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

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

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10 MW biomass based power project of Ind Power limited.

Version 05

11/10/2007

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

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Purpose

The proposed project activity is the installation of 10 MW biomass based power plant at village Mahapalli, Dist. Raigarh in Chhattisgarh. The project proponent Ind power Limited (IPL) is a private company and having power plant. The purpose of project activity to produce clean power by consuming biomass resource *i.e.* rice husk effectively for generation of electricity. The project proponent would export excess power to Chhattisgarh state electricity board (CSEB).

Project's contribution to sustainable development

The four pillars of sustainable development have been addressed as follows:

1. **Social Well-being:**

The project activity will utilize rice husk for power generation. The project activity would lead to direct as well as indirect employment which would provide boost to local economy. The project would help reduce this demand-supply gap in electricity. The project activity would involve rice husk to be transported from mills to project site, this will provide business opportunities for local transporters.

2. **Environmental Well being :**

The project will lead to reduction of carbon dioxide emissions into the atmosphere which would improve the local environment. The rice husk is an agro-waste and project activity would utilize this waste for generation of power. The project activity would produce clean power from non-conventional energy source, thus reducing the dependence on fossil fuel for power generation.

3. **Economic Well-being**:

As rice husk will be used for power generation; it would provide revenues for the rice husk suppliers and local farmers. The project would provide direct employment opportunity to the local community.

4. **Technological Well Being:**

The project activity will use advanced technology for rice husk based power generation. The project would lead to improvement in technical skills of the employees. The operators would be provided sufficient technical know-how to handle the plant efficiently.

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	Ind Power Limited (IPL) (Private entity)	No

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

The project activity is a 10 MW capacity biomass (rice husk) based renewable energy power plant with high-pressure steam turbine. The plant will operate at an annual average plant load factor of 95% after a 3 year stabilisation period during which the PLF is assumed to be 80% in the first year and 85% in the second and 90% in the third year. Though as per MNES guidelines and Chhattisgarh Pollution Control Board consent, the project can operate with coal as a fuel up to a maximum of 30% on an annual basis, the project will not use coal.

Project Activity with technology details

The proposed power plant is based on Rankine Cycle. The boiler type is dual fuel fired. The major installation would consist 40 tph, 65 kg/cm^2, 485 $\pm$ 5 °C high pressure fluidized bed boiler with 10 MW extraction cum condensing steam turbine generator. The project activity would have auxiliary system such as ash disposal system, demineralisation plant, and cooling water system. The technical parameters of the fluidized bed boiler are given below:

TECHNICAL PARAMETERS OF FLUIDISED BED BOILER

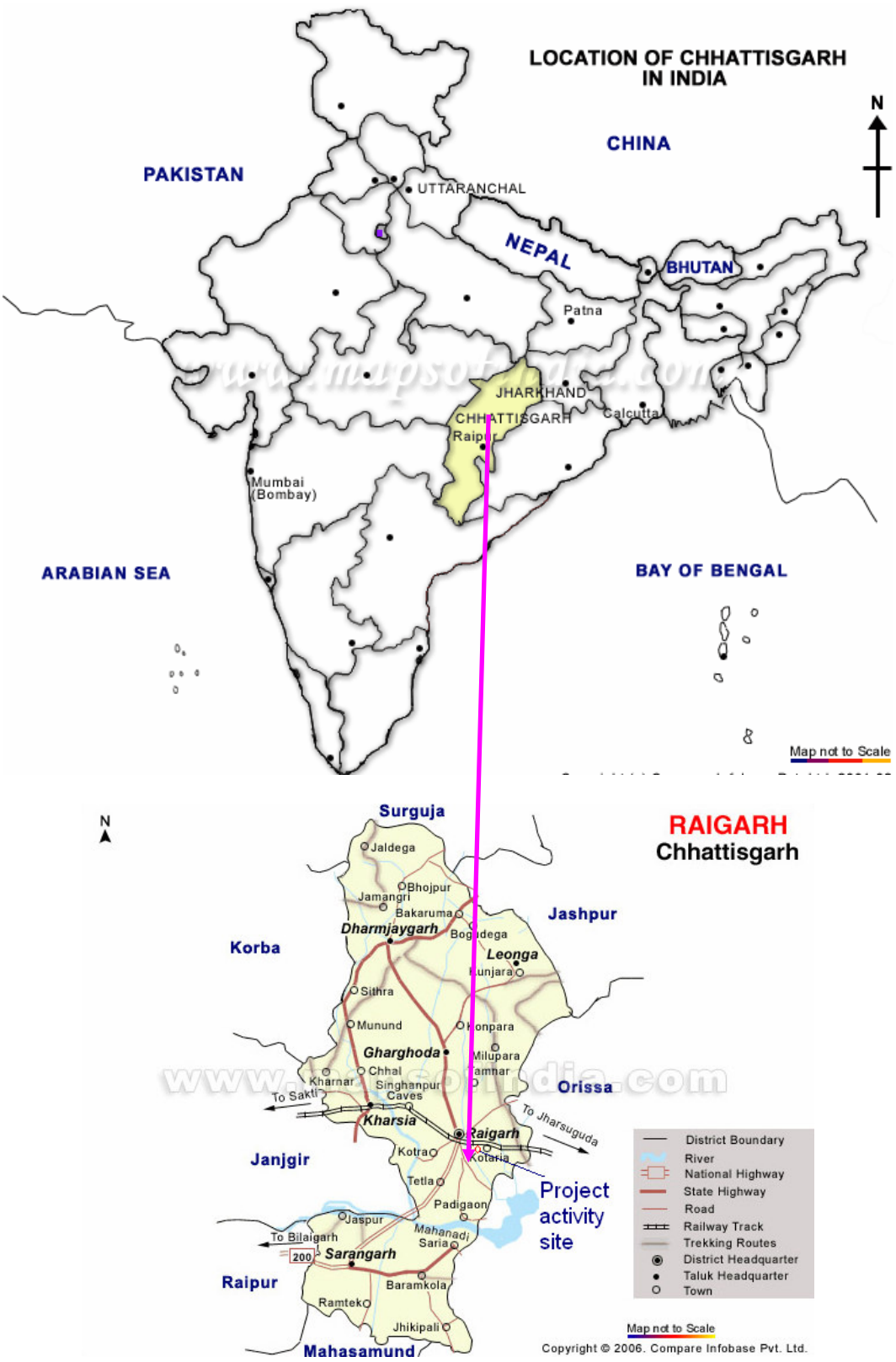
Parameters	Units	Values
Type	-	Single drum water tube boiler
Steam output at maximum continuous rating (MCR)	TPH	40
Steam output, nominal continuous Rating (NCR)	TPH	33
Steam pressure at super heater Outlet	Kg/Cm^2 (abs)	65
Steam temperature at super heater Outlet	°C	485 ± 5
Feed water temperature Economiser	°C	105
Exit temperature of waste gases	°C	150
Boiler Efficiency	%	81±1

Additional environmental and technical information:

1. The emission of Nox is negligible as the temperature in the furnace is lower than 1000 ^{0}C.
2. The sulphur content in biomass is low.
3. The particulate emissions from the plant are controlled by the use of high efficiency (99%) electrostatic precipitators (ESP).
4. There is some contribution to thermal pollution of the atmosphere through the discharge of hot flue gases. The effect at ground level is minimal as the heat is dissipated to the higher levels of the atmosphere through the chimney.
5. Solid wastes include ash generated by the plant. This is drenched with water to avoid dust hazard, and is transported to brick manufacturing units.
6. Liquid wastes from the power plant will result mainly from the boiler blow down and de-mineralised plant. These liquid wastes are used for the greenbelt inside the plant.
7. Noise pollution is relatively low, and wherever the noise level exceeds the acceptable limits such as around the turbine etc, acoustic shields are provided.

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

>> Location of the project activity site is given in the map below:


LOCATION OF CHHATTISGARH IN INDIA
N
CHINA
PAKISTAN
UTTARANCHAL
NEPAL
BHUTAN
Patna
JHARKHAND
CHHATTISGARH
Raipur
Calcutta
Mumbai (Bombay)
ARABIAN SEA
BAY OF BENGAL
Map not to Scale
RAIGARH
Chhattisgarh
Surguja
Jaldega
Bhojpur
Jamangri
Bakaruma
Dharmjaygarh
Jashpur
Korba
Leonga
Kunjara
Sithra
Munund
Gharghoda
Milupara
Chhal
Kharnar
Singhanpur Caves
To Sakti
Orissa
Kharsia
Raigarh
To Jharsuguda
Janjgir
Kotra
Kotaria
Tetla
Padigaon
Project activity site
Jaspur
Mahanadi
To Bilaigarh
200
Sarangarh
Saria
Raipur
Baramkola
Ramteko
Jhikipali
Mahasamund
District Boundary
River
National Highway
State Highway
Road
Railway Track
Trekking Routes
District Headquarter
Taluk Headquarter
Town
Map not to Scale
Copyright © 2006. Compare Infobase Pvt. Ltd.

CDM – Executive Board

Reference: www.mapsofindia.com

Fig 1.1 Location map of project site

A.4.1.1. Host Party(ies):

>> India

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

>> Chhattisgarh

A.4.1.3. City/Town/Community etc:

>> Village Mahapalli, District , Raigarh

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

>> The project is proposed to be located at Mahapalli village area of Raigarh District, Chattisgarh State, India, which is situated at North Eastern part of the state of Chattisgarh. The project site is situated along Mumbai – Nagpur - Howarah electrified main rail route and nearest rail head Kotarlia railway station is approximate 2 kms away from Plant. The nearest airport is located at Raipur, 225 kms from the project area. The geographical location of the plant is 21° 55' 45'' North to 21° 56' 02'' North and 83° 29' 40'' East to 83° 30' 01'' East on the toposheet No. 64 O/5 and 64 O/9.

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

>>

The project meets the applicability criteria of the small-scale CDM project activity category, Type-I: renewable energy projects (D. Grid connected renewable electricity generation) 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 – Grid connected renewable electricity generation -version no 11

As per the provisions of simplified modalities and procedures for small scale CDM project activities (version 11), Type I. D "comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit. If the unit added has both renewable and non-renewable components (*e.g.* a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.

Project activity meets the applicability conditions of the methodology in following manner:

1. The project activity is a biomass (rice husk) based power generation system that displace electricity from an electricity distribution system (western electricity grid) that would have been supplied by at least one fossil fuel fired generating unit.

2. The capacity of power generation is 10 MW which is less than the limit of small scale category i.e. 15 MW.

The baseline and emission reduction calculations from the project would therefore be based on I.D. The monitoring methodology would be based on guidance provided in paragraph 13 of I.D.

Project Activity with technology details

The proposed power plant is based on Rankine Cycle. The boiler type is dual fuel fired. The major installation would consist 40 tph, 65 kg/cm^2, 485 $\pm$ 5 °C high pressure fluidized bed boiler with 10 MW extraction cum condensing steam turbine generator. The project activity would have auxiliary system such as ash disposal system, demineralisation plant, and cooling water system. The technical parameters of the fluidized bed boiler are given below:

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Feed water temperature Economiser	°C	105
Exit temperature of waste gases	°C	150
Boiler Efficiency	%	81±1

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

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Year	Net CER Reductions (Tonnes CO_2)
2007	29679
2008	31531
2009	33387
2010	35243
2011	35243
2012	35243
2013	35243
2014	35243
2015	35243
2016	35243
Total estimated reductions (tonnes of CO_2 e)	**341298**
Total no of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**34129**

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

>>

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 large scale project activity:

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

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, proposed 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 and monitoring methodology

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

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AMS I. D: 'Grid connected renewable electricity generation' - version no 11

Reference:
http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_UYF1PQNDY5FZ4VH4HZ28FYAP13SI9W

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

>>

As per Appendix B of the simplified M&P for small-scale CDM project activities of the UNFCCC CDM website the project falls under Category I.D – Renewable electricity generation for a grid.

Baseline methodology for this category has been detailed in paragraph 9 under Category I.D of this document. 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 as under:

a) A combined margin (CM), consisting of the combination of operating margin (OM) and built margin (BM) are calculated according to the procedures prescribed in the approved methodology ACM0002 (version 06). Simple OM method is used to calculate operating margin.

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 operating margin in the short run and the build margin in the long run, electricity baselines should reflect a combination of these effects. Therefore the most appropriate approach for baseline methodology would be as described in paragraph 9 a under Category I.D of the simplified M&P for small-scale CDM project activities.

A complete analysis of western region electricity grid has been carried out along with the study of various related issues like technology scenario, policy matters, economic conditions, development of renewable energy projects etc. for preparation of baseline scenario and calculation of baseline emission factor of the grid. The detailed analysis has been provided by central electricity authority (CEA)[1] for emission factors. The combined emission factor for western grid (0.812 tCO_2/MWh) has been used in the calculations.

[1] **CENTRAL ELECTRICITY AUTHORITY: CO_2 BASELINE DATABASE,**
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Key information and data used for biomass availability

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

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

These data reveal the following facts:

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

PADDY 2004-05

S. No.	**District**	**Khariff Season**		**Productivity kg/hec.**
		Total Yield		
		Production '000 tons	Cultivation area '000 tons	
1	Raigarh	370.7	212	1749
2	Janjgir Champa	459.67	227	2025
3	Jashpur	260.0	152	1711
4	Korba	180.98	95	1905
	Total	1271.35	686	

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

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

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

Kharif Season:

S. No.	District	Total yield in tones	Area (Hectare)
1	Bargarh	589450	305850
2	Jharsuguda	64140	61310
3	Sambalpur	236100	138830
	Total	889690	505990

The Rice Husk generation from 889690 tonnes of Paddy @22% husk will be 195731.8 tonnes/year only in Kharif. The data for Paddy production in winter and summer crop is not available from official sources. With the above facts, the availability of Rice Husk to more than 515675.8 tonnes/year, while project activity only requires 72040 tonnes/year.

B.3. Description of the project boundary:

>>

Project Boundaries

The project boundary as specified under Category I.D of small-scale CDM project activities in Appendix B of the simplified M&P for the same shall encompass the physical, geographical site of the renewable generation source.

For the project activity the project boundary is from the point of fuel supply to the point of power export to the grid. Thus, boundary covers fuel storage and processing, boiler, steam turbine generator and all other accessory equipments.

Individual power plants supplying to the state grid are considered in the baseline boundary for estimation of baseline emission rate. Since, the project would not have any impact on transmission and distribution losses it is not included in the project boundary. Using part of the available rice husk, being wasted earlier, in the 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.

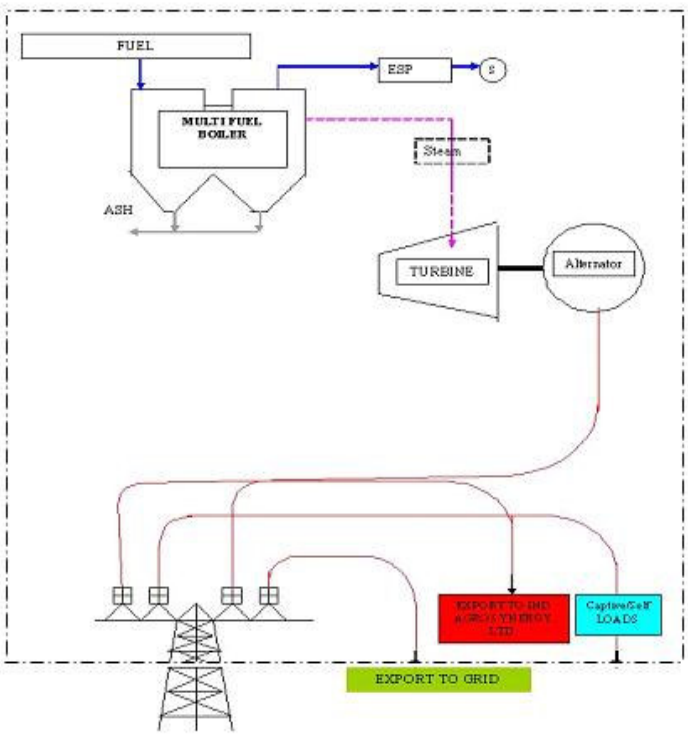


Figure B.1: Project Boundary

B.4. Description of baseline and its development:

>>

The baseline methodology has followed the one specified under Project Category I.D. in Appendix B of the Simplified M&P for small scale CDM project activities. The project activity is having following baseline scenario in absence of project activity:

1. Project activity without CDM revenue: This was one of the baseline options in absence of the project activity. This option was not feasible for the project proponent because this option was not financially viable (Please refer to board note). Therefore this option can not be considered as the baseline option.

2. Coal or other fossil fuel based power generation: The project proponent might have used the coal or any other fossil fuel which is cheaply available near the project activity plant. The option is financially attractive and is the baseline option.

Conservatively the electricity grid which is having lower emission factor is considered for calculation of baseline emissions.

The per kWh emissions from coal based plant is close to 0.9936 kg CO_2 while grid is having 0.6300 kg CO_2; which is very lower and used in the emission reduction calculations.

Central electricity authority has published the data for each regional grid in India. The combined margin electricity emission factor is used for estimation of the CER.
Combined margin factor for western grid = 0.812 ton CO_2/MWh

Date of completing final draft of this baseline section:

10/08/2007

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

That the project activity qualifies to use simplified methodologies has been justified in Section A.4.2 where it has been shown to qualify as a small scale CDM project of Category I.D.

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.

This project activity is a renewable energy project with net zero CO_2 emission from rice husk combustion due to carbon sequestration. Paddy re-grown at the same rate as it is being harvested, acts as a sink for atmospheric carbon dioxide and the net flux of CO_2 to the atmosphere is zero. An analysis of the regional grid generation mix gives the baseline emission factor in kgCO_2/kWh for the credit period, and the CO_2 certified emission reductions [CERs] that the project activity will reduce, by substituting an equivalent grid supply.

Barriers and Additionality

Investment Barrier
According to baseline scenario selection above the coal based power plant is the most lucrative scenario in absence of the project activity. The project proponent has done investment and barrier analysis for additionality justification.

- Investment barriers: The cost of biomass during the preparation of detailed project report (DPR) (Date of DPR Preparation 1 August 2004) was INR 500/ton, which increased to than INR 1550 (current price) /ton. This escalation in the biomass prices was because of increase in demand of this fuel and transportation cost. Also with the successful operation of the project activity the supply of biomass would become an organized business for the suppliers. This increase in cost of biomass would be significantly compensated by the proposed carbon financing and will help to improve the sustainability of the project which will otherwise be rendered financially unstable.

Quantity of Rice husk to be used	72047
DPR Price (INR/ton)	500
Total fuel price as per DPR (INR)	36023500
Current Price (INR)	1550
Total fuel price as per current rate (INR)	111672850
Total price difference between current price and DPR price	**75649350**
CDM contribution @ 10 Euros/CER	16195760

- It is evident from the above table that the project sustainability depends on the price of rice husk. Rice husk handling and pricing is not done in an organised manner, so the prices cannot be ascertained and depends on demand-supply of the rice husk. Project activity is likely to increase the demand; therefore the price uncertainty of rice husk is envisaged. CDM fund will help the project proponent to bridge the gap between estimated price and actual price of rice husk.

- The IRR of the project without CDM revenues is 9.9 % and after considering CDM revenue flow, the IRR works out to be 18.74 %.(IRR sheet is attached in Annex.) The project activity is giving less returns with respect to market interest rates also. The project proponent decided to invest in the biomass based power plant in the anticipation of CDM revenue. The CDM revenue will bridge the difference in the IRR and the prevailing interest rate (11-12%) in the market. With the CDM benefit the project activity is crossing CEA benchmark (14%) as well.

Technological barrier:

a) Clinker Formation: Rice husk has low density. As a result of this the ash generated during rice husk burnings has low density due to which it has a tendency to adhere to the boiler tubes, thereby affecting the heat transfer and reducing thermal efficiency.

b) ESP Blockage: The rice husk ash being low density, gets clogged in the ESP chambers, thereby reducing the efficiency of operation

c) Blocking of Primary Air Lines: During rainy season whenever the rice husk gets wet, it blocks the Primary Air lines at the time of feeding. The blocking of primary air lines blocks the primary air supply to boiler; and call for inefficient combustion. The inefficient combustion increases the fuel intake for same quantity of output from boiler and thereby in affects the operation.

The associated CDM benefits with such a project activity played a key role in motivating the project proponent to invest in spite of the perceived technological risks.

Barriers due to prevailing practice:

Rice husk based power plants are not a prevailing practice in the Chattisgarh scenario. This is the only the third rice husk based power plant in the region. There are huge coal reserves in the vicinity, offering cheap pithead power generation opportunities and there is enough water from the State's largest reservoir of Hasdeo Bango. 84%[2] of India's coal is in Chhattisgarh and two other States. The business as usual (BAU) scenario in Chattisgarh may be considered as thermal power generation using coal as 85-90% of the power generation comes from such sources. In the similar project sector, socio-economic environment, geographic conditions and technological circumstances, the project activity uses a technology, which shows very limited penetration.

Other Barriers:

In addition to all the barriers mentioned above, project proponent would also be facing the following barriers once the project activity is implemented

- Rice husk has low specific gravity which requires proper handling and storage procedures of rice husk at project site. The specific gravity of rice husk being low, it requires a larger stocking area. This has increased the land procurement and site development cost by a significant amount. Compared to project activity a coal based power plant would have been a less technologically advanced alternative with lower risks associated with performance uncertainty, but would have led to higher GHG emissions.

- Since the project activity involves co-firing of rice husk and coal, the handling equipment (like screens, conveyors for stacking etc.) are required more in numbers than that required for a 100% coal based power plant. For the same reason, additional manpower is also required at the project site for handling both rice husk and coal.

It has been clearly established from the above discussion that the project activity faces many barriers in its implementation and successful operation. Some of these barriers have the potential to even disrupt the operation of the rice husk based power plant thereby damaging the commercial viability of the project activity. The management of project proponent considered all risk aspects associated with the implementation of the project activity during the project inception.

During the decision making project proponent has analysed that the biomass based power plant will give less returns with respect to coal based power plant due to less cost of coal; which is available in nearby area. Looking for the CDM revenue for bridging the financial gap and for risk mitigation; project proponent decided to go for biomass based power plant for environmental reasons.

B.6. Emission reductions:

[2] From DPR prepared for the project activity.

B.6.1. Explanation of methodological choices:

>> The project activity has adopted the approved methodology AMS I.D for the emission reduction calculations.

Baseline emissions:

Electricity baseline emission factor of Western Regional Grid (EF_y) is considered for the baseline emission calculations. The combined margin electricity emission factor 0.812 tCO_2/MWh is used for the calculation. The project proponent will use the latest data for electricity emission factor from CEA. The CEA has used ACM0002 ver 06 for the emission factor calculation.

The baseline emission is calculated as: $BE_y = EG_y * EF_y$

where,

BE_y = Baseline Emissions due to displacement of electricity during the year y (in tons of CO_2)

EG_y = Units of electricity exported due to project activity in year y (in MWh)

EF_y = Emission Factor of the grid (in tCO_2/ MWh) and y is any year within the crediting period of the project activity

Project emission:

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

Rice Husk quality procured for generation of electricity may not be consistent and hence it is proposed to use small percentage of fossil fuel like coal to ensure consistent generation of electricity. IPL estimates that

20% fossil fuel is likely to be co-fired.

$PEy = Q_i * NCV_i * EFCO_2$

PE_y = Project Emissions due to use of coal during the year y (in tons of CO_2)

NCV_i = Net calorific value of coal used (in Kcal/Kg) converted to TJ/ton

$EFCO_2$ = Emission factor of the coal used (tCO_2/TJ).

Leakage emissions:

According to para 12 of the AMS I.D version 11 leakage emissions should be considered "If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity".

In the project activity there is no equipment transfer and therefore no leakage emissions are envisaged in the project activity.

Emission reduction

ER = BEy – PEy - Leakage

Where
ER = Emissions reduction (tCO_2/annum)

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

(Copy this table for each data and parameter)

Data / Parameter:	**Emission factor**
Data unit:	tCO_2/TJ
Description:	The emission factor of coal used
Source of data used:	Table 2.2, volume 2, IPCC 2006
Value applied:	96.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from well established IPCC default values. Data archive: Crediting period + 2 Years
Any comment:	No

B.6.3 Ex-ante calculation of emission reductions:

>>

Baseline emissions

The baseline emission is calculated as: $BE_y = EG_y * EF_y$
EG_y = 63360 MWh
EF_y = 0.812 tCO_2/MWh
BEy = 51436 tCO_2

Project emissions

$PEy = Q_i * NCV_i * EFCO_2$
Q_i = 11284 ton
NCV_i = 4800 Kcal/kg
= 0.020064 TJ/ton
$EFCO_2$ = 96.1 tCO_2/TJ
PEy = 21757 tCO_2

Leakage:

No leakage emissions.

Emission reduction

ER = BEy – PEy – Leakage

= 51436 – 21757 – 0

= 29679 tCO_2

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

>>

GHG emission reduction calculation						
Credit Period	**Power exported to the CSEB in MWh**	**Western Region Emission Factor (tCO_2/MWh)**	**Baseline emissions (tCO_2)**	**project emission (tones/year)**	**Leakage emissions from project (tCO_2)**	**GHG Emission Reduction due to project (tCO_2)**
2007	63360.00	0.812	51436	21757	0	29679
2008	67320.00	0.812	54650	23119	0	31531
2009	71280.00	0.812	57865	24478	0	33387
2010	75240.00	0.812	61080	25837	0	35243
2011	75240.00	0.812	61080	25837	0	35243
2012	75240.00	0.812	61080	25837	0	35243
2013	75240.00	0.812	61080	25837	0	35243
2014	75240.00	0.812	61080	25837	0	35243
2015	75240.00	0.812	61080	25837	0	35243
2016	75240.00	0.812	61080	25837	0	35243
Total	**728640.00**		**591511**	**250213**	**0**	**341298**

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

According to monitoring methodology of AMS I.D

13. Monitoring shall consist of metering the electricity generated by the renewable technology.
14. For projects where only biomass or biomass and fossil fuel are used the amount of biomass and fossil fuel input shall be monitored.

The project proponent is monitoring all the relevant parameters referred in the methodology those are required for the project activity. The main parameters are the quantity of net electricity generated, quantity of fossil fuel and biomass used in the plants etc.

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	Calorific value of coal
Data unit:	Kcal/kg
Description:	Calorific value of the coal used in the plant
Source of data to be used:	1. Third party laboratory 2. Latest version of IPCC
Value of data	4800
Description of measurement methods and procedures to be applied:	The calorific value will be taken from any third party or coal supplier. In case of unavailability of these data sources values from IPCC will be used in the calculation. Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	The data will be taken from third party or any other authorized source.
Any comment:	The Kcal/kg will be converted to TJ/ton.

Data / Parameter:	Quantity of Coal consumed
Data unit:	Ton
Description:	The quantity of coal consumed will be monitored during the crediting period.
Source of data to be used:	The data will be used from the plant.
Value of data	11284
Description of measurement methods and procedures to be applied:	The data will be taken from the weigh bridge records at the entrance gate. Equipment used: Weigh bridge Calibration frequency: Once in a year Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	ISO quality system will be used.
Any comment:	No

Data / Parameter:	Total electricity generated
Data unit:	kWh
Description:	The quantity of total electricity generated in power plant
Source of data to be used:	Electricity generation meter
Value of data	Not used in calculation
Description of measurement methods and procedures to be applied:	The data will be monitored from plant generation meter. Equipment used: Electronic energy meter, 0.5 S Calibration frequency: Once in a year Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	ISO quality system will be used.
Any comment:	The value is used to crosscheck the net export from net export meter. The calculated net generation (Total generation – internal consumption) and the electricity exported with be compared and the conservative value will be used for emission reduction calculation.

Data / Parameter:	Power consumed in the plant

Data unit:	kWh
Description:	The quantity of electricity used in the plant
Source of data to be used:	Plant auxiliary meter
Value of data	Not used in calculation
Description of measurement methods and procedures to be applied:	The data will be monitored from auxiliary meter. In case of more than one meter the final value will be addition of all auxiliary meters. Equipment used: Electronic energy meter, 0.5 S Calibration frequency: Once in a year Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	ISO quality system will be used.
Any comment:	The value is used to crosscheck the net export from net export meter. The calculated net generation (Total generation – internal consumption) and the electricity exported with be compared and the conservative value will be used for emission reduction calculation.

Data / Parameter:	**Quantity of Net electricity exported**
Data unit:	kWh
Description:	The quantity of net electricity is exported from plant
Source of data to be used:	Plant export meter
Value of data	63360000
Description of measurement methods and procedures to be applied:	The data will be monitored from export meter. Equipment used: Electronic energy meter, 0.5 S Calibration frequency: Once in a year Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	ISO quality system will be used.
Any comment:	No

Data / Parameter:	**Electricity emission factor**
Data unit:	tCO_2/MWh
Description:	The electrical grid emission factor
Source of data to be used:	Central electricity authority (CEA)
Value of data	0.812
Description of measurement methods and procedures to be applied:	The data will be taken from the government data source. Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	The data is taken from government source.
Any comment:	No

Data / Parameter:	**Quantity of biomass consumed**
Data unit:	Tons

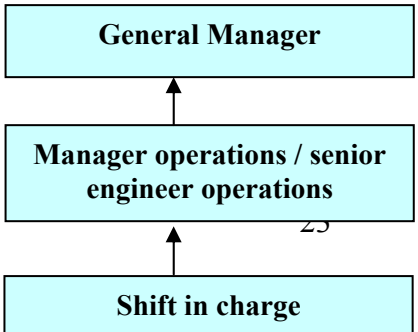
Description:	The quantity of biomass consumed in the plant
Source of data to be used:	Plant
Value of data	72040
Description of measurement methods and procedures to be applied:	The data will be taken from the weigh bridge records at the entrance gate. Equipment used: Weigh bridge Calibration frequency: Once in a year Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	ISO quality system will be used.
Any comment:	No

Data / Parameter:	**Calorific value of biomass (rice husk)**
Data unit:	Kcal/kg
Description:	Calorific value of the biomass (rice husk) used in the plant
Source of data to be used:	1. Third party laboratory 2. Latest version of IPCC
Value of data	Not used in calculation
Description of measurement methods and procedures to be applied:	The calorific value will be taken from any third party or supplier. In case of unavailability of these data sources values from IPCC will be used in the calculation. Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	The data will be taken from third party or any other authorized source.
Any comment:	The Kcal/kg will be converted to TJ/ton.

Data / Parameter:	**Biomass availability**
Data unit:	Tons
Description:	The quantity of rice husk available in the region
Source of data to be used:	Authentic government sources
Value of data	
Description of measurement methods and procedures to be applied:	The data will be taken from the government data source. Data archive: Crediting period + 2 years
QA/QC procedures to be applied:	The data is taken from government source.
Any comment:	No

B.7.2 Description of the monitoring plan:

>> Although most of the parameters are monitored for the financial reports of the project proponent, like total power generated, and Power exported to the grid etc. For the adequate monitoring of the emission reduction project proponent proposes the following structure of monitoring and reporting.



Roles and responsibility:

1**. General Manager:** General Manger will have the following responsibilities

- Decision on the contents of the training program
- Ensuring implementation of monitoring procedures
- Internal audit and project conformance reviews

2. **Manager (Operations):** Manager will have the following responsibilities

- Organizing and conduct training programs,
- Implementing all monitoring control procedures
- Associating with the Manager (QA) towards maintenance and calibration of monitoring equipments
- Has the overall responsibility for record handling and maintenance.
- Reviewing of records and dealing with monitored data
- Organizing internal audit for checking the data recorded
- Has the overall responsibility for closing project non-conformances and implementing corrective actions before the verification

3. **Shift in change:** This officer will have the following responsibilities:

- Supervising and training the operators and maintaining training records.
- Has the overall responsibility of monitoring measurements and reporting
- Will assist the Manager (Operations) in record handling, records checks and review and during internal audit
- Check the data recorded by the operator in the individual sections as described.

4. Operator: The responsibility of operator to record appropriate data of the project activity represented in the monitoring tables. Based on the monitoring frequency, the operator will measure and record the data in the logbook as per the instructions of his officer/ supervisor.
The operational procedures for training, emergency preparedness, maintenance and calibration of monitoring equipments, monitoring measurements and reporting, record handling and maintenance, reviewing monitored data, internal audit, project performance reviews and corrective actions are available at the plant.

Internal audit procedure

A special internal audit team (2-3 members) will be appointed by the General Manager to independently conduct internal audit of monitored data. The internal audit will be conducted once in 6 months. The audit timing will be at least 2 months prior to actual verification by external verifiers. The internal audit team will review all the records, check monitoring equipments for accuracy and whether calibration was performed. The Manager - operation in association with the Shift – in – charge shall answer all the queries raised by the internal audit team. The internal audit team will produce an audit report providing details of concerns that need to be attended to immediately before actual verification by the external verifier. Internal auditor will produce a report within 3 working days indicating non-conformances.

Emergency Preparedness Plan
The total power generating system of power plant will be equipped with an "Automatic Alarming System" which helps the operators to take necessary preventive actions before any kind of non-functioning of the power plant results.
IPL shall have standard procedures for tackling emergencies arising from
• Blackout
• Operational problems related with boiler
• Operational problems related with turbine

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of completing final draft of this baseline section:

10/08/2007

Name and person/entity determining the baseline:

Ind Power Ltd and their CDM consultants
The details are provided in annex 1

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>> 07/09/2004 (Board approval date)

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

>> 20 years 0 month

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

C.2.1. Renewable crediting period

Not Applicable

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

>> Not Applicable

C.2.1.2. Length of the first crediting period:

>> Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>> The crediting period will start after the date of registration of the project activity. For calculation purposes 01/10/2007 is considered as starting date of crediting period.

C.2.2.2. Length:

>> 10 years 0 months

SECTION D. Environmental impacts

>>

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

>>

The project been a renewable energy biomass based power project it does not fall under the purview of the Environmental Impact Assessment (EIA) notification of Ministry of Environment and Forest (MoEF). However, the assessment of environmental impact for the project activity has been carried out by project proponent.

Chhattisgarh Environment Conservation Board (CECB) has issued Consent To Establish (CTE) to project proponent 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 Environment Conservation Board (SECB).

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

1. Construction phase
2. Operational phase

Table D .1: Environmental Impacts due to Project Activity during Construction Phase

SL. NO.	ENVIRONMENTAL IMPACTS & BENEFITS	MITGATION MEASURES
A	CATEGORY– AIR ENVIRONMENT	
1.	The dust levels increases resulting into higher particulate concentration in the air atmosphere.	Proper mitigation measures like sprinkling of water have to be taken to keep the dust levels below acceptable limits. There has to be regular check of important air quality parameter and make sure that limits are not exceeded.
B	CATEGORY– WATER ENVIRONMENT	
1.	There will be consumption of water during construction activity. Domestic wastewater will also be generated because of sanitation.	The domestic sewage has to be appropriately treated.

	Wastewater generation due to construction activities.	The wastewater has to be sent to the treatment system. It has to be disposed off in appropriate manner.
C	CATEGORY-NOISE ENVIRONMENT	
1.	Construction activities involve excavation, digging, hammering etc which leads to increase in noise levels. There will be rise in movement of vehicles in the plant area during the construction phase that could lead to rise in noise levels in the vicinity.	The construction activity has to be scheduled such that most of the work gets completed during the daytime. The contractor has to make sure that construction does not take place during night time.
D	CATEGORY-LAND ENVIRONMENT	
1.	There will be lot of solid waste generation during construction phase. Improper disposal of waste on land environment will lead to changes in land environment. It could lead to changes in soil quality.	Proper measures are to be taken in disposal of solid waste on land.
E	CATEGORY-ECOLOGICAL ENVIRONMENT	
1.	No impact are envisaged during construction activity	-
F	CATEGORY-SOCIO-ECONOMIC ENVIRONMENT	
1.	Employment opportunity will be generated during the construction phase.	-

Table D.2: Environmental Impacts due to Project Activity during Operation Phase

SL. NO.	ENVIRONMENTAL IMPACTS & BENEFITS	MITGATION MEASURES
A	CATEGORY– AIR ENVIRONMENT	
1.	The emissions into air environment include SPM, SO_2, and NOx. The air emissions should not exceed the standard limits prescribed by the Pollution Control Board.	The stack height should be sufficiently high to enable proper dispersion of pollutant released in the atmosphere. The air quality parameters have to be monitored regularly and it has to be made sure that the ground level concentrations are below the standard limits. Appropriate air quality pollution control instruments have to be installed to limit the emissions.
B	CATEGORY– WATER ENVIRONMENT	

1.	The water requirement is only for indirect purposes like cooling and hence the pollution load in the wastewater is relatively less. Water percolation to ground should be avoided.	The wastewater generated should be treated in the treatment system. It should be made sure that only treated water is disposed to surface and ground water.
C	CATEGORY-NOISE ENVIRONMENT	
1.	During operation phase noise levels are expected from turbines, material handling, and boiler operations. The impact on ambient noise due to the project will be marginal at the plant boundary and remain within the stipulate criteria of noise standard prescribed.	It is proposed that personnel who have to work in the noise prone areas will be provided with earmuffs. The noise levels could be controlled by providing proper acoustic enclosures.
D	CATEGORY-LAND ENVIRONMENT	
1.	There will be ash generation due to the project activity. If this ash is disposed off on open land, it will have impact on the land environment.	As far as possible, Ash should be supplied to nearby brick manufactures, or in road preparation etc. coal ash, rice husk ash……
E	CATEGORY-ECOLOGICAL ENVIRONMENT	
1.	No impact are envisaged during construction activity	-
F	CATEGORY-SOCIO-ECONOMIC ENVIRONMENT	
1.	Employment opportunity will be generated during the construction phase.	-
2.	Operation of biomass-based plant will lead to cleaner environment conditions.	

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

>> The environment impacts from the project activity are positive. All the environmental impact is considered and discussed in the section above.

SECTION E. Stakeholders' comments

>>

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

>>

Identification of Stakeholders

Project proponent has proposed to implement a 10 MW rice husk based power plant at Mahapalli village, Raigarh district. The project proposed to use biomass *i. e.* rice husk generated in the fields & located within a radius of 30 Km from the project site. The GHG emissions of the combustion process, mainly CO_2 are sequestered by paddy 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) letter
- ✓ Chhatisgarh State Electricity Board (CSEB)
- ✓ Chhatisgarh Environment Conservation Board (CECB)
- ✓ Ministry of Environment & Forest (MoEF), Government of India
- ✓ Ministry of Non Conventional Energy Sources (MNES)
- ✓ Equipment Suppliers
- ✓ Biomass suppliers and farmers
- ✓ Contractors
- ✓ Ind Synergy Ltd., Village Kotmar, Raigarh

Stakeholder list includes the government and non-government parties, which are involved in the project at various stages. Project proponent 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.

The project proponent invited the comments from various stakeholders by sending then the letters with the explanation of project activity. The copies of the letters have been submitted to validators.

Stakeholders Involvement

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

Project proponent has obtained consent from the biomass collectors, suppliers and farmers and 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 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.

Chhatisgarh Environment Conservation Board (CECB) has prescribed standards of environmental compliance and monitors the adherence to the standards. The project has already received Consent to Establish from CECB to start commissioning of the plant. Chattisgarh State Electricity Board (CSEB) is also a stakeholder in the project.

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 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.

E.2. Summary of the comments received:

>>

Stakeholder's Comments

Project proponent has received the necessary approvals and consents from various authorities prior to project implementation. The approvals include those from CECB, CSEB, Panchayat (Public and local people around Raigarh).

The relevant comments and important clauses mentioned in the project documents / clearances like DPR, environmental clearance, local clearances *etc,* were considered while preparing the CDM Project Design Document.

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

Comments were sort from the Local Regulatory Authority, Local People, Senior Citizens, Contractor, etc. Project proponent received comments from the Regional Officer, (Chhatisgarh Environment Conservation Board, Raigarh), President (Batmul Ashram Shikshan Samiti Mahapalli), Senior Citizen (Village - Ghadumariya), Sarpanch (Village - Loing), Former Sarpanch (Village -Siyarpali), SKA Contractor (A-5 Class Govt. Contractor - PWD, PMGSY, WR) Chandani Chowk, Raigarh.and Executive Director (Ind Synergy Ltd., Village Kotmar, Raigarh) The brief on the comments have been described as follows:

1. Project proponent's initiative of utilizing rice husk for power generation was welcomed
2. The implementation of project will lead to reduction in consumption of coal which is fossil fuel
3. Reduction in emission of atmospheric emissions.

4. It will lead to less mining of coal. Coal mining leads to destruction of biodiversity and top soil. So the project will have positive impact on environment and thus achieve sustainable development in the area.
5. The project will set a example for other industries in and around the region to go for better technologies which will result in less pollution
6. The project will improve local economy, provide contract work & employment opportunities to the local people. It will help in reduction of local labour migration.
7. It will also help in reduction in noxious & green house gases emission.
8. Stakeholders requested to plant as many trees as possible.
9. Stakeholders are also requested to collection Bhadra (seedless rice) at local level and use as fuel for power generation.

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

>>

The comments on the collection of Bhadra (seedless rice) are considered by IPL and they have agreed to purchase that rice and use it in the plant.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Ind Power Limited
Street/P.O.Box:	10, Daga Layout, North Ambazari Road
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URL:	www.indsynergy.com
Represented by:	
Title:	Export Import Executive
Salutation:	Mr
Last Name:	Sharma
Middle Name:	R
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Direct tel:	022 – 26613245
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding available to the project activity.

Annex 3

BASELINE INFORMATION

The baseline is considered from the central electricity authority (CEA) and data for the same is attached in calculation excel sheet (enclosure 1).

Annex 4

MONITORING INFORMATION

Sr. no.	Data description	Procedure for monitoring the parameter	Traceability of calibration method/ standard	Location of instrument	Calibration Method	Least Count	Uncertainty
1	Calorific value of coal	This will be monitored from third party as per IS procedure	Not required as monitored from third party	In third party premises	As per IS method	-	Low
2	Quantity of coal consumed	Measured by Weigh Feeder.	Weight and measure department	At plant gate	Standard test and weight measurement calibration system.	+/-2 %	Low
3	Quantity of electricity exported	Electronic meter	By standard meter test meter (Calibrated by third party)	Plant site	As per standard procedure	+/- 0.5%	Low
4	Total electricity generated	Electronic meter	By standard meter test meter (Calibrated by third party)	Plant site	As per standard procedure	+/- 0.5%	Low

Sr. no.	Data description	Procedure for monitoring the parameter	Traceability of calibration method/ standard	Location of instrument	Calibration Method	Least Count	Uncertainty
5	Power consumed in the plant	Electronic meter	By standard meter test meter (Calibrated by third party)	Plant site	As per standard procedure	+/- 0.5%	Low
6	Calorific value of biomass (rice husk)	This will be monitored from third party as per IS procedure Or IPCC latest data	Not required as monitored from third party	In third party premises	As per IS method	-	Low
7	Electricity emission factor	As per the CEA data	Data taken from standard government data sources.	Data from CEA	Not required	Not required	Low
8	Quantity of biomass consumed	Measured by Weigh Feeder.	Weight and measure department	At plant gate	Standard test and weight measurement calibration system.	+/-2 %	Low
9	Biomass availability	Third party published report	Not applicable	Not applicable	Not applicable	Not applicable	Low

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