E_{GEN} - $E_{AUX,}$ emission calculations as per baseline methodology.
4. E_{NET}	Quantitative	Net electricity generated from small-scale project activity	MWH /month	Online measurement (m)	Continuously /month	100%	Electronic /Paper	12	The CSEB export meter at the export terminal . The CSEB will be regularly checking the calibration of the meter.

Contd.. D..3

ID No.	Data Type	Data Variable	Data unit	Measured, (m) calculated (c) estimated (e)	For which baseline method(s) must this element be included.	Recording Frequency	Proportion of data to be monitored	How the data will be archived electronic / paper	For how long is archived to be kept (Years)	Comment
5 EF_y	Emission factor	CO_2 emission factor of the grid	tCO_2eq/ MWH	Calculated (c)	Ex ante Weighted average of current generation	Yearly	100%	Electronic /Paper	12	calculated once during validation (Ex ante) .
6 $EF_{OM,y}$ simple	Emission factor	CO_2 operating margin emission factor of the grid	tCO_2eq / MWH	Calculated (c)	Simple OM	Yearly	100%	Electronic / Paper	12	Calculated once during validation (Ex ante)
7. F i,j,y	Fuel Qty.	Amount of each fossile fuel Consumed by grid and by importing plants/ sources	Tonnes	Estimated/Calculated	Simple OM, BM	Yearly	100%	Electronic / Paper	12	Obtained from Western Region Grid report / CEA documents. Once during validation ex ante
8. COEF i,k	Emission factor Coefficient	CO2 emission Coefficient for each by grid and by importing plants/ sources	tCO_2eq / t of fuel	Calculated based on CEA data/Estimated based on IPCC values	Simple OM, BM	Yearly	100%	Electronic / Paper	12	Obtained from Western Region Grid report / CEA / IPCC. Once during validation ex ante
9. GEN j,y	Electricity Qty.	Electricity generation / import of CSEB grid	MWH /yr	Estimated	Simple OM	Yearly	100%	Electronic / Paper	12	Obtained from Western Region Grid report documents. Once during

Contd.. D..3

ID No.	Data Type	Data Variable	Data unit	Measured, (m) calculated (c) estimated (e)	For which baseline method(s) must this element be included.	Recording Frequency	Proportion of data to be monitored	How the data will be archived electronic / paper	For how long is archived to be kept (Years)	Comment
10. Qi	Consumption of fuel quantity for project activity (1) Biomass (2) fossil fuel i.e. Coal	weight	Tonnes/day	Measured	For calculating project emission	daily	100%	Electronic / Paper	12	It will be measured and can verified by Stock Register/incoming receipts.
11. NCV	Fuel quality (1) Biomass (2) fossil fuel i.e. Coal	Calorific value	K Cal/kg	Calculated	For calculating project emission	One sample every 15 days	100%	Electronic/ Paper	12	By Govt. recognised laboratory.

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>

Data	Uncertainty level of data High/medium / low	Are QA/QC procedures planned	Outline explanation why QA/QC are or are not being planned.
D..3 (1to3)	Low	No	This data will be used for calculation of electricity generated by project activity.
D..3 (4 to 8)	Low	No	This data is collected hence no need QA procedures.
D..3 (9) to (11)	Low	No	This data will be required for calculation of project emission.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>>

Operation and Management Structure for Monitoring

(A) Purpose

To define the procedures and responsibilities for GHG Performance monitoring, measurement and reporting of data and dealing with uncertainties.

(B) Scope

This procedure is applicable to 14 MW biomass based power project of RREL, India.

(C) Responsibilities

Shift Engineer (Operations): Responsible for reporting hourly and eight hourly data of the biomass and coal consumption, steam generation. The report is then sent to Manager (O&M)

Manager (O&M) : Responsible for reviewing the monitored parameters on hourly and eight hourly based and presenting through a daily executive summary report, duly signed by himself, to the General Manager (Plant).

Shift Engineer (Electrical): Responsible for taking shift wise meter reading for electricity generation, Auxiliary consumption Export to the Grid and pre-operation of the Shift Report. The report is then sent to the Manager (E&I) for his review on daily basis.

Manager (E&I): Responsible for reviewing the monitored parameters shift-wise and presenting through a daily executive summary report, duly signed by himself, to the General Manager (Plant).

General Manager (Plant): Responsible for summarizing data of Electrical, Mechanical, Process (/operation) Departments and report the same to the Vice President (Power) and CMD (RREL) on daily basis.

CSEB Personnel: Responsible for monitoring the total power generated by RREL and certifying the same jointly with RREL on a monthly basis, for making the payment electricity received by the CSEB grid.

Serial No.	Activity
1.0	**GHG Performance Parameter**
1.1	The monitoring protocol requires RREL to monitor the following GHG Performance parameters for estimating the emissions reductions from Biomass based power plant: • Gross generation of electricity • Auxiliary consumption of electricity. • Net electricity generation • Fuel consumption (1) for biomass (2) for Fossil Fuel (Coal)
2.0	**Metering System**
2.1	The metering system for the Power plant consist of • External Metering System of CSEB for metering the net export of power (Main meter). • External metering system of CSEB for metering total generation. • In house metering system of RREL (for metering the generation of power, auxiliary consumption, export to or through CSEB grid) • Flow meter for steam inlet to turbine. • Temperature gauge for fluidised bed boiler steam. • Pressure gauge for Fluidised bed boiler steam. • Biomass consumption in the boiler to be tallied with the store issuance of the biomass and purchase invoices. • Fossil fuel consumption in the boiler to be tallied with the store issuance of the fossil fuel and purchase invoices.
2.2	**In house Metering System of RREL** RREL will have an in-house metering system, to monitor the overall performance of the plant. The metering system mainly comprises of three meters. • One in-house generation meters • In-house Auxiliary consumption meter. • In-house export meter (Check meter) The in-house generation meters (or the Energy Meter) will be micro-processor based metering device monitor, the total power generation as well as the net unit of auxiliary electricity consumed by RREL. The reading of this meter will be used to cross-check the reading of the External Metering System of CSEB. The Shift Engineer (Electrical) shall monitor hourly and eight hourly data on total generation, auxiliary consumption, net electricity available for export. The hourly data will be recorded in the generation log book and the eight hourly data will be

	recorded in the plant log book. The complete and accurate records in the plant log book will be signed by the Shift Engineer (Electrical). Both of these reports will be sent to the Manager (Electrical & Instrumentation) for his review on a daily basis. A daily report of 24 hours will be made based on the three shift reports. On the basis of the reported parameters, a complete and accurate executive daily summary report will be prepared and signed by the Manager (Electrical & Instrumentation) and sent to the General Manager (Plant) for proper administration and accounting.
3.0	**Calibration of the Metering System**
3.1	All the metering devices will be calibrated at regular intervals so that the accuracy of measurement is ensured all the time. The meters recording total generation will be calibrated by CSEB with a pre-calibrated meter. The other meters will be calibrated internally as per supplier's calibration schedule following the standard procedures for calibration. Calibration of meters are done once in a year.
4.0	**Reporting of the Monitored Parameters/ Authority and Responsibility of monitoring and reporting**
4.1	**Metering System of CSEB** The CSEB personnel and RREL personnel will jointly read the CSEB export meter and generation metering system, for recording the net electricity exported to or through CSEB Grid and the total generation from the Power Plant on the last day of every month and keep the complete and accurate records for proper administration and accounting. The accuracy of the main meter reading will be substantiated by the check meter reading. In the event that the main metering is not in service, then the check meter shall be used. A monthly report will be prepared based on these joint meter reading, which will be sent to the Vice President (Power) of RREL. The monthly invoice against the electricity exports to or through CSEB grid will be based on the monthly reports raised by RREL/ CSEB jointly. The Shift Engineer (Electrical) shall take daily reading (at 6.00 AM) of the Main and Check meters of the external metering system and shall keep the complete and accurate records in the CSEB reading book (maintained at the plant) for proper administration. The reading will be verified by the Manager (Electrical and Instrumentation) on daily basis and sent to the General Manager (Plant) at the Administrative Building in the plant for his review and for preparing the daily report.
4.2	**In-house Metering System of RREL** The Shift Engineer (Electrical) shall monitor hourly and eight hourly data on total generation, auxiliary consumption, net electricity available for export. The hourly data will be recorded in the generation log book and the eight hourly data will be recorded in the plant log book. The complete and accurate records in the plant log book will be signed by the Shift Engineer (Electrical). Both of these reports are sent to the Manager (Electrical & Instrumentation) for his review on a daily basis.

	A daily report for 24 hours will be made based on three shift reports. On the basis of the reported parameters, a complete and accurate executive daily summary report will be prepared and signed by the Manager (Electrical & Instrumentation) and sent to the General Manager (Plant) for proper administration and accounting.
5	**Fuel quantity monitoring**
5.1	**Biomass :** The quantity of Biomass will be monitored by (1) Issue records from stores (2) Consumption record of Shift Engineer. (3) Stock records from stores. (4) Purchase records (5) Entry records
5.2	**Coal:** The quantity of coal will be monitored by (1) Issue records from stores (2) Consumption record of Shift Engineer. (3) Stock records from stores. (4) Purchase records (5) Entry records
5.3	The quantities of biomass and fossil fuel will be monitored before blending, and feeding into the boiler.
5.4	**Lab Analysis:** (1) Sample will be drawn from each new source on regular basis of Biomass or Fossil fuel received and sent to laboratory for analysis of the following: (a) Chemical composition (b) Calorific value. (2) The records of all analysis reports will be maintained in paper. (3) The testing will be normally carried out in-house laboratory. However for cross checking purposes, analysis is carried out of the sample by Govt. approved laboratory, once in three months. (4) Sample analysis will be done at least once in every week in the first years of operation; subsequently will be done at least every month.
6.	**Uncertainties and Adjustments:**
6.1	The hourly, eight hourly, daily and monthly data will be recorded at various points as stated above. Any observations (like inconsistencies of report parameters) and/or discrepancies in the operation of the power plant will be documented as "History" in the daily report prepared by the General Manager (Plant) along with its time of occurrence, duration and possible reasons behind such operational disruptions. Necessary corrective actions will be undertaken at the earliest. Any discrepancies in the Main reading (for example, difference between main meter and check meter reading or extreme deviation in the net generation figure from that reported by the In-house Meter of RREL), if identified, will immediately be

	brought to the notice of CSEB. Corrective actions will be undertaken at the earliest after identification of reason of such discrepancy. Furthermore, as a safety measure, the total power generating system will be equipped with an Automatic Alarming System which shall give a prior indication of any fluctuations in the operating parameters of the power plant thereby enabling the operators to take necessary preventive measures. These measures will be undertaken in order to detect and minimize the uncertainty levels in data monitoring.
7.0	**Experience and Training**
7.1	All the Shift Engineers (Electrical and Instrumentation, Operations) are qualified engineers/ technologists. All the operators of the power plant will be IBR certified and NPTI certified engineers, and they also undergo an exhaustive on-the-job training program including plant operations, data monitoring and report preparation. A training schedule has been planned and same is attached as Annexure-4.
7.2	**Emergency Preparedness Plan** The total power generating system of power plant will be equipped with an "Automatic Alarming System" which helps the operators to take necessary preventive actions before any kind of non-functioning of the power plant results. RREL will be having fire fighting system in place. In addition RREL shall have standard procedures for tackling emergencies arising from • Blackout • Low boiler drum level/ low feed water level • Load throw off • Boiler Tube leakage. • Boiler tripping at alarm systems.
	Records 1. Generation Log Book, maintained by Electrical & Instrumentation Department at site, containing hourly data from all the In-house Metering System. 2. Plant Log Book, maintained by Electrical & Instrumentation Department at site, containing eight hourly data from all the In- house Metering System. 3. Daily Executive Summary (submitted to the General Manger (Plant), prepared by Electrical & Instrumentation Department at site containing daily data for all the in-house metering system and record of any History with details. 4. CSEB Reading Book, maintained by Electrical & Instrumentations Department at site, consisting of daily export of power to or through CSEB grid. 5. Daily report containing the performance parameters of the power

		plant and record of any history with details, maintained at site with a copy being sent to the Head Office.
	6.	Monthly Report on net quantity of electricity generated at RREL's Plant and invoice raised by RREL on CSEB as maintained at the plant with a copy being sent to the Head Office of RREL.
	7.	Biomass consumption in the boiler to be tallied with the store issuance of the biomass and purchase invoices.
	8.	Co-fired fossil fuel consumption in the boiler to be tallied with the store issuance of the fossil fuel and purchase invoices.

D.6. Name of person/entity determining the monitoring methodology:

>>

Preparation of this documents has been done by Indus Technical and Financial Consultants Ltd., whose address is

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SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

>>

Not provided in Appendix B

E.1.2 Description of formulae when not provided in appendix B:

>>

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$) due to fossil fuel (coal) being used for co-firing.

Rice Husk quality procured for generation of electricity may not be consistent and hence it is proposed to use small percentage of fossil fuel like coal to ensure consistent generation of electricity. We estimate that 10% fossil fuel is likely to be co-fired. We have taken 10% of the fuel quantity requirement to calculate the project emission due to co-firing. Estimated consumption of Rice Husk is 89617.75 Tonnes per annum for 75% PLF. Hence for calculating the project emission due to co-firing we have considered 8961.775117 tonnes of coal per annum.

$$PEFF_y = Q_i \; NCV_i \; EF_{CO2} \; OXIDi$$

Where,

$PEFF_y$ = Emission arising out of combustion of fossil fuel (Coal) due to co-firing.

Q_i = 8961.775117 Tonne/Year

NCV_i = 19.98×10^{-3} Tj/t (Source: IPCC guidelines)

OXIDi = 0.98 (Source: IPCC guidelines)

EF_{co2} = 96.07 tCO_2/Tj (Source: IPCC guidelines)

$PEFF_y$ = $8961.775 \times (19.98 \times 10^{-3}) \times 96.07 \times 0.98$

= 16857.311 = 16857 tCO_2eq.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>>

As per methodology project leakage as nil. Ly = 0

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

>>

Sum of E.1.2.1 and E.1.2.2 = 16857 t CO2/annum = $PEEF_y$

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

>>

A base line emission factor EF_Y is calculated as simple OM described for each fuel i in case of grid generation and import using the formulae provided in ACM 0002.

$$EF_{OM,\,y} = \frac{\sum F_{i,j,y}.\ COEF_{i,j}}{\sum_j GEN_{j,y}}$$

Where,

$F_{i,j,y}$ is the amount of fuel $_i$ (in tonnes) consumed by relevant power sources $_j$ in years$_y$.

$_j$ refers to the power sources delivering electricity to the grid, not including low-operating Cost and must-rum power plants and including imports to the grid.

$COEF_{i\,j\,y}$ Is the CO_2 emission coefficient of fuel $_i$ (t CO_2/t of fuel), taking into account the carbon content of fuel used by relevant power source $_j$ and the percent oxidation of the fuel in year(s) and

$GEN_{j,y}$ Is the electricity (MWh) delivered to the grid by sources $_j$.

The CO_2 emission Coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i\ .\ EF_{CO2,i}\ ,\ OXID_i$$

Where,

NCV_i is the net calorific value TJ /tonnes of fuel i,

$OXID_i$ oxidation factor

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i

t CO_2 eq / tonnes of fuel

Determination of EG_y

Installed generation capacity	=	14 MW
ASSUMED PLF	=	0.75
Generated power/annum	=	14 x 330 x 24 x 0.75
	=	83160 MWh
auxiliary consumption	=	10%
net power made available to grid	=	83160 x 0.9 = 74844 MWh

Calculation Of CO_2 Baseline Emissions From Grid

$ER_{electricity, y} = EG_y \cdot EF_y$

Where:

$ER_{electricity, y}$ are the emission reductions due to displacement of electricity during the year y in tons of CO_2

EG_y is the net electricity supplied to or through CSEB grid = 74844 MWh

$EF_{electricity, y}$ is the weighted average emission factor in current generation mix for the electricity displaced due to the project activity during the year y in tons CO_2 / MWh. ,= 0.9664 t CO2/ MWh

Thus $ER_{electricity, y}$ = 74844 X 0.9664 = 72329 t C02/anum or Say 72329 tCO_2/Annum

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

>>

Emission reductions as difference between E.1.2.4 and E.1.2.3 = 72329 -16857 = 55472 t CO2/annum

Emission Reductions

$ER_y = ER_{electricity, y} - PEFF_y - L_y$

Where:

ER_y are the emissions reductions of the project activity during the year y in tonnes of CO_2,

$ER_{electricity,y}$ are the emission reductions due to displacement of electricity during the year y in tonnes of CO_2, = 72329 t CO2 /annum

$PEFF_y$ Emission arising out of combustion of fossil fuel (Coal) due to co-firing =16857 tCO_2e / annum.

L_y Leakage.

E.2 Table providing values obtained when applying formulae above:

>>

Year	Estimation of Project activity emission reduction tonnes of CO_2e	Estimation of baseline emission reduction tonnes of CO_2e	Estimation of leakage tonnes of CO_2e	Estimation of emission reduction tonnes of CO_2e
2006	16857	72329	0	55472
2007	16857	72329	0	55472
2008	16857	72329	0	55472
2009	16857	72329	0	55472
2010	16857	72329	0	55472
2011	16857	72329	0	55472
2012	16857	72329	0	55472
2013	16857	72329	0	55472
2014	16857	72329	0	55472
2015	16857	72329	0	55472
				554720 for the entire crediting period

SECTION F.: Environmental impacts:

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

>>

RREL conducted the EIA study for the project . we list below salient points.

Air quality due to project activity

The project uses rice husk biomass as fuel in the boiler. Biomass is considered as carbon neutral as the carbon emissions would have occurred anyway in the absence of project activity. Hence there is no addition in GHG gases emission. Biomass are low in sulphur content and hence SO2 emissions will be negligible.

Biomass has 18% average ash content. Hence ash generation would be to the extent of 60 tpd in boiler. out of this 10% is considered as bed ash which can not be used in cement/ brick making purposes. However balance 90% will be fly ash which will be collected from boiler ESP/Economiser/Air Pre-heater. This fly ash will be conveyed to fly ash silo. The ash handling system of boiler is designed to remove bed ash from the furnace of boiler.

The SPM levels from ESP will be maintained below 100 mg/m^3. Accordingly the Ambient Air Quality surrounding the plant will remain well within the prescribed limits of the State Pollution Control Board and Central Pollution Control Board.

This will totally eliminate any concern regarding the Air born pollution of Ash due to wind.

Water quality

Air cooled Heat Exchanger for water used in turbine exhaust steam condensing will be installed to reduce water consumption. The steam condensate will be reused as boiler feed water. There will be no waste water discharged into surrounding bodies in study area. Waste water generated in DM plant will be neutralised and used for green belt creation/maintenance purposes and for Dust depression.

Noise pollution

Noise arises from boiler and turbo generator. Equipment selection and design has been done in such a way that noise levels of 90dbA at plant level and 55-65dbA will be maintained at the Boundary limits of the Plant Leqs for area will be below set standards.

The Project activity produces 14 MW power based on BIOMASS steam generation (FBB) and steam turbines.

The installation of FBB and POWER PLANT requires approvals of IBR (Indian Boiler Regulation) and CECB (Chhattisgarh Environment Conservation Board) and both the approvals will be received before the Commissioning of project activity.

A. A well equipped laboratory to monitor the ambient air quality; stack emissions and noise levels within the plant and boundary limits was set up.
B. Full fledged horticulture department to use waste waters to create and maintain green belt was established.

C. Fire protection system consists of fire hydrants and portable fire extinguishers.

The Fire hydrant system comprises of electric driven pumps and stand by pumps will be diesel fired. water pumping points with the required length of hose will be provided.

Portable fire extinguishers are combination of different types like foam; and Sand Buckets will be provided at switchyard.

D. ESP are provided to maintain SPM levels below 100 mg/m^3, and bag filters will be provided for other fugitive dust emission control.

E. Conveying systems are provided with proper coverings and bag filters to prevent Fugitive emissions

F. Fly ash silos are of covered type.

G. All roads within the plant are paved and made Pucca as far as possible.

H. Green Belt is provided on the Boundary of the Plant and along the Roads and in the open space available.

I. Sufficient Height Chimney is provided for the Good spatial distribution of SPM emitted through chimney.

J. On the basis of EIA studies; mathematical predictions; evaluation of impacts with recommended environment management plan the power plant is safe from environmental angle.

Project activity meets existing, national and regional regulations in force.

SECTION G. Stakeholders' comments:

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

>>

RREL identifies the following as stake holders to keep the transparency in the operational activity of the project promoted and thereby meeting local/ environmental regulations.

1) Local Authority (Member of Legislative Assembly of Chhattisgarh)
2) Local authority of Village –Garh Umuria and Darra Muda
3) Chhattisgarh State Electricity Board (CSEB)
4) Chhattisgarh Environment Conservation Board (CECB)
5) Chhattisgarh Renewable Energy Development Agency (CREDA)
6) Ministry of Commerce and Industry Govt. of India

G.2. Summary of the comments received:

>>

RREL management appraised the representatives of village Panchayat of village about the project activity. The members of Panchayat appreciated and expressed their no objection for project activity and requested to the industry to provide employment to the local youth and ensure no pollution is caused.

Similarly RREL management appraised MLA regarding the project activity who also appreciated and expressed no objection for the project activity.

Permission have been sought from the State agencies like CECB, CREDA etc. wherever required legally and have been received and other State agencies have been appraised of the project activity.

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

>>

The relevant comments and important clauses mentioned in the project documents/ Detailed project report, Environment clearances were considered while preparation of CDM Project Design Document. RREL management representatives met various stake holders for apprisal regarding project activity and sought the support.

The RREL has provided employment to the local youth on the priority and on the merits. Also the company has obtained permission to establish from State Pollution Control Board i.e. Chhattsgarh Environment Conservation Board (CECB). The company is installing effective Electrostatic Precipitator, and Bag Filters to control the Air Pollution, Green Belt also is being planted.

All the stake holders appreciated the energy efficient environment friendly project activity which has sustainable contribution to the development.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organisation	**R.R. Energy Limited**
Street/ P.O. Box	**Transport Nagar**
Building	**65**
City	**KORBA**
State/ Region	**Chhattisgarh**
Postcode/ Zip	**495679**
Country	**INDIA**
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URL	495679
Represented by:	**Ramavatar Agrawal**
Title	**Managing Director**
Salutation	**Mr**
Last Name :	**Agrawal**
Middle Name:	
First Name:	**Ramavatar**
Department:	**Management**
Mobile:	**98932-88002**
Direct FAX:	
Direct Tel:	
Personal E-mail	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO ANNEXURE 1 PARTY FUNDING IS RECEIVED

Annex 3

BASELINE INFORMATION
Base line information (sources of information)

S.No.	Parameter	Source
1	**Individual Plant Capacity & Generation, Fuel consumption and Auxiliary consumption**	7) Western Region Annual Report 2004-05 8) Review of Performance of Thermal Power Station 2004-05, 2003-04, 2002-03, 1997-98 of CEA. 9) Review of Performance of Hydel Power Station 2003-04, 2002-03 of CEA 10) General Review of 2005 & 2002-03 CEA. 11) Nuclear Power Corporation Report 12) Tariff Order for TPC-FY 2003-04 & FY 2004-05 for Trombay Power Station
2	**Net Calorific Value (NCV) for Coal/ Lignite**	Review of Performance of Thermal Power Station 2004-05 and General Review 2005 and General Review 2002-03 of CEA.
3	**EF_{CO2}, OXDi and NCV for Gas, Diesel, Lignite (Lignite for 2004-05 only)**	IPCC Guidelines.

Base line Information (Baseline Calculations)

Definition of Electric System:

Chhattisgarh Electricity Board (CSEB) is part of Western Region grid. Hence we have selected Western Region grid generation system as our baseline grid electricity system. As per the Executive Board requirement about the choice of the Grid, we have selected WREB Grid.

We are required to calculate the baseline Emission Factor EFy; as combined margin (CM) consisting of the Operating Margin (OM) and Build Margin (BM) factors according to the following three steps. The calculation for this combined margin must be based on data from an official source (where available) and made publicly available.

Step – 1 : Calculate the Operating Margin Emission Factor $EF_{OM,y}$ based on One of the four following methods:

.. The Simple OM emission factor can be calculated using 3 years average, based on most recent statistics available at the time of PDD submission or the year in which the project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring. We have selected past 3 years average, based on most recent statistics available for calculating EF_{OMy}.

The generation figures are based on the official source of Western Regional Electricity Board, Central Electricity Authority and published Thermal /Hydel Power Station Performance Reviews, and Annul General Review.

For calculating Simple OM we have followed the following procedures:

1)	**IPCC guidelines figures which are used for calculation** (Based on IPCC default Carbon content factor Table No. 1.1 in Revised IPCC guidelines, Vol.3				
	Fuel	**NCV(TJ/t)**	**OXDi**	**EF_{CO2} (tCO2/TJ)**	**Calculation for EF_{CO2} (tCO2/TJ)**
	Coal	0.01998	0.98	096.07	(26.2 (carbon content factor for sub.bit. Coal X 44/12)
	Lignite	0.0098	0.98	101.20	(27.6 (carbon content factor for sub.bit. Coal X 44/12)
	Gas	0.043	0.995	056.1	(15.3 (carbon content factor for sub.bit. Coal X 44/12)
	Diesel Oil	0.04333	0.99	074.0666667	(20.2 (carbon content factor for sub.bit. Coal X 44/12)
	Naptha	0.04501	0.99	073.3333333	(20.0 (carbon content factor for sub.bit. Coal X 44/12)

2. (A) Calculation of EF_{OM} simple for Coal based power stations.

Coal based Generation for Western Region	Net Gen.(MU)		
	2004-05	**2003-04**	**2002-03**
Chhattisgarh	7132.13	**6899.77**	6980.96
Madhya Pradesh	13621.03	**11980.94**	13396.12
Gujrat	23701.76	**23068.03**	24863.00
Maharashtra	51353.40	**49605.49**	48278.32
Goa	0.00	**0.00**	0.00
NTPC Central Sector Units	32518.38	**29745.02**	30722.48
Imported Electricity From Central Sector	8346.48	**1794.07**	1281.52
Total ::	136673.17	**121299.25**	125522.40
Calculated Weighted Average of EF_{OM} for year based on calculated EF_{OM} for individual plant. (tCO_2/MWh)	1.164582177	1.147756138	1.228488461
Auxiliary Oil consumption (Tonnes)	246011.71	221275.08	163952.10
Calculated EF_{OM} for 2004-05 based on total oil consumption and power generation.	0.005718988	0.005718988	0.004149946
Weighted Average for EF_{OM} simple coal (including Auxi. Oil consumption)	**1.170301165**	**1.153475126**	**1.232638407**
Weighted Average for Three Years (EF_{OM+} simple)			***1.185184776***

* NCV values for coal for all the three year have been based on Official figures available in the Thermal Reviews and General Reviews of CEA

2. (B) Calculation of EF_{OM} simple for Gas based Power Station.

Gas based Generation for Western Region	Net Gen.(MU)		
	2004-05	**2003-04**	**2002-03**
Chhattisgarh	0	**0**	0
Madhya Pradesh	0	**0**	0
Gujrat	13104.754	**7969.750**	5358.356
Maharashtra	5428.280	**4939.526**	4646.000
Goa	13.8500	**183.924**	251.252
NTPC Central Sector Units	6700.630	**6464.131**	6973.600
Imported Electricity From Central Sector	1.4030	**0.341**	0.244
Total ::	25248.917	**19557.333**	**17229452.10**
Calculated Weighted Average of EF_{OM} for year based on calculated EF_{OM} for individual State, separately for Naptha, Gas & Auxiliary fuel consumption (tCO_2/MWh)	**0.49358**	0.53445	0.56950
Weighted Average for Three Years (EF_{OM+} simple)			***0.527549722***

3 Calculation of combined EF_{OM} simple for Three year average for Coal and Gas

Weighted Average for Three Years (EF_{OM+} simple) for Coal	***1.185184776***
Weighted Average for Three Years (EF_{OM+} simple) for Gas	***0.527549722***
Percentage of Coal based power	***86.13%***
Percentage of Gas based power	***13.87%***
Combined Weighed Average = (Percentage of Coal based Power X EF OM for coal)+ (Percentage of Gas based power X EF OM simple Gas)	**1.09428**

Step – 2 Calculate the Build Margin emission factor $EF_{BM,y}$:

Project participant are required to choose one of the following two option:

Option -1 :

Calculate the Build Margin emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on the plant already built for sample group *m* at the time of PDD submission. The sample group *m* consist either of 5 power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The project participant should use that sample group that comprises the larger annual generation.

Option -2 :

For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex-post* for the year in which the actual project generation and associated emission reduction occurs. For subsequent crediting period $EF_{BM,y}$ should be calculated as *ex-ante* as described in option-1 above. The sample group *m* consist either of 5 power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The project participant should use that sample group that comprises the larger annual generation.

RREL have opted for Option-1, which require following:

1) Calculate the Build Margin emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on the plant already built for sample group *m* at the time of PDD submission. The sample group *m* consist either of 5 power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The project participant should use that sample group that comprises the larger annual generation.
2) Accordingly RREL have worked sample-1 which includes five most recent plants which have total installed capacity of 625 MW.
3) Sample-2 was worked out taking into consideration 20% system generation increase based on 2004-05 system generation and have selected the plant who have contributed to this increased generation. The following table for sample two provide the key information and data used. The capacity addition works out to be 9049.15 MW.

Hence sample-2 is larger than sample-1, sample-2 has been selected for calculating the Build Margin EF_{BM} factor.

S.No.	Name of Power Plant	Dt. of Com.	Addition in Capacity	Increase Gen.	Net Gen 04-05	EF OM (tCO2/MWH) (2004-05)	tCO2 of Increased Gen.
	Coal Based Units						
1	Sanjay Gandhi - 3	28-Feb-99	210	1553.15	1553.15	0.9707	1507.64946
2	Sanjay Gandhi-4	23-Nov-99	210	1474.04	1474.04	0.9707	1430.857039
3	Gandhi Nagar-5	17-Mar-98	210	1560	1560	1.1013	1718.028486
4	Wanakbori-7	31-Dec-99	210	1656.97	1656.97	1.15747	1917.899493
5	Surat Lignite	1-Nov-99	125	858.382	858.382	1.21	1035.131092
6	Surat Lignite		125	946.53	946.53	1.21	1141.429611
7	K'Kheda -II -3	31-May-01	210	1603.6	1603.6	1.32748	2128.752965
8	K'Kheda -II -4	7-Jan-01	210	1493.73	1493.73	1.32748	1982.902323
9	Chandrapur -7	1-Oct-97	500	3376.25	3376.25	1.28983	4354.772692
10	V'Chal STPS-7	1-Mar-99	500	3831.94	3831.94	1.10759	4244.20613
11	V'Chal STPS-8	1-Feb-00	500	3858.53	3858.53	1.10759	4273.656863
12	Akrimota Lignite	31-Mar-05	125	0	0	0	0
	Total for Coal Based Unit	3135	22213.122	22213.122		**25735.28615**	
	Gas Based Unit						
	Dhuvaran CCPP+ GT						
1		22-Sep-03	79.6	557.97	700.97	0.50266	280.4694196
2	GPEC	1998	138	737.92	737.92	0.50266	370.9231574
3	GPEC		138	789.71	789.71	0.50266	396.9559391
4	GPEC		138	764.51	764.51	0.50266	384.2888972
5	GPEC		241	1341.48	1341.48	0.50266	674.3088643
6	GIPCL GT-4	26-Aug-97	160	1133.207	1133.207	0.50266	569.6182762
7	GIPLC ST-2	18-Nov-97	54				
8	GSEG (Hazira)	30-Sep-01	52	387.36	387.36	0.50266	194.7105299
9	GSEG (Hazira)	16-Oct-01	52	377.28	377.28	0.50266	189.6437132
10	GSEG (Hazira)	31-Mar-02	52.1	386.23	386.23	0.50266	194.1425237
11	Dabhol	13-Mar-99	740	0	0	0.45572	0
12	RSPCL	14-Aug-00	48	138.5	138.5	0.45572	63.11790098
	Total for Gas		1892.7	6614.167	6757.167		3318.179222

S.No.	Name of Power Plant	Dt. of Com.	Addition in Capacity	Increase Gen.	Net Gen 04-05	EF OM (tCO2/MWH) (2004-05)	tCO2 of Increased Gen.
	Hydro Power Units						
1	Gangrel	4-Feb-04	10	7.52	7.52	0	0
2	R.P. Sagar		86	188.64	188.64	0	0
3	J.Sagar		49.5	140.52	140.52	0	0
4	Bansagar-II (Silpara)	28-Aug-02	15	33.45	33.45	0	0
5	Bansagar-II (Silpara)	9-Jan-02	15	34.89	34.89	0	0
6	Bansagar-II (Deolondh)	2002	20	24.8	24.8	0	0
7	Bansagar-II (Deolondh)	2001	20	24.97	24.97	0	0
8	Bansagar-II (Deolondh)	2001	20	26.76	26.76	0	0
9	Rajghat-1	15-Oct-99	7.5	18.89	18.89	0	0
10	Rajghat-2	29-Sep-99	7.5	11.03	11.03	0	0
11	Rajghat-3	11-Mar-99	7.5	13.85	13.85	0	0
12	Mini-Micro		3.3	0	0	0	0
13	Sardar Sarovar	2-Jan-05	256.5	150.07	150.07	0	0
14	Indira Sagar	23-Mar-05	1000	1331.87	1331.87	0	0
15	Kadana	2-Jan-98	60	97.54	97.54	0	0
16	Sardar Sarovar	10-Apr-04	72	42.13	42.13	0	0
17	Koyna -IV	20-Jun-99	250	529.6	529.6	0	0
18	Koyna -IV	25-Nov-99	250	268.52	268.52	0	0
19	Koyna -IV	3-Mar-00	250	721.3	721.3	0	0
20	Koyna -IV	5-Mar-00	250	225.85	225.85	0	0
21	Vautarana DPH		1.5	1.54	1.54	0	0
22	Warna	16-Sep-98	16	57.27	57.27	0	0
23	Pench		53.3	75.86	75.86	0	0
24	Dimbhe	17-Oct-98	5	9.11	9.11	0	0
25	Surya RBC	1-Jan-99	0.8	0	0	0	0
26	Terwanmedhe		0.2	0.09	0.09	0	0
27	Sardar Sarovar	2-Jan-05	121.5	71.09	71.09	0	0
28	Tata Hydro			241	1432	0	0
29	Bhira	1997	18	0	0	0	0
30	Aravelam	4-Feb-04	0.05	0	0	0	0
31	RSPCL (Injection)		48	138.36	138.36	0	0
	Total for Hydro		2914.15	2914.15	5677.52	0	0
	Grand Total ::		**7941.85**	**31741.439**	**34647.809**		
		20% increase in System Gen.			33901.0344		

Build Margin = E_{BM} = 0.83853687

Step-3 Base line emission factor

$EFy = W_{OM} . EF_{OM,\ y} + W_{BM} . EF_{BMY}$

BY DEFAULT

$W_{OM} = W_{BM} = 0.5$

EFy = 0.9664 t CO_2 eq/ MWH .

EF (Emission Factor)	t CO_2 eq/ MWH	
Simple OM	**1.09428**	$EF_{OM,\ simple,\ y}$
Build up Margin	**0.83853687**	$EF_{,BM,Y}$
Combined Margin	0.9664	EFy

The calculation for baseline emission reductions are given in **Section-E.**

Annex 4

Training Schedule

	In house training personnel
1	Department Head will be an experienced person.
2	Engineers recruited will have an experience working in similar fields.
3	Boiler Operators are with IBR Certificate.

Training of Fresh Engineers

1	Department head will be imparting training lessons once a week to all fresh Engineers/ Diploma holders.
2	The on job performance of fresh engineers verified / checked by experienced Shift Engineers.
3	On a weekly basis, online job report will be made to assess training of Engineers/ Diploma holders.
4	Equipment suppliers will depute Commissioning Engineers to train Engineers/ Diploma holders/ Technician and supporting operation manuals will be provided by them.
5	If necessary, the training of Engineers can be done by sending to industrial seminars, where such workshops are conducted, like Small Scale Industrial Institute, Bombay who regularly conduct such workshops/ NPRI/ CPRI

Technicians

1	They will have trade certificate
2	They will be directly trained by IBR approved technicians.
3	Technician need to learn mainly an Job.

Lab Technicians

1	Qualified chemist recruited.
2	Training will be imparted on job and also by sending them to training institute like Small Scale Industries Mumbai/ Reputed laboratory technician training institute.

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Appendix I : Abbreviation

ABC	After Burning Chamber
Annex	Annexure
BAU	Business As Usual
CPP	Captive Power Plant
CER	Carbon Emission Reduction
CEA	Central Electricity Authority
CSEB	Chhattisgarh State Electricity Board
CSERC	Chhattisgarh State Electricity Regulatory Commission
CDM	Clean Development Mechanism
DM	De-Mineralized
ESP	Electro Static Precipitator
EIA	Environmental Impact Assessment
FBB	Fluidized Bed Boiler
GHG	Green House Gas
HSD	High Speed Diesel
HT	High Tension
IBR	Indian Boiler Regulation
KWh	Kilo Watt hour
LSHS	Low Sulphur Heavy Stock
MWh	Mega Watt hour
MW	MW
NM^3/Hr	Normal Meter Cub per Hour
PLF	Plant Load Factor
PDD	Project Design Document
Qty	Quantity
RREL	R.R. Energy Ltd.
SEB	State Electricity Board
STG	Steam Turbine Generator
SPM	Suspended Particulate Matter
tCO_2	Tonnes Carbon-dioxide
tCO_2eq	Tonnes Carbon-dioxide equivalent
TPD	Tonnes Per Day
T/hr	Tonnes per hour
T&D	Transmission and Distribution
TG	Turbine Generator