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

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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 activity

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

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Chambal Power Limited's (CPL) proposed 7.5 MW biomass based power project at Rangpur, Kota District, Rajasthan, India.

Version 01

August 8, 2005

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

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Background

Chambal Power Limited (CPL) is a public limited company set up for the purpose of implementing projects for generation and sale of electric power and was incorporated on 27th May 1997. CPL is implementing a 7.5 MW biomass based power plant near village Rangpur, District Kota in Rajasthan, which is the 'project activity' under consideration.

CPL has been incorporated for setting up power projects and is yet to start generation activity. The main sponsors of the "Project" are Mr. M.C.Bagrodia & Associates.

Purpose

The main purpose of the project is to generate and export eco-friendly power to the Rajasthan Rajya Vidyut Prasaran Nigam Limited (RRVPNL), which is a transmission company of the Rajasthan State Electricity Board (RSEB). Considering that the setting up of fossil fuel based power projects has limitations especially with reference to the availability, location & transportation of fossil fuels, this project proposes to use biomass (a renewable source), which is sufficiently available within 50 km diameter of selected location. Biomass being a renewable source and considering the established fact that there would be no net emissions of CO_2 from such renewable energy projects, this 'project activity' will also lead to no net onsite emissions in comparison to the emissions from the alternative fossil fuel based power plants. The project will help reduce the ever-increasing demand and supply gap of electricity besides contributing towards economic growth and development of the area.

The project activity apart from generating employment locally will provide economic value to the agricultural wastes and will provide stable and quality power to the local industry, farmers and households. The project will also create a business opportunity for local stakeholders such as bankers/ consultants, suppliers, manufacturers, contractors and the related.

The following are some additional benefits of the project:

- Appropriate utilisation of surplus biomass
- Avoidance of burning of wasted agricultural residues
- Generation of environment friendly green power
- Reduction in green house gas (GHG) i.e. CO_2 emissions

Salient Features of the Project

CPL proposes to implement a modern 7.5 MW Power Project based on mustard husk and stalks, corn cobs, baggase and other available agricultural wastes as fuel. The project is likely to export surplus power to RRVPNL after meeting in-house auxiliary demand (of about 700 kW). In this regard, the power purchase agreement (PPA) for a 20-year period has been signed with the RRVPNL, for the sale of entire power generated by the project. The project also has provisions of coal co-firing, which will take care of any extreme emergency arising from shortage of supply of biomass due to drought. However, considering the sufficient availability of biomass adjacent to the proposed power plant, this situation would very rarely occur in the future.

The 'project activity' is a biomass based power plant wherein power would be produced by operating a 7.5 MW fully condensing steam turbine. The power plant is designed to generate 7.5 MW gross power with net exportable power of 6.8 MW at 33 KV voltage through a step-up transformer. The steam generator is designed to generate 35 Ton per hour (TPH) steam at 67 kg/cm^2 pressure and 450 ± 5 °C temperature at the super heater outlet considering feed water and temperature at Economizer inlet as 170 °C. The steam pressure and temperature at the inlet to the turbine shall be 64kg/cm^2 pressure and 445 ± 5 °C. All design calculations are based on the fuel composition referred to in **Table 1.1**.

Table 1.1 Fuel Composition for design calculations (Ref #1)

Fuel	C	H_2	O_2	N_2	S	M	Ash	GCV, kcal/kg
Baggase	22.5	3	23	-	-	50	1.5	2270
Mustard husk	39.88	4.17	39.37	0.67	0.6	9.1	6.7	3620
Corn cobs	30.33	4.35	-	-	-	30.64	1.55	3480
Indian Coal	41	3	7	0.6	0.35	8	40	4000
Imported Coal	60	4.6	10	1.5	.3	9	14	6000

Along with the new 35-TPH boiler and the 7.5-MW Turbo-generator (TG), the other auxiliary units of the plant would include:

- Fuel handling system with storage and processing arrangements
- Ash handling system
- Air pollution control devices
- Cooling water system and cooling tower
- De-Mineralised (DM) water plant
- Compressed air system
- Fire protection system
- Air conditioning and ventilation
- Complete electrical system for power plant and grid interconnection including power evacuation, instrumentation and control systems etc.

Availability of Biomass

The project would use biomass such as mustard and soya husks and stalks, corncobs, baggase and other available agricultural wastes as fuels. This project would require biomass quantity of about 245 tons per day (TPD), which is easily available within 50 km distance from project site (Ref #1). The biomass would be procured from the 6 biomass suppliers identified by CPL at and around the Rangpur village. The biomass will be brought to the site by road transport. The details of biomass suppliers and the quantities of biomass to be supplied by each of them are presented in **Table 1.2**.

Eastern part of Rajasthan is essentially a major producer of mustard, soyabean and corn. The production of these crops is good in the Bundi & Kota Districts (Estimated biomass waste is 1,80,000 Metric Tons Per Year (MTPY)) and these areas are within 50 km of the plant site. Corn is a crop of rainy season & this will be available for the project during the months of October to March in sufficient quantities mustard is a winter crop and the husk will be available for the use from April to June every year. For the remaining period CPL will use the stored biomass. CPL will make arrangements for storing sufficient quantity of mustard husk & corncobs at various supply points. CPL therefore, have proposed to appoint various reliable agencies who have necessary facilities for collecting the agro waste from the farmers at one place, bale it & store in their storage & transport the same as & when it is required.

Table 1.2 Details of biomass availability from each supplier[1]

S. No.	Name of supplier	Mustard stalk	Corncobs	Baggase	Agro waste	Total (MT)
1	Garg Construction Company, Kota	9000	6000	4000	-	19000
2	Satyam Gupta & Company, K.Patan	10000	15000	10000	10000	45000
3	Gems Techno crafts, Kota	15000	5000	-	5000	25000
4	Mathu Traders, Kota	8000	2000	50000	10000	25000
5	Ram Gopal Narendra Kumar	15000	-	-	12000	27000
6.	Sharma & Company, Jaipur	-	20000	-	5000	25000
7.	**Total Biomass available**	**57,000**	**48,000**	**19,000**	**42,000**	**1,66,000**
8.	**Requirement**					**85,000**
9.	**Loss @ 5%**					**4,250**
10	**Total Requirement**					**89,250**
11	**Excess Availability**					**76,750**

Power Export

[1] Biomass assessment report conducted by RREC

The power would be generated at the biomass based power plant, then evacuated from the 11/33 KV, HV switch yard of the proposed plant and will be exported to the RRVPNL grid system. The PPA for a 20-year period has been signed with the RRVPNL, for the sale of entire power generated by the project. The PPA can be extended for further 10 years beyond the initial 20-year agreement.

CPL will pay interest free development security amount of 10 lakhs to RRVPNL. RRVPNL shall purchase contracted energy at Rs. 3.6824 per unit applicable for the tariff year 2004-05 where after it will be increased @5% per annum on compounded basis for the period of 8 years. Thereafter the tariff shall be mutually settled between RRVPNL and CPL at least 6 months before the expiry of 10^{th} year from the date of PPA.

Ash Disposal

The ash generation will be in the range of 5 MT – 6 MT per day. This ash will be collected in the silo & transported to the fly ash bricks manufacturer on long-term contract basis. The generation of ash from biomass fuel will be negligible in quantity.

Implementation schedule

The company has received all the clearances required for the project including those from the Rajasthan state pollution control board (RSPCB) and airport authority of India (AAI).

CPL has appointed Sitson India Pvt Ltd as Engineering Procurement and Construction (EPC) contractor for the project & the construction work has already started. Land has been acquired and mortgage formalities have been completed. The project is expected to start generating electricity by March 2005.

Financial plans

The company has already tied up the total loan requirement of Rs. 2298.8 lacs from UCO bank, State bank of Patiala and State bank of Indore. The whole of the equity of Rs 985.20 lacs has been invested in the project as on June 2004.

Project's contribution to sustainable development

The project activity is located in a rural belt, which will contribute positively to the 'Sustainable Development of India'. The four pillars of sustainable development has been addressed as follows:

1. **Social Well-being:** The plant is located in a village and there is no significant development of industry in and around the project site. Project activity will help alleviate poverty to some extent by generating both direct and indirect employment in the area of skilled and unskilled jobs for operation and maintenance of the power plant. The productive use of a renewable agro waste will bring in associated economic and social benefits. The project will also help to bridge the gap of electricity demand and supply at local and national level.
2. **Economic Well-being**: Firstly the project will create jobs locally. The increase in demand of biomass exerted by the project will further have a local effect on its price and will generate additional revenue for the biomass suppliers and farmers. Generation of electricity using the same (biomass) as fuel will evidently contribute to the economic well - being by generating revenue and inflow of funds. Local and central government will also be financially benefited from the project as it will help in the rural upliftment of the farmers in the locality and is also consistent with the Government's rural development programme.
3. **Environmental Well-being**: The project activity is a renewable energy power project, which will use biomass generated from the agricultural fields in the locality as fuel for power generation and then export clean power to RRVPNL. This electricity generation will substitute the power generation by RSEB, dominated by conventional fossil fuel based projects or make power available for additional demand. Also the project by utilisation of renewable energy source will positively contribute towards reduction in finite natural resource like coal/ gas/ oil thereby minimizing the depletion. The project will help to reduce the CO_2 emissions by reducing equivalent quantity of conventional fuel, which is a carbon emissive non-renewable resource. Indian economy is highly dependent on "coal" as fuel to generate energy and for production processes. Thermal power plants are the major consumers of coal in India. There is a considerable gap between the demand and supply of electricity. Excessive demands for electricity place immense stress on the environment. Changing coal consumption patterns will require a multi-pronged strategy focusing on demand, reducing wastage of energy and the optimum use of renewable energy sources. The project would contribute towards achieving the same.
4. **Technological well-being**: The project activity will use energy efficient and environment friendly technology in the renewable energy sector which includes a modern boiler designed to operate with biomass like mustard and soya husk and stalks, corncobs, baggase and other available agricultural wastes.

The project activity would contribute in a great way to environmental and social aspects and therefore sustainable development by:

- Export of 6.8 MW power to the state grid and thereby replacing the generation of equivalent quantity of power using conventional fuel
- Conserving fossil fuels like coal/ gas which are non-renewable natural resources
- Making fossil fuels like coal/ gas available for other important applications
- Reducing GHG i.e. CO_2 emissions
- Contributing to a small increase in the local employment in the area of skilled and non-skilled jobs, for operation and maintenance of the power plant.
- Capacity building of local people towards operation of modern technology power generation
- Adding to the economic well being of the locality
- Adopting an advanced and sustainable technology for long-term benefits

A.3. Project participants:

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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Ministry of Environmental & Forest (MoEF), India (Public entity)	No
India (Host)	Chambal Power Limited (CPL) (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):

>> India

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

>> Rajasthan

A.4.1.3. City/Town/Community etc:

>> Village Rangpur, District Kota

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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The project is proposed to be located at Rangpur village area of Kota District, Rajasthan State, India, which is about 8 km from Kota railway station towards north direction and about 1 km south of village Rangpur. The latitude & longitude of the site are 25°16'36'' North & 75°56'22'' East. The location has been selected considering various aspects like availability of basic needs such as water, land, fuel availability etc. The location also has abundant availability of skilled and semi-skilled labour and is well connected with road, rail, air and communication. The physical location is shown in the **Fig 1.1**.

Salient features of selected site:

- Availability of adequate land, well connected to the road and electricity lines
- Suitability of land from topography & ecological aspects
- Proximity to good road to facilitate movement of biomass & availability of biomass
- Availability of adequate quantity of water to meet the requirements
- Facility for interconnection with transmission & distribution system for evacuation of power
- Comfortable weather condition

Fig 1.1 Location map of project site

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

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The project meets the applicability criteria of the small-scale CDM project activity category, Type-I: renewable energy projects (D. Renewable electricity generation for a grid) of the indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories.

Main Category: ***Type I - Renewable Energy Power project***

Sub Category: ***D – Renewable Electricity Generation for a Grid, (Biomass based Power Generation Project)***

As per the provisions of appendix B of simplified modalities and procedures for small scale CDM project activities (version 05), Type ID "comprises renewables, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit. If the unit added co-fires [non-] renewable biomass and fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW."

Project is a grid-connected biomass based power plant with fuels such as mustard and soya husk and stalks, corncobs and baggase, fired in the boiler, with a high-pressure steam turbine configuration having a capacity of 7.5MW. As per paragraph 1 of I.D of appendix B of the UNFCCC-defined simplified modalities and procedures for small-scale CDM project activities, in case of unit which fires renewable biomass [mustard and soya husk and stalks and corncobs] the capacity of the entire unit shall not exceed the limit of 15 MW, for the project to qualify as a small-scale CDM project. Evidently, the project qualifies as a small scale one under Type I.D.

The baseline and emission reduction calculations from the project would therefore be based on paragraph 7 of I.D of appendix B. The monitoring methodology would be based on guidance provided in paragraph 9 of I.D of appendix B.

Project Activity with technology details

Biomass as fuel for energy

Fuel assessment study was carried out by project proponents and it divulged that surplus biomass to the tune of 180,000 tonnes per year[2] (TPY) is available in 50 km radius of the project site The project participants have identified mustard and soya husk and stalks, corn cobs and baggase as biomass fuels. The typical characteristics of the proposed biomass fuels are given in Table 1.1.

A brief on the technology

The power plant is based on Rankine Cycle. The steam generator is designed to operate on any biomass like mustard and soya husk and stalks, corncobs, bagasse and also coal to ensure consistent plant efficiency even in times of biomass deficiency, if any.

There will be one 35 TPH, 67 kg/cm^2, 450 +/- 5°C high pressure boiler and a single bleed cum condensing steam turbine generator (STG) of 7.5 MW capacity. The 35 TPH of steam from boiler will be fed into condensing turbine. The boiler will be of fluidised bed combustion (FBC) type and will have the advantages of high thermal and combustion efficiency reducing quantity of husk needed, to a minimum, automatic operation for consistent high efficiencies and reduced need for manpower.

Steam turbine of fully condensing mode with suitable alternator generator will be installed for generating electricity. The turbine will be single cylinder, single exhaust fully condensing type, designed for high operating efficiencies and maximum reliability.

Along with the new 35-TPH boiler and the 7.5-MW turbo-generator (TG), the other auxiliary units of the plant would include: fuel handling system with storage and processing arrangements; ash handling system; air pollution control devices; cooling water system and cooling tower; de-mineralised (DM) water plant; compressed air system; fire protection system; air conditioning and ventilation; complete electrical system for power plant and grid interconnection including power evacuation, instrumentation and control systems etc.

In India, till date only one power plant based on mustard crop residues (MCR) as primary fuel has been commissioned[3] and this plant is the one and only biomass based power plant that has been commissioned in

[2] Biomass assessment study report conducted by RREC

[3] Kalpataru Power Transmission Limited commissioned in October 2003

Rajasthan (until October 2004). The project activity of CPL, which has started civil works during March 2004 and likely to be commissioned during October 2005, will be the second biomass based power project in the State of Rajasthan.

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 proposed power plant would use eco-friendly sustainable resources, mustard and soya husk and stalks, corncobs, bagasse and other available agricultural wastes as fuel, and hence the project would lead to GHG on-site emissions in the form of CO_2 from combustion of biomass. As CO_2 is required in the photosynthesis of green plants (biomass), by this CO_2 plants store there food as fixed carbon. This carbon is used in burning (oxidation) of biomass. So in total life cycle of a plant (biomass) there is no net emission of CO_2. Since the mustard and soya husk and stalks, corncobs contain only negligible quantities of other elements like nitrogen, sulphur (Table 1.1) release of other GHG's is considered as negligible. From the above we can conclude that the project activity would result in a net reduction of GHG emissions in the form of CO_2 emissions.

CPL's project will generate 7.5MW power and export about 90% to RRVPNL with only a small part (around 700 kW) used for meeting its auxiliary power needs. The plant load factor (PLF) is proposed to be 90%.

The plant is proposed to start operation in March 2005 and would export around 53.22 million units of electric energy annually to the RRVPNL. A constant value of the power export i.e. 53.22 MU has been assumed for the entire crediting period of 7 years, for estimation of certified emission reduction (CER) benefits.

Without the proposed project activity, equivalent energy load would have been supplied to the grid customers from a mix of fossil-fuel based thermal power plants. Emission of CO_2 would have occurred due to combustion of conventional fuels like coal by the state grid.

The Rajasthan grid relies heavily on coal, as does in most of India, and this dependence is predicted to increase over time, given the significant power shortages and exponential demand growth in Rajasthan. As per the future energy requirement and peak demand projections by Central Electrical Authority (CEA) 16th

power survey, the expected rise in energy requirement is about 7.18% and demand of power is about 7.30% per annum. The power scenario in Rajasthan during 2002 - 2003 is provided in **Table 1.3.**

In view of the above situation of power shortage, the RRVPNL will be a continuous buyer of energy from the CPL project. Although there is no binding on RRVPNL for power generation with renewable sources, CPL has taken a pro-active step to develop such technically advanced biomass based renewable power project in the Rajasthan state. The proposed power plant is not only justified in view of shortage both in peak power availability and in energy but also due to eco-friendly power generation. The project will evidently result in a reduction of GHG emissions

The project will therefore reduce the combined margin carbon intensity of the grid (i.e. the average carbon intensity of the operating margin and the built margin) given the generation mix of the grid. In the project scenario, Rajasthan Grid's conventional electrical energy equivalent of **372.54** Million Units for a period of 7 years would be replaced by exporting power from the proposed 7.5 MW non-conventional renewable resource (biomass) based power plant with CO_2 emission reduction of **337,456** tonnes in 7 years. Without project activity, an equivalent energy load would be taken up by state grid dominated by thermal power plants and there would be CO_2 emissions from combustion of conventional fossil fuels like coal / gas.

Table 1.3 Rajasthan Power Scenario

PARAMETER	VALUES
Year	2002-03
Own generation Purchased from NTPC From IPPs	3068.67 1911.06 1250
Gross availability	6229.73
Peak Availability	4360.81
Peak demand	5998
Deficit	1637.19
% Deficit	27.296%

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

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Year	Net CER Reductions (Tonnes CO_2)
2006-2007	48,208
2007-2008	48,208
2008-2009	48,208
2009-2010	48,208
2010-2011	48,208
2011-2012	48,208
2012-2013	48,208
Total estimated reductions (tonnes of CO_2 e)	**337,456**
Total no of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**48,208**

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

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No public funding from parties included in Annex I to the UNFCCC, is available to the project

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

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

According to para 2 of appendix C (ref #2)

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

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

According to above-mentioned points of de-bundling, CPL's project activity is not a part of any of the above, so it should be considered as small scale CDM 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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Title: **Renewable electricity generation for a grid (Ref #2)**

The project activity meets the eligibility criteria to use simplified modalities and procedures for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7 and fits under the category of renewable energy projects as per "appendix B of the simplified modalities and procedures for small-scale CDM project activities" of the UNFCCC. The details of approved methodology for baseline calculations for small-scale CDM projects of capacity less than 15 MW are available in this appendix.

Since the project generates electricity from a renewable biomass resource and exports power to the State grid, it is covered under category Type I.D [renewable electricity generation for a grid]. The category Type I.D comprises projects using renewable sources such as solar, hydro, tidal / wave, wind, geothermal and biomass that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non renewable biomass fired generation

For baseline calculation and emission reduction (in terms of $kgCO_2equ/ kWh$), reference has been taken from the "indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories" considering all the factors influencing the generation mix of the state grid.

The proposed project of CPL will be feeding power to the grid whose generation mix comprises coal based power projects, gas based projects, hydro projects, nuclear project and power from renewable projects. The major share belongs to the coal based thermal power plants.

Main Category: Type I – Renewable Energy Power Project

Sub Category: I.D Electricity generation for a Grid

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

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The project activity will use surplus biomass to generate electricity and export to RRVPNL. As stated above in the baseline scenario and in the absence of the proposed project, equivalent energy load would be met by the operating and future generation mix of the State grid (which is dominated by the coal and gas

based thermal power projects). The baseline emissions from the most likely baseline scenario are in line with the guidance provided in Appendix B.

The guidance given in *Appendix B of the simplified modalities & procedures for small-scale CDM project activities of the UNFCCC*, provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories and guidelines for preparing the project design document (PDD) including baseline calculations. As per this document the proposed project fits under Type I.D – Renewable electricity generation for a grid.

Baseline methodology for projects under Type I. D has been detailed in point no. 7 of I.D of this document (Appendix B). It states that the **baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in $kgCO_2/kWh$) calculated in a transparent and conservative manner as under**:

The average of the "approximate operating margin" and the "build margin", where,

i) The "approximate operating margin" is the weighted average emissions (in $kgCO_2equ/kWh$) of all generating sources surviving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

ii) The "build margin" is the weighted average emissions (in kg CO_2equ/kWh) of recent capacity[4] additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20%[5] of existing plants or the 5 most recent plants."

OR

The weighted average emissions (in $kgCO_2equ/kWh$) of current generation mix.

To assess the applicability of the relevant baseline methodology, a complete analysis of Rajasthan's electricity grid was carried out along with the study of various related issues like technology scenario, policy matters, economic conditions, development of renewable energy projects *etc* which can further be used for preparation of baseline scenario and calculation of baseline emission factor of the grid. The project activity would displace an equivalent amount of electricity that would have been drawn from the grid generation-mix. Since the displaced electricity generation is the element that is likely to affect both the

[4] Generation data available for the most recent year.

[5] If 20% falls on part capacity of a plant, that plant is included in the calculation.

operating margin in the short run and the build margin in the long run, electricity baselines should reflect a combination of these effects.

In this project case, the project is small-scale only having generation capacity of 7.5 MW. Hence this is an operating margin scenario where we can assume that the principal effect will be on the operation of current or future power plants. However in view of the predicted power deficit status of the state in future, a delayed effect in future power plants may creep in due to the occurrence of this project although to a limited extent. Ideal baseline approach is envisaged as the one that combines both Operating and Build Margin as prescribed in first alternative given in *Paragraph 7 of I.D of the (Annex B) UNFCCC modalities and procedures for small scale projects*.

Therefore we may conclude that the project may use the 'applicable baseline calculation for the Type I-D project category. Hence, the baseline emissions calculated using "the average of the **approximate operating margin and the build margin",** represent the realistic anthropogenic emissions by sources that would occur in absence of the 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:

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The project reduces anthropogenic emissions of greenhouse gases by sources below those that would have occurred in absence of the registered CDM project activity.

Although Government of Rajasthan (GoR) had brought out a policy for promotion power generation from Non-Conventional Sources, CPL is not legally bound to invest in the high efficiency biomass based power plant. There are no planned regulations that will coerce the Independent Power Producers (IPP) to implement the project activity within the crediting period. The implementation of the biomass based power project is a voluntary step undertaken by CPL with no direct or indirect mandate by law.

In absence of the project proponent's initiative to implement the project, the present and future electricity demand of the end-users would be met by the operating and future generation mix of the State grid which is dominated by coal and gas based thermal power plants. Therefore the most appropriate baseline is the grid mix of Rajasthan State. With the implementation of the project, 372.54 million kWh of electricity would be exported to RRVPNL during the 7-year credit period, which will reduce the combined margin carbon intensity of the grid.

The project proponent conducted a comprehensive analysis on the common practices adopted in Rajasthan for power generation in order to substantiate that the project is not a part of the baseline and the most appropriate baseline, in absence of project would be the grid mix of Rajasthan State during year 2003-2004[6].

- 72.69 % thermal power plants;
- 10.02 % nuclear plant
- 16.85 % hydro projects; and
- 0.44 % wind and cogeneration projects

In thermal power plant category, coal based plants contribute for 65.91 % and balance 6.78 % is contributed by the gas based power plants.

Government of Rajasthan (GoR) had brought out a policy for promotion of generation of power from non-conventional sources on 11.3.99. Some agreements for implementation of biomass waste fuel and mustard husk based power plants additions have been executed. However till date a total of 7 MW capacity has been commissioned[7].

This illustrates the low penetration of such renewable energy projects and little willingness of entrepreneurs to change the current operating practices in the region. We may conclude from the above statistics that the proposed project under discussion is not a common practice in the region. In India, till date, only one plant based on mustard crop residues (MCR) as primary fuel, has been commissioned i.e. *Kalpataru Power Transmission Limited, commissioned in October 2003* and this is the one and only biomass based power plant in Rajasthan (until October 2004). The practice of generating power by using biomass and especially MCR as main fuel has not penetrated in the region due certain prohibitive barriers to project implementation. The comprehensive analysis on the common practices adopted for power generation in Rajasthan further justifies that the project is not a part of the baseline. This project which has started civil work in March 2004 and likely to be commissioned in October 2005, will be second biomass based power project to be commissioned in the State, once all the barriers associated to project implementation are overcome.

[6] Northern Regional Load Despatch Centre (NRLDC) and Central Electrical Authority (CEA)

[7] http://www.rajenergy.com/

Though the project is not a common practice, the project proponent was keen to take up this new initiative of utilizing mustard, soya and other agricultural wastes as primary fuel by overcoming the barriers to prevailing practises. Some of the driving forces to this 'climate change initiative' were:

- Rural development of the region by creating a new demand for the waste biomass thereby carving a source of additional revenue for the farmers involved in sourcing the raw material
- GHG reduction
- Demonstrating to other entrepreneurs the un-tapped potential of generating clean power from combustion of mustard and soya husks and stalks, corncobs, bagasse and other agricultural wastes

However, the project proponent was aware of the various barriers to project implementation considering that the barriers would be overcome with the availability of carbon financing against a sale consideration of carbon credits that would be generated once the project were implemented. The project proponent has taken this CDM revenue stream into consideration before taking the initial steps to project planning.

As per the decision 17/cp.7 Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Referring to attachment A to appendix B document of "indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories", project participants are required to provide a qualitative explanation to show that the project activity would not have occurred anyway, **at least one** of the listed elements should be identified in concrete terms to show that the activity is either beyond the regulatory and policy requirement or improves compliance to the requirement by removing barrier(s); The guidance provided herein has been used to establish project additionality.

The project proponent demonstrates project additionality by ascertaining that without the proposed carbon financing the CPL investors would not have initiated the process of conceptualising and detailing the project plan due to the various prohibitive barriers associated to project implementation. Some of the key barriers being

Barriers and Additionality

Attachment A to appendix B of *the simplified modalities and procedures for small-scale CDM project activities of the UNFCCC CDM website* asks for an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a) Investment barrier

b) Technological barrier

c) Barrier due to prevailing practice

d) Other barriers

Investment barrier

In order to implement the project, the project proponent was required to

(1) Develop adequate infrastructure for fuel collection system

(2) Secure financial closure

(3) Consider existing policies with regard to non-conventional energy in the State

(1) Develop adequate infrastructure for fuel collection system

The project proponent had to develop infrastructure in terms of manpower and financial resources, in order to ensure continuous fuel availability, as one single supplier cannot supply the entire quantity of fuel required for the power plant. Negotiations had to be done with many suppliers/farmers for providing sufficient quantity of mustard and soya husk and stalks, corncobs and other agricultural wastes, based on which, six biomass suppliers have been identified within Rangpur village to provide the required quantity of mustard and soya husk and stalks, corncobs and agricultural residues. Biomass collection centres are proposed and trucks will transport about 85% of biomass and tractors will transport the rest 15%. While 70% of biomass will be collected within 5 km distance, 15% of it will be collected within 6-10 km and the rest would be collected between 11 – 15 km from the project site. This demands a rich experience in the rural economics but it also has its inherent advantages, since it will be a source of income to the local rural population and will contribute to sustainable development. Carbon financing therefore, will help project proponent develop and maintain a robust fuel collection system.

(2) Secure financial closure

Project cost of the proposed high-pressure configuration of 67 kg/cm^2 with biomass as primary fuel will be very high as compared to the conventional biomass power project with low-pressure configuration (below 40 kg/cm^2). Power generation/export to grid will also be significantly higher in high pressure configuration as compared to low-pressure configuration, since, low-pressure configuration will have reduced power to fuel ratio. Considering the above, high upfront cost, lack of easy and long-term financing, project cash flows *etc.* are the known investment barriers to the these high efficiency renewable energy projects. Due to

restrictions like institutional barriers and low penetration in the region, the accumulation of sufficient funds to finance a high investment and capital-intensive project, such as the proposed CDM renewable energy project is a quite difficult proposition.

Financial closure for the project activity has been achieved despite restrictions like (a) high upfront cost,(b) technological issues to project implementation, (c) institutional aspects related to project cash flows, (d) very little prior experience in power generation with mustard, soya, corncobs & other agricultural wastes as primary fuel, and (e) in selling power to the grid or other users. This is CPL's first venture into the business of biomass based power generation. The total project cost is proposed to be financed by equity and debt with debt to equity ratio of 70:30. CPL conducted discussions with some banks/financial institutions for project financing and has tied up with total loan requirement with bankers. CPL got better loan repayment terms from the banks/financial institutions in view of proposed carbon financing.

Therefore, carbon financing over the 7-year crediting period as one of the cash inflows of the project will add more credibility to CPL's loan repayment capability thereby helping them secure private financing to implement the proposed power project. CPL, proposes to shoulder the significant market or financial risk and taking a pro-active approach by showing confidence in the Kyoto Protocol/CDM system. Without the proposed carbon revenues securing private financing will be difficult. Besides the direct financing risk, CPL is shouldering the additional transaction costs such as preparing documents, supporting CDM initiatives and developing and maintaining monitoring and verification (M &V) protocol to fulfil CDM requirements.

(3) Existing policies with regard to non-conventional energy in the State

In Rajasthan, the State Government has taken positive steps in encouraging non-conventional power generation and has established a separate entity namely Rajasthan Renewable Energy Corporation (RREC) solely to cater to the needs and give assistance to entrepreneurs to develop such biomass based projects. RREC and Government of Rajasthan (GoR) have formulated separate policy for non-conventional energy based power plants on the guidelines issued by Ministry of Non-conventional Energy Sources (MNES). The first non-conventional power policy in the State was introduced in 1999 for a period of 5 years. After formation of RREC, this corporation has formulated the policy more realistic and consistent with the need to provide adequate encouragement to private sector participation formation of supportive policy by RREC and GoR to the project has generated interest in entrepreneurs to consider proposal for establishing non-

conventional power plants in the State. The CDM funds to some extent will help to overcome any perceived risk of cost of generation and purchase of power at right price.

Technological barrier

The 7.5 MW biomass based power project proves its technical additionality due to following reasons:

- Biomass (mustard and soya husk and stalk, corncobs, bagasse and agricultural wastes) getting wet in the monsoon would pose a serious problem in its use as boiler fuel
- A coal based thermal power plant would be a less technologically advanced alternative with lower risks associated with performance uncertainty, but would lead to higher GHG emissions
- The project will use modern energy efficient technology with high pressure and temperature configuration. Major equipments of power plants are boiler and steam turbine and generator (STG) set. The power plant will have one condensing steam turbo generator unit with a matching boiler of travelling grate type design capable of firing multi-fuel with mustard and soya husk, corncobs, bagasse or other agricultural wastes as the primary fuel. The boiler is sized to produce a maximum of 35 TPH of steam. The steam turbine will be a condensing type. The steam conditions at the boiler heat outlet are a pressure of 67 kg/cm^2 and temperature of 450 $\pm$ 5 ^{0}C. This suggests that project proponent proposed to use environmental friendly technology with higher investment. A lower investment technology would consume equivalent biomass but would generate less power, which in turn would lead to higher emissions. The perceived technological risks associated with biomass utilization as primary fuel are too high for CPL to take the initiative of proposing the project and to attract investment without ensured revenue from sale of carbon credits of the project.

Barrier due to prevailing practice

In Rajasthan, a serious deterrent to the private sector participation in the non-conventional power generation is the lack of adequate infrastructure. The first non-conventional power policy in the State was introduced in 1999 for a periods of five (5) years. The entrepreneurs are not keen to take the project related risks, in absence of very supportive renewable energy policies. The transmission lines in the state are aging and require huge investment for replacement / repairs. The lack of adequate financial resources is likely to continue due to the prevailing practice barrier. A sustained effort in this direction is required to overcome these institutional barriers.

As a result of the above identified barriers only 7 MW has been successfully commissioned till date. The CDM funds would help entrepreneurs to overcome these perceived institutional risks, which would affect the cost of power generation and sale of power.

As mentioned earlier this is CPL's first venture into the business of biomass based power generation. They have to understand and deal with the economics of electricity generation, distribution and dealing with power sector economics, bureaucracy etc.

CPL has signed a Power Purchase Agreement (PPA) with RRVPNL. For their cash in flows the project depends on the payments from RRVPNL against the sale of electricity to the grid. Electricity boards in India are not very financially healthy. Total outstanding dues against Rajasthan payable to CPSUs as on 31st March 2003 were INR 480.75 crores[8]. It's likely that there could be problems with the cash inflows of project. CPL was well aware of the situation but the proposed carbon financing as one of the revenue streams, the management has decided to take this risk and face this institutional barrier on which they have limited or no control.

Although, government of India is promoting such projects through Ministry of Non Conventional Energy Sources (MNES), at present there are not many projects in operation in India with similar configuration as that of the project activity, i.e. pressure of 67 kg/cm^2 and temperature of 450 ^{0}C. This illustrates the low penetration of such projects and the proposed project activity will overcome the risks associated with under-taking un-common projects.

Information component: Lack of institutions giving information and advice, lack of awareness among users on government rules and incentives, not enough technical and economic information to make a decision. The use of biomass for power generation is not a time-tested business proposition and there may be certain unknown risks associated with the project, which exposes the forerunners such as CPL to failure risks. Moreover, the promoters have limited knowledge and exposure of complications associated with commercial production and sale of power.

In spite of the above limitations, CPL is one such entrepreneur to initiate this GHG abatement project under clean development mechanism. If CPL is successful in overcoming the identified barriers, it will **encourage other entrepreneurs** to come up with similar project activities.

[8] http://powermin.nic.in/power-profile-NR_files/v3_document.htm. 1 crores=10,000,000

In view of the mentioned prohibitive barriers it is understood that the project activity is additional and it would be very difficult for the project proponent to repay loans in the absence of the anticipated CDM funding. The project will therefore result in GHG emission reductions, which are additional.

Other barriers

Regulatory Barrier: The project activity is not mandated by the law either from the Centre or the State. Although the MNES and the state government is promoting such renewable energy endeavours, there is no legal binding on either the state or the promoter to come up with such biomass based power plant. The analysis of barriers to the project leads to the conclusion that the project might not have occurred due to any of the barriers identified above. Hence it merits additionality from the above analysis.

Based on the baseline calculation methodology, it is calculated that (see section 5 and Annex 3 for the calculation) the proposed project activity will avoid **337,456** tonnes of CO_2 emissions in a 7 year-credit period, when compared to an equivalent generation from the state grid. Hence, the project activity is not a baseline scenario and without the project activity there will be emissions as per the carbon intensity of the Rajasthan grid to which the project activity is supplying electricity.

Thus biomass usage as fuel for power generation by CPL is additional from the BAU scenario.

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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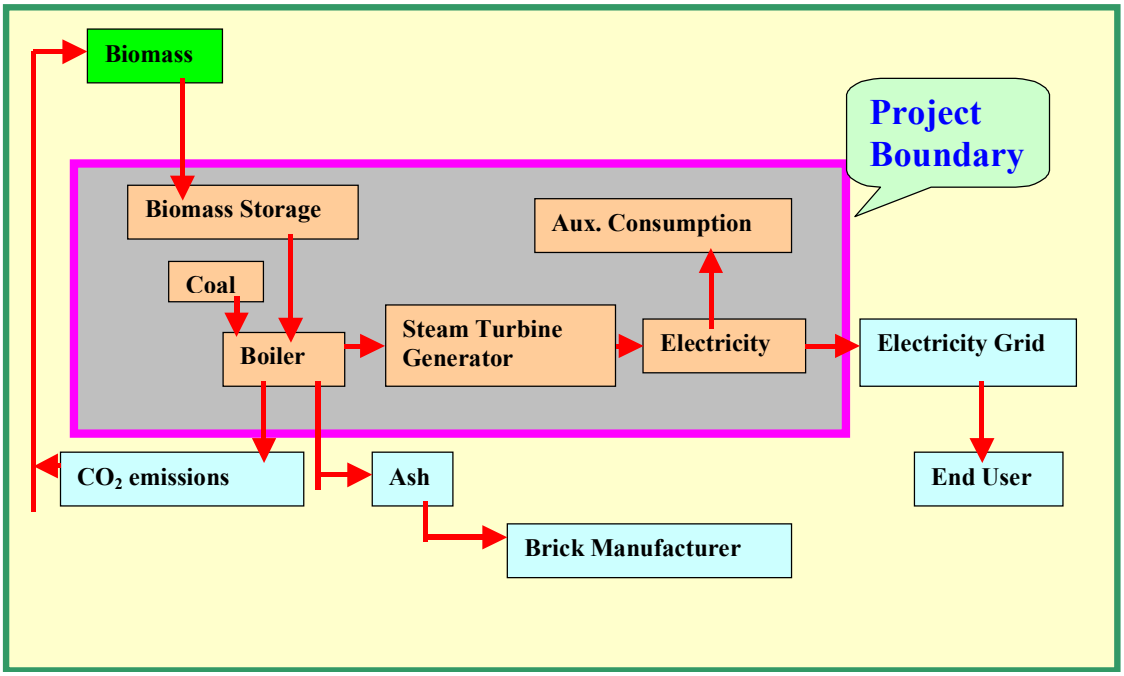
Project Boundaries

As per the guidelines mentioned in Type I.D. of Annex-B of the simplified modalities and procedures for small-scale CDM project activities, project boundary encompasses the physical and geographical site of the renewable generation source.

For the proposed project activity, the project boundary is from the point of fuel supply to the point of power export to the grid where the project proponent has a full control. Thus, boundary covers fuel storage and processing, boiler, steam turbine generator and all other accessory equipments. Individual power plants (existing and proposed) supplying to the state grid are considered in the baseline boundary for estimation of baseline emission rate. Since, the project would not have any significant impact on transmission and distribution losses it is not included in the project boundary. Using part of the available biomass, being

wasted earlier, in the proposed project, will not affect current needs for other fuels and therefore the emissions from any other fuel-use are not included in the system boundary.

Flow chart and project boundary is illustrated in the following diagram [the **thick** pink line demarcates the boundary



B.5. Details of the baseline and its development:

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The baseline methodology has followed the methodology specified in the project category I.D. in para 7 of I.D of the appendix B of the simplified modalities and procedures for small-scale CDM project activities.

All existing sources of power generation have been considered from various sources like the Central Electrical Authority (CEA), RSEB and documents on RSEB's plans for the future. Percentage share of power generation from different fuel sources has been calculated. The emission factors for different sources of fuel are considered as actual/ Intergovernmental Panel for Climate Change (IPCC) values.

Since the project activity is feeding power to RRVPNL, the baseline for this project activity is a function of the generation mix of Rajasthan state grid. Using the methodology available for small-scale project

activities, the average of operating and build margin (in $kgCO_2equ/kWh$) of current generation mix of Rajasthan is used for the calculation of baseline. Actual CO_2 emission factors are used for the purpose.

The calculation of the emission factor and corresponding CO_2 emission reductions have been done in an excel sheet which is enclosed as Annex 3 and the same has been explained in Chapter E.

Steps in Application of Methodology in the context of the project:

The project activity will increase installed capacity (marginally) of state grid. Also, it will have a delayed effect on the capacity addition program for the state and reduce the carbon intensity of the grid mix. The methodology demands extensive background data for analysis and application. For detailed analysis, data/information was collected from government/non-government organisations and other authentic sources; Above-mentioned methodology of baseline analysis is used as under for baseline emission factor estimation and estimation of resulting CO_2 emission reduction due to the project

- Study of Current Power Scenario and Policies
- Study of Rajasthan Government policy/guidelines of RSEB for generation of electricity by private participants.
- Required data / information from RSEB regarding present generation mix, sector wise installed capacities, generation efficiencies, technology used for power generation, present condition to meet peak demand and energy requirements etc.
- Study of present status of renewable energy and policy / plan for development of renewable energy projects in the state.
- Calculation of net baseline factor of RSEB grid using individual emission factors for conventional fuels used for power generation.
- Estimation of electricity generation by the project activity, which will replace grid electricity, which receives power from various power generation stations.
- Estimation of CO_2 emission reductions due to supply of clean electricity to RSEB grid by the proposed project.

The value of the emission factor (EF) from the 'combined margin method' = 0.91 $kgCO_2/kWh$

The value of the emission reduction estimated with the value of emission factor from the "average of approximate operating margin and build margin" (0.91 $kgCO_2$ /kWh) is considered as the emission reductions from the project activity *[Refer to Chapter E for calculation]*

Date of Completion: August 8, 2005

Name of person/entity: Chambal Power limited and their CDM consultants.

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

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

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The project will start commercial production from October 2005.

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

>>
01/03/2004 (Construction start date)

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

>>
25 years 0 month

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

>>

C.2.1. Renewable crediting period:

>>
Renewable crediting period

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

>>
01/03/2006

C.2.1.2. Length of the first crediting period:

>>
7 years 0 months.

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

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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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Title: Monitoring methodology for category Type I.D – renewable electricity generation for a grid

Reference: 'Paragraph 9 ' as provided in I. D of appendix B of the simplified modalities and procedures for small-scale CDM project activities - Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories.

The document requires the project-monitoring plan to consist of metering the electricity generated by the renewable technology.

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

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As per the provisions of paragraph 14 of Draft simplified modalities and procedures for small scale CDM project activities [FCCC/CP/2002/7/Add.3, English, Page 21] the "Project participants may use the simplified baseline and monitoring methodologies specified in appendix B for their project category" if they meet the applicability criteria of small scale CDM project activity. Since the project activity is a small-scale CDM project of Type I.D category, the monitoring methodology and plan has been developed in line with the guidance provided in paragraph 9 of I.D of Appendix B.

Since the project is a grid connected renewable energy project, emission reduction quantity totally depends on the units of energy in kWh exported to the RRVPNL and the baseline emission of the state grid. The methodology covers the monitoring of units exported and the other parameters affecting the quantity of power export and CO_2 emissions. The project fires biomass such as mustard and soya husk, corncobs, baggase and other agricultural wastes, hence, the methodology must also include monitoring the amount of biomass input and the energy availability from the same. In order to monitor the mitigation of GHG due to generation of power at CPL, it is required that the total power produced and auxiliary power consumed are measured.

Description of the Monitoring Plan

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

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

The project revenue is based on the units exported as measured by power meters at plant and check meters at the high-tension substation of the RSEB. The monitoring and verification system would mainly comprise of these meters as far as power export is concerned. The biomass (mustard and soya husk, corncobs, bagasse, agricultural wastes) input is also to be monitored. The export of electricity will be through invoices to RSEB. The invoices, based on meter readings will also be covered in audit.

The measurement of the quantity of biomass used will produce evidence to the quantity of energy generated with zero net CO_2 emissions. The certified emission reductions (CERs) will be generated from the quantity of power generation from biomass and the auxiliary consumption.

The project would employ latest state of art monitoring and control equipment that will measure, record, report, monitor and control various key parameters. Parameters monitored will be quantity and quality of biomass used, total power generated, power exported to the grid, *etc* (details enclosed in the tables given below). These monitoring and controls will be the part of the distributed control system (DCS) of the entire plant. All monitoring and control functions will be done as per the internally accepted standards and norms of CPL.

The instrumentation system proposed for the project will mostly comprise microprocessor-based instruments of reputed make with desired level of accuracy. All instruments will be calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time. The quantity of

emission reduction claimed by the project will only be a fraction of the total generated emissions, which depends on the actual generation mix of the grid in a particular year.

RSEB publishes yearly reports regarding the performance of all power generation units (which include private sector generation units and RSEB's own generation units). Hence, authentic data related to the measurements, recording, monitoring and control of the generation mix of the RSEB grid is ensured.

The RSEB report contains all information regarding type of generation like hydro, thermal, nuclear, renewable *etc*., installed capacity, de-rated capacity, performance of generating unit, actual generation, capacity additions during the year, *etc*. which can be used for verification of generation mix and emission factors for baseline calculation for a particular year.

GHG SOURCES

Direct On-Site Emissions

Direct on-site emissions after implementation of the project arise from the burning of biomass in the boiler. These emissions mainly include CO_2. These emissions mainly include CO_2. Since the biomass is formed by fixing the atmospheric CO_2 by the action of photosynthesis in the presence of sunlight, the CO_2 released due to combustion of biomass is assumed to be equal to the CO_2 fixed by the photosynthesis. The CO_2 released during the combustion will be consumed by the plant species for their growth. In view of the above, biomass combustion and growth of biomass and associated CO_2 consumption and release can be treated as cyclic process resulting in no net increase of CO_2 in the atmosphere. Hence, the project will not lead to GHG emissions. On site emissions will take place if any fossil fuel is used as a supplementary fuel along with the biomass for power generation.

Direct Off-Site Emissions

Direct off-site emissions in the proposed project arise from the biomass transport. The collection of biomass (i.e. mustard husk and stalks, soya husk and stalks, corncobs & agricultural residues) will be done through farmers who will transport the biomass from their fields to the fuel processing centres in their own vehicles (i.e. by trucks & tractors). Biomass collection centres are proposed and trucks will transport about 85% of biomass and tractors will transport the rest 15%. While 70% of biomass will be collected within 5

km distance, 15% of it will be collected within 6-10 km and the rest would be collected between 11 – 15 km from the project site.[9]

In the baseline scenario, similar type of CO_2 emission (leakage) would occur during transportation of coal from coal mines to respective power plants and distance between the coal mine and power plant is quite high as compared to the average transportation distance considered between project site and biomass collection centres and hence higher the CO_2 emissions. Considering that sufficient biomass is available within 15 km radius from the proposed project site of CPL, it is anticipated that the direct off site emissions will be very less or negligible compared to the baseline. To be on conservative side, the leakage due to coal transportation has not been added while calculating the baseline of State grid and the small leakage due to transportation of biomass has been included from the calculations.

Indirect On-Site Emissions

The indirect on site GHG source is the consumption of energy and the emission of GHGs involved in the construction of biomass based power plant.

Considering the life cycle assessment of the total power generated and the emissions to be avoided in the life span of 25 years, emissions from the above-mentioned source is too small and hence neglected.

No other indirect on-site emissions are anticipated from the project activity.

Indirect Off-Site Emissions

The indirect off-site GHG source is the emission of GHGs that are involved in the process construction and erection of the transmission lines from the nearest sub station, up to the point from where the project wheels the power.

Same as above, considering the life cycle assessment of the total power generated and the emissions to be avoided in the life span of 25 years, emissions from this source is also too small and hence neglected.

Project Parameters affecting Emission Reduction

Monitoring Approach

The general monitoring principles are based on:

[9] Biomass fuel collection and delivery system report

- Frequency
- Reliability
- Registration and reporting

As the emission reduction from the project will be determined by the number of units exported to the RRVPNL (and then multiplying with appropriate emission factor), it becomes important for the project to monitor the net export of power to the grid on real time basis.

Frequency of monitoring

The project developer will install all metering and check metering facilities within the plant premises as well as in the grid substation where exported power is connected to the grid. The measurement will be recorded and monitored on a continuous basis by both RRVPNL and the project developer through DCS.

Reliability

The amount of emission reduction is proportional to the net energy generation from the project. Thus the final kWh meter reading is the final value from project side. All measurement devices will be of microprocessor based with best accuracy and procured from reputed manufacturers and calibrated. Since the reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the result all power measuring instruments must be calibrated once a year for ensuring reliability of the system. All instruments carry tag plates, which indicate the date of calibration and the date of next calibration. Therefore the system ensures the final generation is highly reliable.

Registration and reporting

Registration of data is on-line in the control cabin through a microprocessor. However, hourly data logging will be there in addition to software memory. Daily, weekly and monthly reports are prepared stating the generation. In addition to the records maintained by CPL, RRVPN also monitors the actual power exported to the grid and certify the same.

Fuel Requirement, Availability and Utilization

Availability of biomass

The major fuel proposed for power plant is biomass like mustard and soya husk, corncobs and baggase available from biomass dealers in the area. The requirement has been assessed as 245 TPD. The total maximum requirement per year quantifies to approximately 85,000 MT considering 5% wastage of biomass during transfer process. As per the detailed biomass resource assessment, the biomass availability in the allotted area is 1,80,000 MT / year, hence there will be no shortage of biomass.

Quantity of the biomass used in the boiler as fuel

The biomass received from the dealers will be stored in the plants storage area specially designed for such storage. From the storage area the biomass will be transferred to the intermediate bunkers by bucket elevator/belt conveyor. Belt conveyors would transfer the biomass from the bunkers to the feeding hopper of the boiler, from where biomass would be fed into the boiler. An online weighing system will be provided to the belt conveyors to measure, record and transmit, the actual quantity of the fuel entering into the boiler for online monitoring in the DCS. The weighing system needs to be calibrated regularly to ensure the accuracy of the measurement. The data will be recorded for further verification. The amount of biomass purchased, will be based on invoices / receipts from fuel contractors, which will be weighed on fully automatic electronic weighing bridge to be installed in the plant.

Though the project proponent proposes to use 100% biomass for power generation the project proponent will provide for a proper online coal weighing system in order measure the quantity of coal used.

Quality of Biomass used in the boiler

The main type of fuel proposed for the power generation is only biomass like mustard and soya husk and stalks, corncobs, bagasse and agricultural residues. The properties of the biomass from ultimate analysis, calorific value, ash composition etc. are already established and will be consistent in the region. However, it is proposed to monitor various properties of biomass used as fuel, by taking samples at random, so that in case of any drastic change in the properties, corrective actions can be taken.

Though the project proponent proposes to use 100% biomass for power generation the project proponent will provide for a necessary provision to measure carbon content of the coal samples and to arrive at project emissions from coal combustion if any.

The measurement of fuel properties like ultimate analysis, calorific value etc. will be done at the unit's own laboratory as per international practices and data or documents will be kept open for verifiers. This will be

verified periodically by getting the analysis done from reputed laboratories in the country. A proper Management Information System (MIS) for such data shall be in place.

Operational Parameters of the power-generating unit

Total Power Generated

The total power generated by the power project will be measured in the plant premises to the best accuracy and will be recorded, monitored on a continuous basis through DCS. All measurement devices will be microprocessor based with best accuracy and will be procured from reputed manufacturers. All instruments will be calibrated at regular intervals. All instruments carry a tag plate, which indicates the date of last calibration and the date of next calibration. The parameter will substantiate the smooth operations of the power plant. During verification the total power generated would be verified as compared to the power exported to the grid.

Power consumed by the plant auxiliaries

The power consumed by plant auxiliaries will be recorded in the plant premises to the best accuracy. This will be recorded and monitored on a continuous basis through DCS. All measurement devices will be microprocessor based with best accuracy and will be procured from reputed manufacturers. All instruments will be calibrated at regular intervals. All instruments carry tag plates, which indicate the date of calibration and the date of next calibration. The total quantum of power consumed by the auxiliaries would affect the total power to be exported to the grid and therefore the amount of GHG reductions. Therefore any increase in the consumption pattern of the auxiliary system would be attended to.

Net Power exported to the grid

The project revenue is based on the net units exported as measured by main metering system and/or backup metering system. The monitoring and verification system would mainly comprise of these meters as far as power export is concerned. RRVPNL will be billed by CPL based on joint meter reading promptly following the end of each month for energy supplied

Efficiency of the power generation activity

High-pressure boiler of 67 kg/cm^2 at 450ºC will be used by the project. The performance of the boiler is already predicted and can be verifiable. However, the boiler proposed for the project is a multi-fuel fired

boiler, which can use both biomass and coal. The inlet and outlet steam parameters will be measured and monitored along with the parameters of fuel and feed water.

Fully condensing type of steam turbine with generator set of 7.5 MW will be used by the project. Quantity with major quality parameters of the steam at the inlet to the turbine will be measured on-line and monitored through DCS.

Based on the measured input and output parameters the system efficiency will be calculated and monitored by DCS. In case of any irregularity, the root cause of the deviations would be identified and the necessary corrective actions will be taken. All the above parameters / factors will demonstrate the performance of the project at any point of time.

Verification

The generation of power from the biomass based power project and the export of power to state grid leads to CO_2 emission reductions. The longer the power plant runs and exports power to the grid, the more would be the emission reductions. The project control system would comprise a state of the art sophisticated control and monitoring system like Distributed Control System which would measure, collect information about various process parameters, record, monitor and control on a continuous basis. A-fully functional management information systems will be built in DCS so that accessing and verification of actual data are possible at any point of time.

There are 2 aspects in verification, which includes (a) verification of the monitoring system and (b) verification of data.

Verification of monitoring system includes:

- Verification of various measurement and monitoring methods
- Verification of instrument calibration methods
- Verification of data generated by DCS
- Verification of measurement accuracy

The other important thing that needs to be verified is the grid generation mix. This needs to be checked every year and any deviation from the projections should be recorded and incorporated in the baseline scenario for the project.

Like above activities, following major project parameters which affects the emission claims need to be verified, based on the available operating data is as under.

- Total generation of power, auxiliary power requirements and total power exported to the grid
- Quantity and quality of fuel i.e. biomass used
- Coal consumption if any

The project proponent is required to provide supporting data to verify the monitoring system as well as data archived as per Section D3.

D.3	Data to be monitored:

>>

a) Parameters affecting emission reduction of project activity

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
D.3.a.1.	Power	Total electricity generated	kWh	M	Shiftwise	100%	Electronic	3 years after issue of CER	Measured in plant premises and monitored and recorded continuously through DCS. Manufacturers of equipments should be of repute.
D.3.a.2.	Power	Auxiliary consumption	kWh	M	Shiftwise	100%	Electronic	3 years after issue of CER	-
D.3.a.3.	Power	Power export	kWh	M	Shiftwise	100%	Electronic	3 years after issue of CER	As per PPA with RSEB

b) Parameters affecting leakage emissions from project activity

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
D.3.b.1	Fuel	Biomass Quantity	MT	Measured	Daily	100%	Paper	3 years after issue of CER	
D.3.b.2	Fuel	Biomass calorific value	Kcal/Kg	Measured	Fortnightly	-	Paper	3 years after issue of CER	Through sample testing
D.3.b.3	Fuel	Coal quantity	MT	Measured	Daily	100%	Paper	3 years after issue of CER	
D.3.b.4	Fuel	Coal calorific value	Kcal/Kg	Measured	Once	Grab sample	Paper	3 years after issue of CER	Through sample testing
D.3.b.5	Distance	Distance of procurement	Km	Calculated	Daily	100%	Paper	3 years after issue of CER	
D.3.b.6	Mileage	Mileage of vehicle	Km/litre	Estimated	Monthly	-	Paper	3 years after issue of CER	
D.3.b.7	Density	Density of fuel	Kg/liter	Measured	Once	-	Paper	3 years after issue of CER	Through sample testing
D.3.b.8	Volume	Capacity of vehicle	MT	Measured	Once	-	Paper	3 years after issue of CER	

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

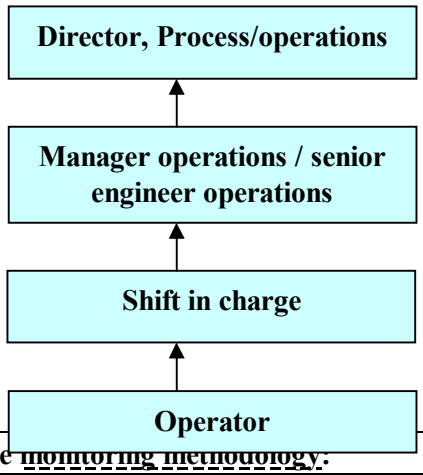
>>

Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.3.a.1	Low	Yes, ISO 9001 or similar type of system should be used
D.3.a.2	Low	Yes, ISO 9001 or similar type of system should be used
D.3.a.3	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.1	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.2	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.3	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.4	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.5	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.6	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.7	Low	Yes, ISO 9001 or similar type of system should be used
D.3.b.8	Low	Yes, ISO 9001 or similar type of system should be used

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:

>>

Although most of the monitored parameters required for the financial reports of the CPL. Like total power generated, total export to the grid etc. For the adequate monitoring of the emission reduction CPL proposes the following structure.



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

>>

Date of Completion: August 8, 2005

Name of person/entity: Chambal Power Limited and their CDM consultants

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

Since the proposed power plant would use environmentally sustainable grown biomass like mustard and soya husk and stalks, corncobs, baggase and agricultural residues as main fuels, the project would lead to zero net GHG on-site emissions. If in the project some supplementary fuel such as coal were used then there would be GHG emissions, which can be calculated. Since, the proposed biomass contains only negligible quantities of other elements like Nitrogen, Sulphur etc. the release of other GHG emissions are considered as negligible. Further, use of any fossil fuels is not envisaged in the project considering the sufficient availability of biomass around the project site. Hence there net emissions are not anticipated within the project boundary.

E.1.1 Selected formulae as provided in appendix B:

>>

Not applicable

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:

>>

If in the project activity only biomass fuel is used then the emissions from the project activity will be nil. If any supplementary fuel is used with biomass then the emissions will be calculated based on this formula:

CO_2 Emission (kg) = Stoicheiometric CO_2 release from carbon content in coal (based on total carbon content

To have an estimate of the project CO_2 emission quantity due to combustion of coal along with the biomass, total carbon content of the coal should be known. Combustion reaction for CO_2 emission is as under.

$C + O_2 = CO_2$

Assuming complete combustion of coal, following formula can be used for conservative estimation of CO_2 emissions.

$$CE_c = (44/12) * C * Q$$

where,

CEc - Stoichiometric carbon-dioxide emission due to coal burning at project, MT

C - Carbon percentage in coal, %

Q - Quantity of coal burned, MT

Although calculation for project emissions have been incorporated in Chapter E, carbon dioxide emissions from coal combustion are considered as zero since the CPL does not propose to use coal as fuel for power generation. CPL proposes to use 100% biomass since there is surplus crop residue available within a radius of 15 km, and is estimated to be 166,000 MT/ annum of which CPL requires only 85,000 MT/ annum taking into account 5% wastage of biomass in transport.

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

>>

The leakage activity identified, which contributes for GHG emissions outside the project boundary is transportation of biomass from biomass collection centers to biomass power project site. The collection of biomass will be done through the farmers. They bring the biomass to these fuel processing centers in their own vehicles i.e. tractors. Biomass collection centres are proposed and trucks will transport about 85% of biomass and tractors will transport the rest 15%. While 70% of biomass will be collected within 5 km distance, 15% of it will be collected within 6-10 km and the rest would be collected between 11 – 15 km from the project site. Calculation of leakage has been carried-out as under: [For details refer to Enclosure B-Leakage Calculations]

For truck transport

- Biomass to be procured (including 5% wastage in transport) - 85,000 MT
- Biomass to be transported by trucks (85% of total required) - 72,250 MT
- Avg distance between project site and biomass collection areas - 30 km (both ways)
- Biomass load per truck - 10 MT
- Number of trips - 22/day
- Mileage - 3.5 km/litre

- Total diesel consumption - 61,929 litres/annum
- CO_2 emission factor for diesel (as per IPCC guidelines) - 74.10 tons CO_2/ TJ
- CO_2 emission per annum - 164 tons

For tractor transport

- Biomass to be procured (including 5% wastage in transport) - 85,000 MT
- Biomass to be transported by tractor (15% of total required) - 12,750 MT
- Avg distance between project site and biomass collection areas - 30 km (both ways)
- Biomass load per tractor - 5 MT
- Number of trips - 8/day
- Mileage - 3.5 km/litre
- Total diesel consumption - 21,857 litres/annum
- CO_2 emission factor for diesel (as per IPCC guidelines) - 74.10 tons CO_2/ TJ
- CO_2 emission per annum - 58 tons

The CO_2 emission (leakage) occurs during the transportation of coal from the mines to respective coal based power plants. The distance between the coal mines and the power plants is higher as compared to the transportation distance between biomass collection centers to biomass power project site and hence the higher CO_2 emissions. To be on conservative side, this leakage due to coal transportation has not been added while calculating the baseline of RRVPNL grid and the leakage of **222 tons** annually, due to transportation of biomass by means of trucks and tractors has been included the calculations.

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

>>

Net project emissions (NE_p) = (Leakage) tons/year (If only biomass is used in the project activity)

= (Leakage) + **(44/12) * (C_C*Q_f)** (if any supplementary fossil fuel used)

- C_C- Carbon content of fuel
- Q_f– Quantity of fuel combusted
- Leakage = $\frac{Q_{bio} D_p N_y D_n C_v C_f E_f}{C_t M}$
  - Q_{bio} = Quantity of biomass transported (MT/day)
  - C_t = Capacity of truck/ vehicle carrying biomass (MT)
  - D_p = Distance of procurement including return journey of vehicle (km)

- M = Mileage of vehicle (km/litre)
- N_y = No of days in a year
- D_n = Density of fuel (Kg/Litre)
- C_v = Calorific value of fuel (Kcal/ kg)
- C_f = Conversion factor from Kcal to Trillion Joules (TJ)
- E_f = Emission factor of fuel (ton CO_2/ TJ)

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:

>>

RRVPNL is only an electricity distribution company. They receive electricity from different sources, i.e. power plants as well as independent sources and are responsible for only distribution. Therefore the Rajasthan grid has been considered as the system boundary for the baseline emission calculations. Rajasthan's present generation mix, sector wise installed capacities and emission co-efficients are used to arrive at the net carbon intensity/baseline factor of the chosen grid. As per the provisions of the proposed methodology the emission coefficient for the electricity displaced would be calculated in accordance with provisions of paragraph 7 of I.D of appendix B of Draft simplified modalities and procedures for small scale CDM project activities for grid systems. As mentioned in Chapter 2, in the Rajasthan generation mix, coal and gas based power projects are responsible for GHG emissions.

The emission coefficient has been calculated in a transparent and conservative manner as:

The average of the "approximate operating margin" and the "build margin"

(i) The "approximate operating margin (OM)" is the weighted average emissions of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation

(ii) The "build margin (BM)" is the weighted average emissions (in kg CO_2equ/kWh) of recent capacity additions to the system

Formula used for estimation of the anthropogenic emissions by sources of greenhouse gases of the baseline is as under.

[**A] Power generation by the selected grid mix**

$P_{tot} = P_{ff} + P_{ren}$

Where,

P_{tot} - Power generation by all sources of grid mix.

P_{ff} - Power generation using carbon emissive fossil fuels

P_{ren} - Power generation by renewable and nuclear power projects of grid mix

[B] Share of Power generation from each project type of the grid

$$SP_{tot} = \frac{P_n}{P_{tot}} x100$$

$$SP_{ff} = \frac{P_n}{P_{ff}} x100$$

Where,

SP_{tot} - Share (in %) of power generation by each project type / fuel used (n = types e.g. coal, natural gas) out of total power generation.

SP_{ff} - Share (in %) of power generation by each project type / fuel used (n = types e.g. coal, natural gas) out of the power generation from fossil fuels only.

P_n - Power generation by project types based on fuel used.

[C] Calculation of Operating Margin emission factor for each source of baseline generation mix

$$OM = \sum SP_{ff} \, x \, E_n$$

Where,

OM - Operating margin Emission Factor of baseline (in kg CO_2/kWh)

E_n . Emission factor (actual or IPCC) for each fuel type.

[D] Calculation of Built Margin emission factor for each source of baseline generation mix

BM = Weighted average of emissions from the top of most recent plants representing 20% of the capacity or the 5 most recent plants whichever is greater (in kg CO_2/kWh).

[E] Calculation of Combined Margin:

CMF = Average of OM and BM (in kg CO_2/kWh).

Where: CMF is the combined margin emission factor

The net baseline emission factor here refers to the CMF i.e. the combined margin emission factor

$$NEF_B = CMF$$

For conservative baseline emission factor, the lowest value of the CMF during the crediting period of the project has been selected as baseline factor for calculation of CO_2 emission reductions.

[G] Power generation and export by project activity

$$TP_{gen} = TP_{exp} + TP_{aux}\ TP_{loss}$$

Where,

TP_{gen} - Total power generated

TP_{exp} - Total clean power export to grid per annum by project activity

TP_{aux} - Auxiliary consumption of the power plant

TP_{loss} - T & D Loss

(all power units are in Million kWh)

The plant will meter power export to grid.

[H] Baseline Emission Reduction

$$ER_B = TP_{exp} * NEF_B$$

Where,

ER_B - Baseline Emission reduction per annum (tones/year)

TP_{exp} - Total clean power export to grid per annum

Description of estimation of CO_2 emissions is as under

- Approximate operating margin and build margin is calculated as per paragraphs 7a (i) and 7a (ii) of the UNFCCC approved methodology for small scale activities under Type I.D - Renewable electricity generation for the grid.
- For estimation of "approximate operating margin" the weighted average emissions (in kg CO_2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation is considered.
- For estimation of "build margin" the weighted average emissions (in kg CO2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants."

- Step by step calculation of CO_2 emissions due to burning of coal and gas for power generation and emission reductions by project activity is as under
- Since the selected state grid is power deficit, there is a continuous addition of capacity in all sectors of grid mix. To take care of this, the baseline factor has been calculated by using the combined margin method (CMM). The effect of present and future capacity additions (*Ex Post* & *Ex Ante* calculations) is considered for estimation of carbon intensity of the grid for future years (credit period).
- The lower emission factor value of 'combined margin' during the entire crediting period of the project is taken as 'baseline emission factor'.

Since there is a gap in demand and supply scenario in Rajasthan (Ref # 10), the export of power to RRVPNL will get absorbed to partially fulfil the RRVPNL power requirement. If equivalent electricity is generated by coal or gas based power project, it will add to the emissions that is getting reduced by the project activity. Hence, the baseline calculated using above methods/ scenarios would represent the anthropogenic emissions by sources (coal and gas power plants) that would occur in absence of the proposed project activity. Stepwise estimation of emission reductions is as given below:

Step 1	**:**	Net emission factor for coal	=	Actual emission factor for coal x % of generation by coal out of total generation excl. RE projects.
Step 2	**:**	Net emission factor for gas	=	Step 1 is to be repeated for gas
Step 3	**:**	Operating margin factor	=	Net emission factor for coal + Net emission factor for gas
Step 4	**:**	Built margin factor	=	(Avg. actual emission factor for thermal projects x recently build thermal projects + emission factor for hydro x recently build hydro projects) / (total of recent 20% built thermal & hydro projects)
Step 5	**:**	Average of operating and build margin factor	=	(Operating margin factor + Built margin factor) / 2

Step 6	**:**	Conservative Combined Margin Factor	=	Selected lowest value Combined Margin over a Credit Period.
Step 8		Final Baseline emission factor	=	Conservative combined margin factor (CMF)
Step 9		Units exported to RRVPNL	=	Net metered units exported to RRVPNL grid
Step 10	**:**	CO_2 emission of baseline	=	Units exported to RRVPNL grid x Final Baseline emission factor

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:

>>

$$\mathbf{ER = ER_B - NE_P}$$

Where,

ER - CO_2 Emission reduction per annum by project activity (tones/year)

ER_B - Baseline Emission reduction per annum (tones/year)

NEp - Net emission by project activity (tones/year)

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

>>

Year	Net Weighted average emission ($KgCO_2$/ kWh)	Units supplied to RRVPN (kWh)	Baseline emissions	Leakage emissions (tCO_2/ year)	Net CER Reductions (Tonnes CO_2)
2006-2007	0.91	53220000	48430	222	48208
2007-2008	0.91	53220000	48430	222	48208
2008-2009	0.91	53220000	48430	222	48208
2009-2010	0.91	53220000	48430	222	48208
2010-2011	0.91	53220000	48430	222	48208
2011-2012	0.91	53220000	48430	222	48208
2012-2013	0.91	53220000	48430	222	48208
Total		372,540,000	**339,010**	**1554**	**337,456**

SECTION F.: Environmental impacts:

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

>>

The assessment of environmental impact for the project activity has been carried out as required under Environmental (Protection) Act 1986, Government of India, mandatory for expansion or modernization of any activity or for setting up new projects listed in Schedule I of the notification.

Rajasthan State Pollution Control Board (RSPCB) have issued Consent To Establish (CTE) to CPL under the provisions of Water (Prevention and Control of Pollution) Act, 1974 & Air (Prevention and Control of Pollution) Act, 1981, Environment Protection Act, 1986.

The treated effluent shall confirm to the limits of the general standards prescribed under the provisions of EP act 1986 for discharge of effluent into inland surface water. Air emissions shall confirm to Emission Regulations issued by the Central Pollution Control Board (CPCB) and as adopted by the State Pollution Control Board (SPCB). The infrastructure facility for monitoring of stack emissions on each stack and flow measuring devices at each unit of effluent treatment plant shall be provided.

SECTION G. Stakeholders' comments:

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

>>

Identification of Stakeholders

Chambal Power Limited (CPL) has proposed to implement a 7.5 MW non-conventional renewable energy source (i.e. biomass) based power plant at Rangpur village, Kota district. The project proposed to use biomass like mustard and soya husk / residue / stalks, corncobs and other agricultural residues generated in the fields & located within a radius of 50 Km from the project site. The GHG emissions of the combustion process, mainly CO_2 are sequestered by mustard / soya/ corn crop plantation, representing a cyclic process. So the project leads to zero net GHG on-site emissions.

The stakeholders identified for the project are as under.

- ✓ Elected body of representatives administering the local area (village Panchayat)
- ✓ Rajasthan Rajya Vidyut Prasaran Nigam Ltd (RRVPNL)
- ✓ Rajasthan Renewable Energy Corporation Limited (RREC)
- ✓ Rajasthan State Pollution Control Board (RSPCB)
- ✓ Ministry of Environment & Forest (MoEF), Government of India
- ✓ Ministry of Non Conventional Energy Sources (MNES)
- ✓ Non-Governmental Organizations (NGOs)
- ✓ Consultants
- ✓ Equipment Suppliers

Stakeholder list includes the government and non-government parties, which are involved in the project at various stages. CPL has not only communicated with the relevant stakeholders under statutory obligations but also has engaged the other stakeholders in a proactive manner in expressing and accounting their opinions on the project.

G.2. Summary of the comments received:

>>

Stakeholders Involvement

The village Panchayat /local elected body of representatives administering the local area is a true representative of the local population in a democracy like India. Hence, their consent / permission to set up

the project is necessary. CPL has already completed the necessary consultation and documented their approval for the project.

Local population comprises of the local people in and around the project area. The role of the local people is as a beneficiary of the project. They supply of raw material i.e, mustard husk / residue / stalks, corncobs from agricultural fields for the power plant. In addition to this, it also includes local manpower working at the plant site. Since, the project will provide good direct and indirect employment opportunities the local populace is encouraging the project.

The project has not displaced any local population. In addition, the local population is also an indirect consumer of the power that is supplied from the power plant. This is essentially because the power sold to the grid has improved the stability in the local electricity network. Since, the distance between the electrical substation for power evacuation and the plant is not very high, installation of transmission lines did not create any inconvenience to the local population. Thus, the project has not caused any adverse social impacts on local population rather has helped in improving their quality of life.

Rajasthan State Pollution Control Board (RSPCB) has prescribed standards of environmental compliance and monitors the adherence to the standards. The project has already received Consent to Establish from RSPCB to start commissioning of the plant.

Rajasthan Renewable Energy Corporation Limited (RREC) implements policies in respect of non-conventional renewable power projects in the State of Rajasthan and has accorded approval to the project. Further, State's apex body of power have already issued consent for the installation and operation of the biomass based power plant of 7.5 MW capacity.

As a buyer of the power, the RRVPNL will be a major stakeholder in the project. They hold the key of the commercial success of the project. RRVPNL has already cleared the project and CPL has signed the Power Purchase Agreement (PPA) with RRVPN for a period of 20 years.

The tariff will be Rs 3.6824 per kWh in the year 2004-05 and will escalate by 5 % per annum on compounded basis for a period of 8 years thereafter. The tariff beyond this period will be mutually settled between RRVPNL and CPL

The Government of India, through Ministry of Non-conventional energy Sources (MNES), has been promoting energy conservation, demand side management and viable renewable energy projects including wind, small hydro, solar and biomass power generation projects.

Projects consultants are to be involved in the project to take care of the various pre contact and post contract issues / activities like preparation of detailed project report (DPR), preparation of basic and detailed engineering documents, preparation of tender documents, selection of vendors / suppliers, supervision of project operation, implementation, successful commissioning and trial run.

Stakeholder's Comments

CPL has received the necessary approvals and consents from various authorities prior to project implementation. The approvals include those from RSPCB, RRVPNL, Panchayat (Public and local people around Kota).

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

>>

The relevant comments and important clauses mentioned in the project documents / clearances like Detailed Project Report (DPR), environmental clearance, Power Purchase Agreement (PPA), local clearances *etc,* were considered while preparing the CDM Project Design Document.

The CPL representative met with the local NGOs and apprised them about the project and sought their support for the project.

As per UNFCCC requirement the PDD will be published at the validator's web site for public comments

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Chambal Power Limited
Street/P.O.Box:	Village Rangpur
Building:	-
City:	District Kota
State/Region:	Rajasthan
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Country:	India
Telephone:	0744-2438398
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URL:	
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Wagle
Middle Name:	R
First Name:	S
Department:	
Mobile:	
Direct FAX:	
Direct tel:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Till now funding from any annex i party is not available.

- - - - -

Appendix: 1

Gap in energy availability and requirement

52) Thus total firm availability is 22430.24 MUs in 2001-02 against requirement of 26239.99 MUs, worked out by the Commission in para 36 leaving a deficit of 3809.75 MUs, which has to be made good by temporary allocation out of 15% unallocated power of seven power stations of NTPC, by bilateral purchases from PSEB & DVB (night sale of power from Dadri TPS) and interregional purchases. Overdraw of energy is against grid discipline and will attract heavy penalty under Availability Based Tariff to be introduced with effect from 1.6.2001. As such overdraw has to be avoided and instead long / short-term agreements to tide over power shortage need to be entered into well in advance. The Commission has not considered any such availability in absence of agreement. Temporary allocation to Rajasthan from unallocated power has progressively reduced over the years. It is now 20% - 25% of 15% unallocated capacity. Bilateral purchases have been 291MUs in 1999-2000 (191.2 from neighbouring states and 99.8 from western grid). This year up to November it was only 3.6 and 36.9 MUs, which is much less than these purchases during corresponding period last year. In view of these, temporary allocation of 25% out of unallocated power i.e. 1454.90 MUs, 80 MUs as bilateral / interregional purchases and 200 MUs from DVB during night hours (500 MW for 8 hours for 100 days) has been considered. There will still be a gap of 2074.85 MUs (i.e. 7.9% shortage). This shortage can be partially met by availing additional generation, if available, from Central sector power station on account of improved PLF and by extra bilateral / interregional purchases. About 50% of this gap i.e. approximately 1037.42 MU is considered to be covered by such measures and for 50% of gap representing about 3.95% shortage, power cuts and load shedding may have to be resorted to unless availability improves from any source. The Commission directs RVPN and Vitran Nigams to prepare a comprehensive power cut and load shedding scheme so that no sector suffers at the cost of other and all categories of consumers share the shortage.

53 To sum up the following situation emerges in Commission's estimate regarding requirement of power, its availability and gap for the year 2001-2002.

			In MU
1.	Total requirement		26239.99
2.	Firm availability from all sources		22430.24
3.	Gross gap in requirement (1-2)		3809.75
4.	Expected from other sources		
	(i)	Temporary allocation out of unallocated power	1454.90
	(ii)	Bilateral purchases	80.00
	(iii)	Purchase in night from DVB	200.00
		Sub total	1734.90
5.	Reduced gap (3-4)		2074.85
6.	50% of reduced gap expected to be covered by higher availability due to improved PLF, bilateral purchases etc.		1037.42
7.	Net shortage anticipated in availability to RVPN		1037.42
8.	Net shortage anticipated in supply to distribution companies considering losses.		929.41
9.	Net availability for RVPN = (1)-(7)=		25202.56

Reference: [1] http://www.rerc.gov.in/bulksupplypwc.htm; Petition No.RERC/tariff/8/2000 Para –52

Appendix: 2

Report on Environmental Impact

The proposed project is to establish a 7.5 MW power plant using Biomass like mustard husk / residue / stalks, corncobs etc. as fuel.

The environmental impacts can be either categorized as primary or secondary impacts. Primary impacts are those that can be attributed directly to the project itself while secondary impacts are those, which are induced indirectly because of the development activity which may be triggered by the primary impact. The secondary impacts typically include the associated investment and changed patterns of social and economic activity by the project activity

The impact of the project on the environment can occur at two stages:

1. Construction phase
2. Operational phase

Impacts during construction phase

The impacts during construction phase due to the construction of the 7.5 MW Biomass based power plant are listed as given here:

Air quality impacts:

- Due to particulate emissions from site clearing
- Due to vehicular emissions from transportation of raw materials such as cement, sand, gravel etc
- Due to particulate emissions from construction activities such as pre-casting, fabrication, welding etc

Noise level increase:

- From construction activities like rock drilling, blasting, hammering etc.
- From earth moving equipments used for site clearing
- From vehicles used for transportation of raw materials such as cement, sand, gravel etc

Land and soil impacts:

- From change/ replacement of existing land-use by site clearing
- From the sanitary wastes
- From soil erosion due to removal of vegetation

- From solid wastes disposed on land from construction activities

Water environment impacts

- From consumption of water for construction purposes
- From wastewater emerging from the construction activities

Impacts on ecology

- Removal of vegetation at the site

Impacts on socioeconomic environment

- Employment opportunities to local people

The above represents a broad range of environmental impacts during the construction phase of the Power plant.

It should be noted that the impacts due to construction activities are mostly short-term and will cease to exist beyond the construction phase.

Impacts during operational phase

The operational phase involves power generation from biomass. The power plant exports power to the grid and indirectly prevents the pollutants otherwise let out into the atmosphere from the thermal power plants (coal, gas and diesel based) of the State grid.

Since biomass (mustard husk, soya husk, corncobs) being a renewable fuel does not add any net CO2 to the atmosphere, as the carbon gets recycled during the crop growth.

Alternative methods of biomass disposal being currently practiced includes inefficient burning in fields or letting it to decompose, which would lead to more dust and GHG emissions when compared to the present project activity. The impacts during operational phase of the power plant are given below:

Air quality impacts:

The biomass power plant discharges the following pollutants into the air:

- Suspended Particulate Matter (SPM) from fly ash in the flue gas
- Sulphur dioxide (SO_2)
- Carbon dioxide (CO_2)

The ash content in the biomass is less than 7 %. As the pollution control regulations limit the particulate matter emissions from biomass fired steam generators to 150 mg/ Nm^3, electrostatic precipitators (ESP's η = 99%) are used in the power plant to contain the dust emission from the plant to less than 150mg/Nm^3 during biomass firing.

The fly ash collected from the ESP hoppers and air heater hoppers and the ash collected from the furnace bottom hoppers will be provided to cement plants. As there is very low sulphur content (0.6 – 1.0 %) in the biomass, SO_2 emissions are not expected much. Carbon dioxide produced by firing biomass is absorbed by Mustard / Corn plantation and hence recycled.

To reduce to ground level air contaminants, 70 m stack is suggested for biomass-fired boiler. This would help in faster dispersion of air pollutants into the atmosphere thus reducing the impact on the project surroundings.

The biomass is transported from nearby agricultural fields to the project site. However considering 2 truck trips per day for transporting 245 tons/day of biomass from 50 Km distance, the air emissions would be very negligible.

The air quality parameters released i.e. SO_2, NOx, CO and SPM emissions from the stacks attached to the boiler of the Power plant are to be monitored as per the PCB norms.

Noise level increase:

The power plants have most of the fuel and ash handling systems either mechanical or pneumatic. The heavy crushing / impacting or mechanical operations are missing and thus, process noise levels are considerably low. However, the boiler and steam turbine are the equipment causing high noise levels.

The noise pressure levels of boiler are generally felt only inside the boiler house. It is proposed that personnel who have to work in the noise prone areas will be provided with earmuffs. The walls and enclosures for these installations namely boiler, stem turbine will be constructed of heavy block work to reduce traversing of the noise beyond the building. Similarly the air intakes and exhaust systems will be provide with silencers to attenuate the noise transmission to outside.

The vehicular transport of biomass from nearby fields to the power plant includes only 2 truck trips per day and hence the impact is likely to be negligible. The green belt will be provided around the plant area for noise attenuation.

Water quality impacts:

Since, the CPL does not propose to discharge any contaminated water, in the receiving system, hence the impact will be marginal.

CPL also proposes to install effluent treatment plant (ETP) system to treat the discharges from the following sources of wastewater.

- Backwash
    - Softener
    - DM plant
- Cooling tower bleed
- Boiler Blow down

The effluents generated from the project activity will be treated in the effluent treatment plant to ensure that there is no environmental deterioration.

The treated effluent shall be collected in a sump for pumping for sprinkling biomass storage as well as for plantation and green belt development in a properly designed water distribution system.

Ecological impacts:

No ecological impacts are envisaged, as the wastewaters from the power plant will be treated appropriately before final disposal.

Also as trees are proposed to be planted around the power plant, it gives a cool atmosphere in the operational area and provide as a barrier for air emissions and noise level increase.

Land and soil impacts:

The solid wastes generated from the power plant are the dry fly ash and wet bottom ash from grate. This ash will be used in brick manufacturing.

Socio-economic impacts

The power plant will contribute to socio economic growth in the following ways;

- Generation of employment to technical experts in various fields like mechanical, electrical, electronics, instrumentation, chemical engineering etc
- Exporting power to the grid thereby bridging the gap between demand and supply in a power deficit State
- Offering environmentally friendly solution for additional power generation without using fossil fuels
- Reduction in fuel transportation costs
- Reduction in transmission losses
- Self reliance of power in rural areas

Environmental Management Plan (EMP)

The EMP is prepared to basically manage the various impacts arising from construction and operational phases of the biomass power plant.

Construction phase

Air environment

The following mitigative measures were proposed during construction phase

- Spraying of water at regular intervals to control fugitive dust emissions from construction activities
- Air pollution due to plying of vehicles would also be contained and reduced by constructing proper approach roads and planting green belt alongside roads
- Regular and periodic emission check for transportation vehicles
- Use of personal protective equipment (PPE) like goggles and nose masks to reduce impact of dust emissions during construction activities

Noise environment

- Usage of well maintained muffler of approved design and technology in the vehicles.
- Prevent transportation and consequent noise generating activities in the night time
- Periodic noise control checks on transportation vehicles
- Provision of ear plugs, work rotation, adequate training
- Land and soil environment
- CPL shall provide temporary toilets to take care of sanitary wastes.

All the construction debris and waste material shall be collected and stored in earmarked places.

Operational phase

Air environment

- Regular and periodic emission check for transportation vehicles
- Use of personal protective equipment (PPE) like goggles and nose masks to reduce impact of dust emissions
- Periodic monitoring of boiler stack emissions

Noise environment

- Periodic noise control checks on vehicles
- Provision of ear plugs, work rotation, adequate training

- Incorporation of noise control measures at source
- Sound proofing/ glass paneling of critical operating stations
- Regular noise level monitoring at the plant and surrounding area
- Plantation of green belt which acts as a attenuator of noise

Land and soil environment

- Improvement of soil quality and plantation of suitable tolerant species in the study area.

Water environment

- Treatment of power plant effluents in the effluent treatment plant
- Periodic monitoring of water quality parameters

Ecological environment

- Plantation of greenbelt

Post project monitoring

- The effluent characteristics will be being monitored so as to meet the requirements of the RSPCB norms and the minimum national standards (MINAS) for effluent from thermal power plants
- Air quality monitoring will be done so as to meet the requirements of the RSPCB.

The air quality parameters to be monitored from the stack emissions are SPM and SO2

Appendix: 3

References

Sl..No.	Particulars of the references
1	Detailed project report (DPR) of 7.5 MW biomass based power plant of CPL
2	Appendix C to the simplified M&P for the small-scale CDM project activities.
3	UNFCCC, Clean Development Mechanism Simplified Project Design Document For Small Scale Project Activities (SSC-PDD) *[Version 05:25 February, 2005]*
4	Practical Baseline Recommendations for Green House Gas Mitigation Projects in the Electric Power Sector, OECD and IEA Information
5	Web site of the Rajasthan Electricity Regulatory Commission (RREC) http://www.rerc.gov.in http://www.rerc.gov.in/bulksupplypwc.htm; Petition No.RERC/tariff/8/2000.Para –52
6	Web site of the Rajasthan State Energy Department http://www.rajenergy.com/newprojects.htm
8	Website of Infraline Research http://www.infraline.com
9	Website of Rajasthan State Energy Department, Rajasthan Rajya Vidyut Prasaran Nigam Ltd (RRVPNL) http://www.rajenergy.com/ticap_1.htm
10	Website of Central Electricity Authority (CEA), Ministry of Power, Govt. of India - **www.cea.nic.in**
11	Website of United Nations Framework Convention on Climate Change (UNFCCC), **http://unfccc.int**
12	UNFCCC Decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol.

Appendix: 4:
List of Abbreviations

%	Percentage
AAI	Airports Authority of India
BAU	Business-as-usual
BM	Build Margin
CPCB	Central Pollution Control Board
CPL	Chambal Power Limited
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CMM	Combined Margin Method
CO_2	Carbon di-oxide
Crores	Rs 10,000,000
CTE	Consent For Establishment
DCS	Distributed Control System
DM	De Mineralized
DNA	Designated National Authority
DPR	Detailed Project Report
EF	Emission Factor
EPC	Engineering, Procurement & Construction
ER	Emission reduction
ER_B	Baseline emission
ER_P	Emissions from project activity
ESP	Electrostatic Precipitator
ETP	Effluent Treatment Plant
FBC	Fluidized Bed Combustion
GHG	Greenhouse Gas
GoR	Government of Rajasthan
IEA	International Energy Agency
IPCC	Intra-governmental Panel for Climate Change
IPP	Independent Power Plants
km	Kilo meter

kWh	Kilo Watt Hour
Lakhs	Rs 100,000
MCR	Mustard Crop Residues
MINAS	Minimum National Standards
MNES	Ministry of Non-conventional Energy Sources
MoEF	Ministry of Environment and Forests
MT	Metric tons
MTPY	Metric Tons Per Year
MU	Million Units
MW	Mega Watt
NGO	Non Governmental Organization
NTPC	National Thermal Power Corporation
OECD	Organization for Economic Cooperation and Development
OM	Operating Margin
PDD	Project Design Document
PLF	Plant Load Factor
PPA	Power Purchase Agreement
PPE	Personnel Protective Equipment
RRVPNL	Rajasthan Rajya Vidyut Prasaran Nigam Limited
RSEB	Rajasthan State Electricity Board
RSPCB	Rajasthan State Pollution Control Board
RREC	Rajasthan Renewable Energy Corporation
Rs	Indian Rupees
SPCB	State Pollution Control Board
SSC	Small Scale
STG	Steam Turbine Generator
TG	Turbo Generator
TPD	Tons per day
TPH	Tons per hour
TPY	Tons per year
UNFCCC	United Nations Framework Convention on Climate Change