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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Electricity generation from mustard crop residues: Tonk, India
Fifth version, dated 2nd October 2008

Previous versions:
Fourth version, dated 11th March 2008
Third version, dated 19th October 2007
Second version, dated 7th June 2007
First version, dated 30th April 2005

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

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Summary
The following proposed CDM project activity is located in the State of Rajasthan, India. The project involves the implementation of a biomass-based power generation plant using direct combustion boiler technology by Kalpataru Power Transmission Ltd. (KPTL), a leading firm in the implementation of power transmission and distribution systems. The installed capacity of the plant is 8 MW_{el}. The fuel used is primarily mustard crop residue, which is abundantly available in the vicinity of the site. The electricity generated will be sold primarily to the state grid. The total amount of CERs to be delivered for the first crediting period is expected to be **206,710 tCO2eq**.

In 2000, KPTL decided to gradually diversify its business activities by including power generation. Small-scale biomass energy projects were targeted by the Board of Directors of KPTL as a first step into that direction, through the assistance of CDM revenue on projects that might otherwise be too unattractive. The 7.8 MW project in Ganganagar was the first of these projects and is currently registered within the UNFCCC[1]. Based on this first successful experience a final investment decision on the Tonk project was taken in March 2005. Its construction began in June 2005 and its operation commenced in November 2006.

The Tonk biomass-based power generation project (from now on "the Tonk Project") is in line with the policies of the Ministry of Non Conventional Energy Sources (MNES) and the Government of Rajasthan (GoR). The project has contributed to achieve the 11th Plan target of 10,000 MW of renewable energy set by MNES. The purpose of the project is also to contribute to an economically, environmentally and socially sustainable development in the region through the commercial operation of a power plant and thereby creating sustainable stakeholder value. According to guidelines from the Designated National Authority in India, the following sustainable development aspects should be considered when designing a CDM project activity[2]:

- Social well being
- Economic well being

[1] Project registration number: 0058

[2] Sustainable development indicators required for Indian projects: http://cdmindia.nic.in/host_approval_criteria.htm

- Environmental well being
- Technological well being

The project contributes to these sustainable development aspects as follows:

Social well being

Rajasthan is included in the BIMARU[3] states, a group of states considered laggards regarding development. The project is situated far from an urban centre, thus creating rural employment. It is estimated that the project creates a potential of approximately 150,000 man-days of work per year. The creation of employment opportunities in rural areas has long been recognised as a major driver of sustainable development. Large-scale migration from rural to urban areas is the cornerstone of most of the Government of India's (GOI) rural development programmes and sustainable development criteria. To this extent, the project directly addresses a core national concern. Besides creating income for farmers through the purchase of fuels, the supplier is engaged in capacity building among local farmers.

Economic well being

Rajasthan had a peak deficit of 7.8% during 2004-2005, according to the Ministry of Power[4]. The Tonk project contributes, though in a small measure, to bridge the gap between the supply and demand of power in the state.

The project is located in a rural location, which reduces the transmission and distribution (T&D) losses to some extent.

Contrary to certain fossil fuel-fired plants, the proposed project has not incurred in an outflow of foreign exchange capital, since most capital equipment is locally produced and the biomass waste does not have to be imported. The fuel, purchased locally, brings additional revenue to farmers where otherwise the mustard crop residue would have been predominantly left with no commercial value. Also, because of this new power capacity installed, the project has increased the employment in the rural area.

Environmental well being

The generated electricity replaces a mixture of coal and gas-based power generation which have more local contaminants and greenhouse gases.

Mustard crop residues are the main source of biomass fuels considered for this project activity. This residue is usually left in the fields for its burn under uncontrolled conditions. This directly affects local air quality.

Technological well being

Building on the expertise gained in Kalpataru's biomass facility in Ganganagar, the project activity continues to develop the use of mustard crop residue as an innovative source of fuel. The technical knowledge acquired on boiler's performance and chemical reactions from mustard husk's combustion, will facilitate the establishment of mustard husk biomass facilities elsewhere in India.

A.3. Project participants:

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[3] Demographic term created by Ashish Bose. See: www.isical.ac.in/~wemp/Papers/PaperAshishBose.doc

[4] http://powermin.nic.in/indian_electricity_scenario/pdf/NR0305.pdf / See slide 55

Table 1: Project Participants

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)
Government of India (host)	Kalpataru Power Transmission Limited (KPTL): project owner	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

Kalpataru Power Transmission Limited (KPTL) – India

Role in the project
Developer of and investor in the biomass power projects and supplier of the carbon credits.

Short company description
Kalpataru Power Transmission Limited (KPTL) is a leading EPC Contractor for Power Transmission Lines (132 KV to 800 KV) for Power Utilities both in India and overseas. KPTL is a publicly listed company operating in various fields of Infrastructure and Contracting with an expected gross revenue of Rs 15 Billion (USD 375 Million) in 2006-07 and a net worth of approx Rs 6 billion (USD 150 Million) for 2006-2007. KPTL has a world-class facility for designing, fabricating, galvanizing and testing of tower structures. It also has a full-fledged construction team for civil works, erection and stringing of power transmission lines. A controlling stake in a civil contracting company called JMC Projects (India) Ltd. was also secured.

KPTL is a part of the diversified Kalpataru Group, with promoters now holding 64% of the equity. Being listed on the stock exchange, its shares are also held by over 5,000 shareholders. It has implemented the Code of Corporate Governance, including appointment of independent directors and mandatory disclosure and transparency requirements.

Contact information of this organization is included in Annex 1.

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

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

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A.4.1.1. Host Party(ies):

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India

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

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Rajasthan

A.4.1.3. City/Town/Community etc:

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Khatoli village. Approximately 5 kilometres from Uniara Town, Tonk District

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

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Address of the project: *Khasara (street) N° 34, 873/35, 874/35, 44 to 47, Village Khatoli, Tehsil Uniara*. The coordinates of the Khatoli Village have been used to represent the geographical location of the project activity. These coordinates are:

Latitude: 25°52'0"N

Longitude: 76° 3'60"E

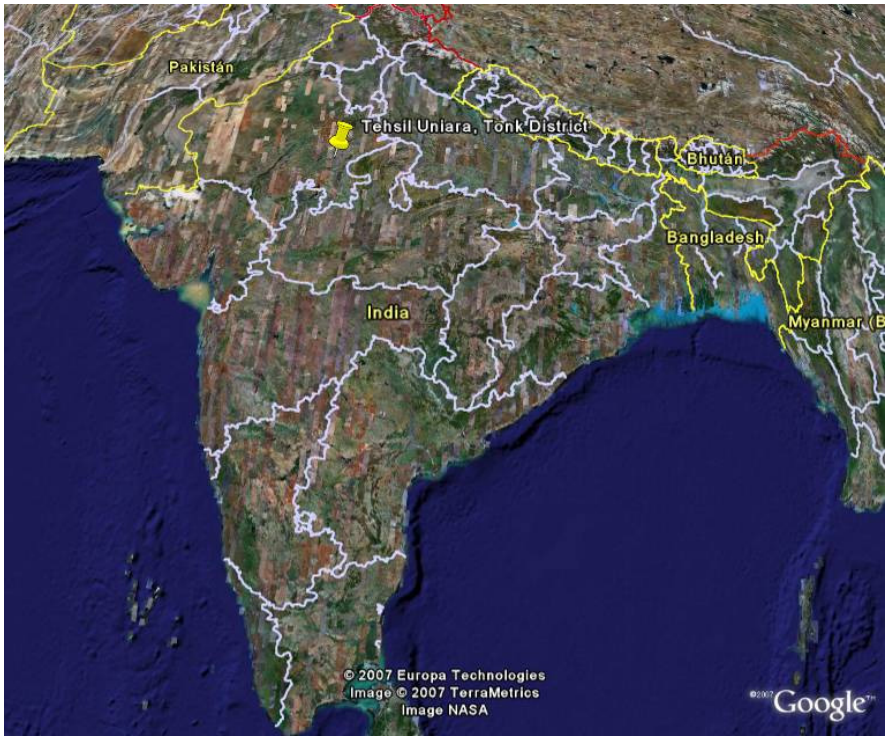

Figure A.1: Tehsil Uniara inTonk district, Rajasthan

Figure A.2: Location of the project activity

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

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The project falls under the Appendix B of the simplified modalities and procedures for small scale CDM project activities.

Project Category: **Renewable Energy Project**
Sub category: **Renewable electricity generation for a grid**

Technology of project activity

The project involves the implementation of a biomass-based power generation plant with an installed capacity of 8 MW using direct combustion boiler technology. The project is a case of utilizing an existing technology of combusting biomass fuels in a medium-pressure steam boiler (modified Rankine cycle with regenerative feed water heating and water-cooled condensation).

The power plant is designed to operate with multiple agricultural biomass residues. The most important part of the feedstock comprises mustard crop residue, together with a small amount of juli-flora residues (complete name Prosopis Juli Flora) only in case of shortages. A small quantity of wood chips is also consumed as a start-up auxiliary fuel. The Tonk project consumes less than 33% of the total agricultural residues available in the region, leaving enough for household fuel consumption and other uses. Nevertheless, the availability of surplus biomass fuel in the region will be included as a relevant variable of the monitoring plan.

The technology of biomass based medium steam pressure power generation itself is known and in use in India. However, the use of mustard crop residue as a fuel for power generation is still a pioneering effort

by KPTL. The previous CDM project activity in Ganganagar represented the first time mustard crop residue was used for the generation of electricity on a commercial scale.

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

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The table below summarizes the results of the ex-ante estimation of emission reductions for all years of the first crediting period.

Table 2: Summary of the ex-ante estimation of emission reductions for the first crediting period.

Years	Estimation of annual emission reductions in tones of CO_2e
2008/2009	31,614
2009/2010	24,319
2010/2011	31,614
2011/2012	31,614
2012/2013	31,614
2013/2014	24,319
2014/2015	31,614
Total emission reductions (tonnes of CO_2 e)	**206,710**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period (tCO_2 e)	**29,530**

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

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No public funding is involved in the financing of this project. Equity for the project is supplied by KPTL, debt is supplied by a private Indian bank. Evidence to justify this is included in Annex 2.

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

As highlighted in Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, 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;
- 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.

Although Ganganagar CDM project is also owned by KTPL, uses the same technology and is registered within the previous 2 years, the Tonk project cannot be considered a debundled component of a large project as the Ganganagar plant is over 500 kilometres away (closest point to point) from this project activity's proposed site in Tonk (see the figure).

Figure A.3: Map showing distance between Ganganagar and the Tonk biomass facilities

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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Project Category: **Renewable Energy Project**

Name of approved baseline and monitoring methodology: **AMS-I.D. version 11 'Grid connected renewable electricity generation'**

Reference: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories (UNFCCC, 2007)

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

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According to AMS-I.D ver. 11 category 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".

The Tonk biomass-based power generation project supplies electricity to a grid that is primarily based on coal power plants. Planned capacity additions will come predominantly from fossil fuel based generating facilities. Category I.D is thus applicable to the Tonk project.

Justification of simplified methodologies
The installed capacity of the biomass plant is 8 MW; this is less than the eligibility limit of 15 MW, justifying it to be a small-scale project activity

B.3. Description of the project boundary:

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Figure B.1 shows the flow chart of the project and its boundaries. The project boundary encompasses the physical, geographical site of the biomass plant including auxiliary electricity use of the plant and the storage of biomass. Auxiliary consumption refers to the small portion of the generated electricity that is consumed to operate the power plant.

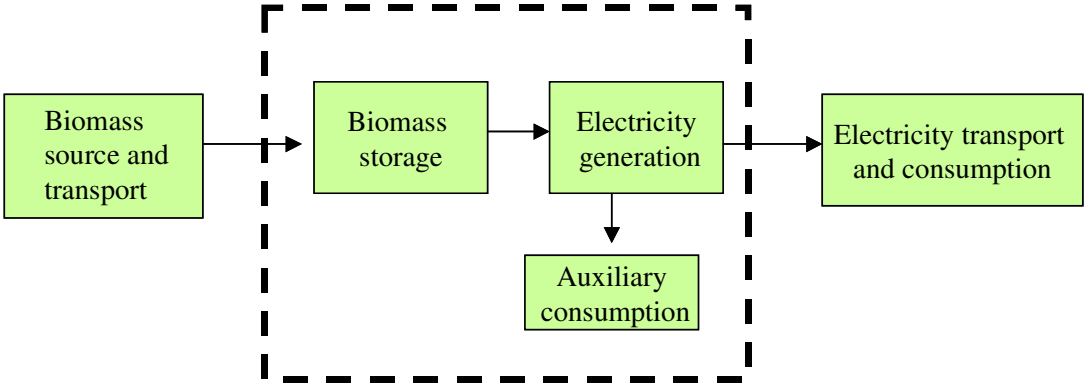

Figure B.1: Flow chart and project boundary

The boundary for determining the baseline emission factor is the grid supplying electricity to the Northern Region of India as defined by Central Electricity Authority (CEA).

The project does not involve the addition of new capacity to an existing facility, nor the replacement or modification of an existing facility.

The energy generating equipment has not been transferred from another activity, so potential leakage due to this source will not be considered.

B.4. Description of baseline and its development:

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In order to identify realistic and feasible baseline alternatives, the following questions should be answered:

1. How **power** would be generated in the absence of the CDM project activity (the scenario that could produce an equivalent amount of electricity as the project);
2. What would happen to the **biomass** residues in the absence of the project activity;

Baseline for power generation.

In order to answer the first question on how power would be generated in the absence of the CDM project activity, the following alternatives scenarios for power generation have been identified. The time frame for the definition of these scenarios is the moment when the investment decision was taken (this is March 2005):

Table 3: Alternative power generation scenarios for selection of potential baselines

Alternative Scenarios for power generation	Explanation of selection or discard of the scenario
a. The proposed project activity not undertaken as a CDM project activity: Installation of a new biomass fired power plant at a site where currently no power generation occurs (Greenfield power project)	The barriers that affect the development of this activity and discard this as a potential baseline scenario are described under section B.5. This scenario is chosen to represent the project activity to contrast it with the selected baseline.
b. Generation of power by the generation plants in the grid	The end user (consumers of electricity in the state of Rajasthan who import power from RVPN), would obtain electricity from the current grid generation mix. Use of fossil fuels would generate GHGs. This is the most common source for electricity consumption. Therefore it has been selected as a potential scenario.
c. The generation of power from a new 8 MW coal based power plant connected to the grid	Before the materialization of the project there was not an existing power plant using fossil fuels at the project's site. It is not common practice to implement coal power plants of such a small capacity in view of techno-economic circumstances. Moreover, KPTL started its activities in the Power Generation business focusing exclusively on small scale biomass energy projects, considering the support from CDM. For this reason the CDM project will not replace the generation of power from a power plant using coal and this scenario can be discarded.
d. The installation of a new biomass residue fired power plant with a lower efficiency of electricity generation. Therefore, the power output is lower than the project case for the same amount of biomass or the power output is the same for a higher amount of biomass than the project case.	As it will be discussed in B.5., the implementation of a power plant fuelled with mainly mustard crop residues entails technical and operational risks that can only be addressed in the context of CDM development. KPTL has not considered an alternative design for the biomass power plant, with lower efficiency. Therefore this scenario has been discarded and biomass based power generation will only be included under the predefined scenario recognized as "a - The proposed project activity not undertaken as a CDM project activity".

The only scenarios left for power generation are:

(a) The proposed project activity not undertaken as a CDM project activity, and

(b) **The prevailing practice:** The generation of power in the grid.

The barriers shown in section B.5. demonstrate that the predefined scenario can only be feasible and sustainable through its lifetime with the support of carbon revenues from the CDM. Therefore the chosen baseline scenario will be (b): The generation of power in the grid.

In the proposed baseline, the Northern Region's grid is used as the reference region for estimating the current generation mix. This is justified because Rajasthan remains integrated with the northern regional grid, although Rajasthan has its own dispatch centre – as do all the states in India – and decisions pertaining to the state are primarily made on the state level. Hardly any exchange of electricity takes place between states in India. Rajasthan is relatively self-supporting (it had an electricity deficit of 0.8%,[5] Ministry of Power, 2005), but it is the regional dispatch centre that makes decisions on intra-state transmissions. Therefore the Northern Region's generation mix is used as the reference region for the baseline estimation. If the Rajasthan grid is taken as the baseline, the carbon intensity of emissions would significantly increase given the predominance of coal in satisfying Rajasthan's electricity requirement. 81.4% of the energy requirement from the Rajasthan grid is currently supplied by coal installations while the percentage in the Northern Grid as a whole is of only 52.1%, with the remainder taken up by hydro, nuclear and gas installations[6]. This choice results in a conservative estimate of emission reductions

Baseline for biomass use and management.

In order to answer the question on what happens to biomass residues in the absence of the project activity, the following potential scenarios for management practices have been identified for each type of biomass category considered in the project activity:

[5] Electricity deficit in past years: 2.5 % in 1998/99; 4.5 % in 99/00 in 3.6 % 00/01; 1.2 % in 2001/02 ; 2.1 % in 2002/03; and 0.8 % in 2004/05 Source: http://powermin.nic.in/indian_electricity_scenario/pdf/NR0305.pdf slide 55.

[6] http://www.nreb.nic.in/Reports/ar06-07/Chapter2/Annex2.4.pdf

Table 4: Alternative scenarios for biomass management practices[7]

Biomass category	Alternative scenario for biomass	Description of the scenario
Mustard crop residues (MCR's main fuel)	A1. Left in the fields for its natural decay, or burning in an uncontrolled manner	This is identified as one of the common management practice for MCRs.
	A2. Used as animal bed	This is identified as one of the common management practice for MCRs.
	A3. Use as fuel for power generation	Almost no power plants or cogeneration plants are currently considering this renewable fuel as an alternative for their boilers, considering the major technical difficulties mentioned in section B.5 The only potential consumers that could compete on the use of mustard crop residues are brick kilns, briquette production units and small industrial factories using boilers such as rice mills.
Juli flora (secondary)	B1. Left in the fields for its natural decay	Juli Flora is considered as an aggressive weed in several states of India, due to its dominance over other species and its invasive eruption over grasslands, irrigation channels and arable land. Because of this, Juli Flora is usually seen as unwanted with more negative impacts rather than benefits.
	B2. Use as a cooking/domestic fuel by a minority of very poor farmers	Most farmers use cooking gas for domestic fuel. Juli flora is abundant and used only by a minority of the poorest strata of farmers. Its shrub has thorns and hence is difficult and very tedious to make use of it as a renewable fuel.
	B3. Production of electricity	This type of activity is still under a very experimental phase. Some preliminary studies in this regard are available for India. However, much research and development efforts are still required in this direction[8].
	B4. Other uses: Use for livestock feed of pods from Juli Flora.	In India, at the moment, large stands of well managed P. juliflora trees are not available. Therefore this scenario will usually not be found.

The only scenarios that have some relevance in terms of greenhouse gas emissions are those where biomass residues are left on the fields for natural decay (scenarios A1 and B1). Because of the several practices identified, no emission reductions will be claimed for avoided CH_4 emissions due to dumped biomass. This results in a conservative estimation of emission reductions.

It is recognized that there is no competing use for these biomass categories, for there is abundant availability under a ratio of 50 Km from the City of Uniara at the Tonk District (see results from

[7] Further characterization of the common management practice for biomass is found in Annex 9 of the Supporting Documentation.

[8] http://www.gardenorganic.org.uk/pdfs/international_programme/ManagingProsopisManual.pdf

preliminary biomass assessment study in Annex 9 of the Supporting Documentation). Nevertheless, an annual assessment on surplus availability has been included in the monitoring plan. This assessment will continuously represent, throughout the crediting period, the common management practices for the biomass under the scope of this project.

Final baseline definition

The baseline scenario is identified by the following descriptions, taking into consideration the statements presented above:

1. **Power**: Electricity generated by the project plant would in the absence of the project activity be generated by other power facilities connected to the same grid.
2. **Biomass**: In the absence of the project activity biomass residues would be left on fields for their natural decay or burnt on brick kilns, in an uncontrolled manner.

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:

Emission reductions

On-site emissions

Construction of power plants

The first direct on-site emissions occur during the construction of the power plants. However, because there is a shortage of electricity in India[9] it can be assumed that in the baseline situation, fossil fuel power plants would have been constructed instead. This would at least result in similar emission levels. We can therefore safely assume that the construction of biomass plants does not result in additional emissions compared to the baseline.

Storage of biomass

The harvesting of the mustard crop takes place in the period from February to April every year. Since mustard crop residues are only available for three to six months a year, adequate storage facilities are required. The design and implementation of an adequate storage facility has taken into account technical difficulties such as MCR's tendency to self-combust and to easily absorb moisture.

It is not expected that relevant N_2O and CH_4 emissions could arise from storage[10]:

- The amount of N_2O emissions formed during biomass storage can be assumed as comparable to the amount of N_2O emissions arising from agricultural residues when left on the field, which is one of the common management practices for MCRs. As a consequence the N_2O emissions will not be influenced by the project and will therefore not be taken into account. However a preliminary estimation is made under Annex 10 of the supporting Documentation
- Substantial CH_4 emissions from storage are not anticipated. There are three arguments for this:
    1. The biomass materials used in this project have very little organic components that are biodegradable under anaerobic conditions.
    2. The materials are stored in a dry and ventilated place, so that anaerobic digestion is very unlikely

[9] Paragraph 1.4 of National Electricity Policy, 2005. http://cea.nic.in/planning/national_Electricity_policy.htm and in http://powermin.nic.in/indian_electricity_scenario/national_electricity_policy.htm

[10] An explanation for these statements has been included in Annex 10 of the Supporting Documentation.

3. CH_4 production from anaerobic digestion only starts after a couple of months and reaches its peak after 2 years (storage time for the proposed project is on average six to nine months).

Moreover, also in the baseline situation some CH_4 emissions will occur because part of the crop residue is left on the field, although this will be considered as negligible and not taken into account following a conservative approach.

Off-site emissions
As it has been referenced in the document ***General guidance on leakage in biomass project activities***[11]**,** no emissions of biomass transportation or CH_4 emissions from controlled biomass combustion in the project scenario, will be included as part of the emission reductions calculations.

National Policies for electricity generation.
The policy framework attempts on bringing in competition, private sector participation and independent regulation (especially attempts bringing in independence from Government interference in state owned utilities).
The regulatory system now consists of a Central Electricity Regulatory Commission (CERC) regulating all matters pertaining to more than one state, and the State Electricity Regulatory Commissions (SERC) for matters within a state and an Appellate Tribunal (being the higher court of appeal against the two regulators). In addition, there is a Central Government authority – the Central Electricity Authority (CEA) responsible for power planning for the country and according approvals for large hydro projects.
The legislative framework is governed by the Electricity Act, 2003. This along with subsequent policies including the National Tariff Policy, the National Electricity Policy and the Rural Electrification Policies define the policy landscape.

The Ministry of Power (MoP) has set an agenda to meet the present national power deficit. To achieve this target, about 100,000 MW of new capacity needs to be added by the end of 2012, to the existing installed capacity[12]. With this target on mind, the Government of India has initiated several reform measures to create a favourable environment for the addition of new generating capacity in the country. The Electricity Act of 2003[13] which has put in place a highly liberal framework for generation, characterized by:

- No requirements of licensing for generation,
- No requirements of a techno-economic clearance from the CEA for thermal generation projects
- Captive generation is free from all controls.

[11] Attachment C to Appendix B -Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories- (paragraph 12)

[12] http://www.pppinindia.com/sector_power.asp

[13] See Section 7, 8 and 9 of Part III of the Electricity Act of 2003. The complete electricity act can be found under http://powermin.nic.in/acts_notification/electricity_act2003/The%20Electricity%20Act_2003.pdf

In India coal is the main fuel used for power generation. This is mainly due to the assured return on investment, economies of scale and easy availability of finances. The following developments have significantly strengthened the preference of the private sector for coal-based mega power projects over other energy sources:

- Even with full development of the feasible renewable energy potential in the country, coal would necessarily continue to remain the primary fuel for meeting future electricity demand[14]
- Imported coal based thermal power stations, particularly at coastal locations, would be encouraged based on their economic viability. Use of low ash content coal would also help in reducing the problem of fly ash emissions[15]
- Emphasis has been laid on the MoP policies for setting up large pithead stations to avoid high costs associated with transporting high ash bearing Indian coal and over-straining the already stretched rail network[16].
- Opening of captive coal mining for power, iron and steel, and cement for private investment: Foreign investments are now permitted in Indian companies taking up coal mining for captive use. The allocation of coal blocks are proposed to be done on the basis of competitive bidding[17]

All the above developments indicate positive signs for setting up of fossil fuel based thermal generation.

National policy for Renewable Energy

The Ministry of Non-Conventional Energy Sources (MNES) has been implementing comprehensive programmes for the development and utilisation of various renewable energy sources in the country. As a result of these efforts made during the past quarter century, a number of technologies and devices have been developed and have become commercially available. So far, from an approximate medium term potential of 133,000 MW of renewable energy based grid connected power in the country, only 10,252 MW[18] of installed capacity has been realized. The renewable energy based power generation capacity presently constitutes 7% of the total installed capacity in the country for power generation from all sources[19].

Renewable Energy based power generation has not been able to make much contribution for capacity additions during the past periods, in spite of the government's initiatives to develop the sector.

It is clear that the national power policy announced by the Indian government has given more trust on developing coal based power plants.

[14] 5.2.12 National electricity policy (http://powermin.nic.in/indian_electricity_scenario/national_electricity_policy.htm)

[15] 5.2.13 National electricity policy

[16] 5.2.17. National electricity policy

[17] India Energy Outlook –KPMG 2007: http://www.kpmg.com.au/Portals/0/India%20Energy%20Outlook%20-%202007.pdf

[18] MNES http://mnes.nic.in/ach1.htm

[19] http://www.cea.nic.in/power_sec_reports/Executive_Summary/2007_06/6.pdf

Additionality

In this section the additionality of the project will be explained, taking into account an analysis based on the following barriers (as included in Attachment A to Appendix B of the simplified M&P for small scale CDM project activities):

- Barrier analysis
- Common Practise analysis

Barrier analysis

The following section describes the operational difficulties related to the consumption of Mustard crop residues and Juli flora residues for power generation, which are not present in other fuels.

Biomass management and storage

The harvesting of the mustard crop takes place in the period from February to April every year. Since mustard crop residues are only available for three to six months a year, adequate storage facilities are required. It is not expected to generate significant GHG emissions from this storage, as it is explained above.

There are several technical considerations related with the management and storage of mustard crop/husk:

- Open storage of mustard husk causes substantial deterioration of its calorific value, due to its tendency to absorb moisture. This also causes more consumption of mustard husk in the boiler to maintain the temperature profile, and high water content in rainy seasons affecting the thermal efficiency of the boiler[20].
- Since the availability is only once in a year, the volume required for fuel storage should be enough to cope the consumption of more than 8 months. Therefore huge fuel storage yard, fuel handling equipments (portables, blowers, dozers etc), fire fighting system and conveying systems are required.
- Mustard crop residues have a tendency of self-combustion and its usage as a fuel is highly unpredictable after the rainy season.

To prevent the self combustion the following precautions are adopted:

- Bifurcate the fuel storage yard at plant and collection centres.
- Fuel stacking should be fluffy (not compact).
- Material should be reshuffled after rainy season to ventilate gasses and avoid self combustion.

Another barrier to the project activity concerns the use of Juli-flora residues as an alternative renewable fuel. The shrub of this biomass resource has thorns and hence is difficult and very tedious to make use of it as a renewable fuel. This has added more costs and difficulties to the biomass supply; still KPTL has considered this resource as an alternative fuel for MCRs taking into account its availability and few consumers.

Operational Risks

[20] Rajasthan Electricity Regulatory Commission (order on tariff 15/03/07). Paragraph 71. http://rerc.gov.in/Order/JS_(PO)_Order_RE_Tariff_15.03.07.pdf

The following technological issues related to the combustion of mustard crop residues are descrived below:

- The mustard husks themselves are extremely light in weight making a major portion of the fuel source burning while in suspension. This affects the efficiency of the power generation system.
- High super-heater temperatures together with the mustard crop's chemical composition (high content of alkalis and chlorine) continue to result in scaling, fouling and corrosion in the fireside of the super-heater tubes in the boiler. Presence of alkali salt reduces the ash fusion temperature, which causes clinker formation in the furnace. This results in the frequent failure of the super-heater and heavy deposits in the furnace and super-heater. Figure B.2 illustrates the amount of corrosion that can occur, as well as the heavy deposits in the furnace and super-heater.
- Effects are further compounded by the fact that local conditions ensure a significant amount of dust and fine particles from the arid fields which remain imbedded within the mustard residue;

Figure B.2: Corrosion, deposits and scale formation on super-heater tubes

In order to minimize these problems the usage of MCR as a fuel requires:

(i) Maintenance of low temperature in the furnace
(ii) Total control of carryover of combustibles from the furnace to avoid secondary combustion
(iii) Rapid removal of ash from the furnace.

The experience of using MCR's in the Ganganagar CDM power project is useful to illustrate the technical difficulties that affect this project. This plant has gone through several modifications as well as simultaneous shutdowns since the beginning of its operation. This has affected Ganganagar's historical operating plant load factor (PLFs) showing that the technology is yet far from optimisation, and not achieving the expected electricity generation capacity. Additional information on these technical difficulties at Ganganagar has been included in Annex 10 of the Supporting Documentation.

The estimation of electricity generation for the Tonk Project has considered this unsteadiness in the PLF. A representative and conservative ex-ante estimate of 65% will be used for the PLF value, based on the experiences of Gangangar and the historical performance of the Tonk Project. This estimate relies on equipment modifications made to improve the performance of the project's boiler. PLF is further affected during drought seasons. For years 2009 and 2013, a 50% of load is considered, expecting these to be years of drought. This is a conservative assumption based on the report Quick Biomass Assessment Study for Proposed Biomass Power Project at the Tonk District in Rajasthan (PRA 2005), which concludes that droughts are expected for "2 years in the coming 10 years". The main results of this study on droughts in the area are included in Annex 10 of the Supporting Documentation

Further modifications to improve performance and efficiency of the boiler at Ganganagar, proposed by Thermax, the boiler supplier, where implemented also at the Tonk biomass-based power generation project. The purpose of these modifications was to decrease the temperature at the furnace outlet and final temperature.
Extra water wall panel as well as condensate preheater coils have been installed in boiler and economizer section respectively. Annex 10 of the Supporting documentation gives more detail on these modifications.

The boiler at the Tonk Project is working under a stable regime since its operation in November 06. Still, trials continue to be performed to further refine the best operating parameters.

Droughts continue to be a relevant issue because they enhance MCR's ability to self combust. A recent fire incident to represent this occurred on the 26th april 07, making the plant stop its operation for nearly 5 months. A picture of the fire can be found under Annex 10 of the Supporting Documentation, under the title "Technical problems in the use of Mustard Crop Residues at Ganganagar".

The only comparable small power plant that was announced during the investment decision was the 25 MW coal/lignite and petcoke plant from ACC[21] at Lakheri, a distance less then 50 kilometres from the Tonk project. This illustrates that even captive users are unwilling to look at biomass options at the same site where mustard husk is plentifully available for biomass installations.

This assessment has shown that the implementation of the Tonk Project has confronted several technological barriers related to the type of fuels considered and their implications on storage, management and final combustion.

Common Practise Analysis
The project submitted for registration was initially to be developed in parallel with the registered project "Biomass in Rajasthan - Electricity generation from mustard crop residues" UNFCCC CDM project reference number 0058 ('the Ganganagar project'). In 2002 the project was as such submitted to the Dutch government CERUPT programme. Following the technical/ technological risk associated with the first time usage of Mustard Crop Residues on this scale for power generation. It was decided not to develop them in parallel, but to make a decision on the development of the Tonk project after more certainty on the successful registration at the UNFCCC of the Ganganagar project was obtained. The minutes from this meeting are attached as separate document. Due to various delays the project participants were not able to complete the validation until March 2008.
A detailed time-line for the development of the project can be found in Table 5.

Table 5: Project development process and milestones

Date	Action	Reference (provided as separate documents)

[21] Further information on the plant can be found at www.acclimited.com wherein following is quoted: "The project at Lakheri for the expansion of capacity and 25 MW captive power plant has been taken on hand". This had appeared in the Press Release/Financial results of 6th May 2005. ACC is a part of Holcim Group.

Jan-02	Submission of Ganganagar and Tonk project to SenterNovem	Contract Senter 20031119 Article 2.1
Jul-03	Start of operation Ganganagar	Rajasthan Renewable Energy Corporation (RREC) 20080206
Nov-03	Contract with Senter for Ganganagar and Tonk	Contract Senter 20031119
Jan-05	Investment Decision Tonk	Minutes of Board Meeting kalpataru 20050107
May-05	Registration Ganganagar	UNFCCC website
Jun-05	Letter of approval Tonk	UNFCCC website
Sep-05	Validation start (GSP)	UNFCCC website
Nov-06	Start of operation Tonk	RREC - 20080206
Jul-07	Re-GSP	UNFCCC website
Mar-08	Final Validation Report Tonk	UNFCCC website
Apr-08	Submit for Registration Tonk	UNFCCC website

Prevailing practice for power generation in Rajasthan is still using coal (81%) as fuel for power generation. The installed generation capacity in the state of Rajasthan can be found in Table 6.

Table 6: Installed generation capacity in Rajasthan[22].

Type	Installed Capacity MW
Hydro	256.86
Thermal	2545.00
Gas Turbine	223.80
Total	3125.66

The total biomass generation capacity is 46.3 MW[23]. This could not be derived from the above statistics, but was obtained from the Rajasthan Renewable energy company (see separate document).

The project participants further want to highlight that the project faces technical barriers, as described in the PDD which are related to:

- The storage and management of the biomass;
- The operational difficulties of the combustion of Mustard Crop Residues (MCR); and
- The uncertainty related to the expect amount of available MCR.

Three similar projects (projects that use Mustard Husk for energy generation) can be identified in the same region where the project is located, which is the state of Rajasthan[24]. In Table 7 below

[22] http://www.nreb.nic.in/Reports/ar06-07/Chapter2/Annex2.4.pdf

[23] Of which 23.5MW Mustard Crop Residues only.

all other operational biomass based generation projects are included. In the table is shown that the similar projects were developed as a CDM projects. The other operational biomass generation plant developed by the Birla Corporation has is generating electricity for captive use[25] this is therefore a different type of project.

Table 7: Power generation projects based on Mustard Husk Residues in Rajasthan[26]

Name of the Power producer	Cap. in MW	District	Start date	Fuel	UNFCCC CDM ref. no.	UNFCCC Reg. Date
KalpaTaru Power Transmission Ltd.	7.8	Sri Ganganagar	15 July 2003	Mustard Husk, Cotton Stalk	0058	23 May 2005
Alwar Power Ltd.	7.5	Alwar	not operational	Mustard Husk	0082	24 October 2005
Surya Chambal Power Ltd.	7.5	Kota	31 March 2006	Mustard Husk	0347	8 May 2006
Amrit. Envi. Tech Ltd.	8	Jaipur	1 October 2006	Mustard Husk	0372	29 Sept. 2006
S.M. Env. Tech. Ltd.	8	Bharatpur	Not operational	Mustard Husk and Wood Chips	0375	15 June 2006
Birla Corporation	15	Chittorgarh	24 December 2005	Rice Husk, Mustard Husk, Soyabin Residue	N.A.	N.A.

The Tonk and Ganganagar projects are among the first of its kind in terms of technology, geography, sector, type of investment and investor, market and the project uses CDM to overcome this barrier. That the use of Mustard Husk as fuel can be considered as difficult is also demonstrated by the registered CDM projects 0082 and 0375 which are still not operational.

Overall conclusion for additionality

From barrier analysis we can conclude that the proposed project activity has faced the following barriers during its implementation:

[24] Rajastan Rajasthan covers an area of 342,239 km² (about the size of Germany). Source: http://en.wikipedia.org/wiki/Rajasthan

[25] http://www.investrajasthan.com/lib/bpulse/022006/bio.html

[26] For a full list of biomass based power generation plants which operational or under construction, please see document biomass based power generation in Rajasthan.

- Special conditioning for storage of MCRs is needed to implement this type of project, to prevent self combustion and absorb moisture (as evidenced by the fire in April 2007 which led to the plant's shutdown for over 4.5 months)
- Operational difficulties on the combustion of MCR's that continue to be a relevant issue
- Drought related uncertainty of PLF due to low biomass production

From the common practise analysis we can conclude that no biomass based power plant delivering electricity to the grid is successfully operating without the support of the Clean Development Mechanism.

The additionality proof of the project is based on the fact that KPTL would not have been able to overcome the technical difficulties and operate the plant successfully without the assurance of the support in the form of carbon credits through the Clean Development Mechanism.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

I Calculation of the grid emission factor

The monitoring methodology consists of metering the electricity generated by the renewable technology. With this information, a reliable estimate of the amount of emission reductions can be made.

The ex-ante estimate of the baseline emissions are calculated based on the projected net energy provided to the grid (in GWh /year), and an emission factor for the displaced grid electricity (in tCO2 /GWh). The data required to calculate the emission factor is based on historic data (ex-ante approach). The grid emission factor has been calculated in line with AMS I.D, choosing option (a), which represents the baseline grid emission factor as:

:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002.

This combined margin emission factor has been calculated according to the procedures of ACM0002[27] and relying on information from the "CO_2 Baseline Database" published by CEA[28]. This is the most recent and consolidated source of compiled data to represent the emission factor for any grid in India, and it has been used successfully in other registered renewable energy CDM project activities[29]. It will be considered representative and effective for any CDM project in this region.

[27] Consistent with the first approach of footnote 4 in ACM0002 ver.6: "acquired directly from the dispatch center or power producers, if available".

[28] CO2 Baseline Database: This project will use version 2.0 of this database for ex-ante estimations, considering that it is the most updated version.
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

[29] See for example project reference number 943 "5 MW Renewable Energy Project for a Grid system, India at Beas Nallah in Kullu district of Himachal Pradesh by M/s Sai Engineering Foundation"

The Operating Margin refers to the actual generation mix by sources installed in the Northern grid. According to ACM0002, there are four criteria to represent this emission factor. Lack of data to represent each hour of operation from the Northern regional grid system prevents the application of the dispatch analysis method and the Simple Adjusted OM. On the other hand, the low-cost/must run resources[5] constitute less than 50% of the total grid generation from the Indian northern regional grid system. This is shown in the next table:

Table 8: Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	25.9%	25.7%	26.1%	28.1%	26.8%	28.1%

Therefore this context is applicable for the "simple operating margin" method, while the "average OM" is excluded.

II Calculation of the project emissions

As it has been referenced in the document ***General guidance on leakage in biomass project activities***[30]: "*All other emission sources are likely to be smaller than 10% of the total emission reductions (- including transportation of raw materials and biomass, fossil fuel consumption for the cultivation of plantations - and can therefore be neglected in the context of SSC project activities"*

For this reason, no emissions of biomass transportation or CH_4 emissions from controlled biomass combustion in the project scenario, will be included as part of the emission reductions calculations.

III Calculation of leakage

The proposed CDM project activity considers the use of Mustard Crop Residues (MCRs) as the main source of fuel. Juli flora will be used only as for MCRs.

The only emissions that will be assessed are those related to a potential competitive use of biomass residues. The rest of the components considered in the General guidance tool do not apply to this project because only biomass residues will be taken into account as fuel, for no lands will be cultivated or forested at all. The project does not result in an additional uptake of CO_2 by sinks.

Leakage emissions: competitive use of biomass residues

The preliminary assessment of the potential competitive use of biomass residues is based on a study prepared for KPTL on this specific CDM project activity[31]. The study has assessed the availability of each category of renewable biomass considered in the scope of this project activity (mainly mustard crop residues, and a minor quantity of JuliFlora). The results of this study have been included in Annex 9 in the Supporting Documentation to this PDD, and shows that the quantity of available mustard crop residues in the region (e.g. 50 km radius) in years with a minimum crop production and normal crop production, is larger enough to supply the total mustard crop residues demand from the project activity. The same surplus can be evidenced for Juli Flora residues that will be the alternative fuel for MCR's. The complete study can be available for the DOE if requested.

[30] Attachment C to Appendix B -Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories- (paragraph 12)

[31] A Report on Quick Biomass assessment study for Proposed biomass power project in Uniara at the Tonk District in Rajasthan, for Kalpataru Power Transmission Ltd., Mumbai. By Progressive Research Aids (PRA), Pune.

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

Data / Parameter:	EF_{CM}
Data unit:	tCO_2/GWh
Description:	Emission factor for northern India's interconnected grid
Source of data used:	Calculated from the combined margin taking the "CO_2 Baseline Database" published by CEA as the main reference of values. Imports from other Regions will be counted as part of the baseline emissions.
Value applied:	793.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Methodology adopted for determining baseline emission factor is the combined margin of the generating mix in the Northern regional grid system (including imports), which will represent the intensity of carbon emissions of the grid system. The main source of data is the "CO2 Baseline Database Version 2.0" published by CEA, for the latest available year (2005-2006).
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/lt or TJ/ton.
Description:	is the net calorific value of fuel i
Source of data used:	Provided from CEA baseline data, provided in Annex 3
Value applied:	See annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	All parameters related to the grid emission factor calculation are based on data provided by the CEA database.
Any comment:	Default values were used for some thermal stations where station-specific values were not available.

Data / Parameter:	$F_{i,j,y}$
Data unit:	TJ/year
Description:	consumption of fuel *i* by fuel sources *j* in year *y*
Source of data used:	Calculated upon CEA baseline data Version 2.0: http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	All parameters related to the grid emission factor calculation are based on data provided by the CEA database.
Any comment:	

Data / Parameter:	$EF_{CO2,i;}$
Data unit:	tC/TJ.
Description:	is the emission factor for fuel i,
Source of data used:	Coal/Lignite - Initial National Communication, Gas/Oil/Diesel/Naphta - IPCC 2006, Corex – CEA assumption
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All parameters related to the grid emission factor calculation are based on data provided by the CEA database.
Any comment:	

Data / Parameter:	$OXID_i$						
Data unit:	%						
Description:	Oxidation factor for fuel i						
Source of data used:	Coal/Lignite - Initial National Communication, Gas/Oil/Diesel/Naphta - IPCC 2006, Corex – CEA assumption						
Value applied:		Coal	Lignite	Gas	Oil	Diesel	Naphta	Corex
	Oxidation Factor	0.98	0.98	1.00	1.00	1.00	1.00	n/a
Justification of the choice of data or description of measurement methods and procedures actually applied :	All parameters related to the grid emission factor calculation are based on data provided by the CEA database.						
Any comment:							

Data / Parameter:	GENi,j,y
Data unit:	GWh
Description:	is the grid electricity generation for plant j, with fuel i, in year y
Source of data used:	Calculated upon CEA baseline data Version 2.0: http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	All parameters related to the grid emission factor calculation are based on data provided by the CEA database.
Any comment:	

Data / Parameter:	$SFC_{b,1}$
Data unit:	Dry Tonnes of biomass/GWh
Description:	Specific fuel consumption for biomass fuel category 1 (mustard crop residue)- on a dry basis
Source of data used:	Calculated based on Gross calorific values measured at the Shriram Institute Lab and performance of the overall cycle.
Value applied:	1347 dry tonnes of mustard crop residue /GWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	See Annex 7 of the Supporting Documentation
Any comment:	Specific fuel consumption is based on dry biomass and net electricity dispatched.

Data / Parameter:	$SFC_{b,2}$
Data unit:	Dry tonnes of biomass/GWh
Description:	Specific fuel consumption for biomass fuel category 2 (Juli-Flora residues) – on a dry basis
Source of data used:	Calculated based on Gross calorific values measured at the Shriram Institute Lab.
Value applied:	1018 dry tonnes of Juli-flora /GWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	See Annex 7 of the Supporting Documentation
Any comment:	

Data / Parameter:	$SFC_{b,3}$
Data unit:	Dry tonnes of biomass/GWh
Description:	Specific fuel consumption for biomass fuel category 3 (Wood chips) – on a dry basis
Source of data used:	Calculated based on Gross calorific values measured at the Shriram Institute Lab.
Value applied:	1083 dry tonnes of wood chip/GWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	See Annex 7 of the Supporting Documentation
Any comment:	Specific fuel consumption is based on dry biomass and net electricity dispatched.

Data / Parameter:	SFC_{ff}
Data unit:	tonnes of fossil fuel/GWh
Description:	Specific fuel consumption for fossil fuel (coal or lignite)
Source of data used:	Calculated based on Gross calorific values
Value applied:	1039 tonnes of lignite/GWh - 724 tonnes of coal/GWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	See Annex 7 of the Supporting Documentation
Any comment:	Specific fuel consumption is based on dry biomass and net electricity dispatched.

Data / Parameter:	NCV_{MCR}
Data unit:	MJ/kg
Description:	Net calorific value of the mustard crop residues (on a moist basis)
Source of data used:	Calculated based on Gross calorific values and moisture measured at the Shriram Institute Lab
Value applied:	13.43
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mustard crop residue will be considered as a representative category for the complete mix of biomass supply
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

$$ERa_y = BEa_y - PEa_y - La_y \qquad (1)$$

Where:

ERa_y	Ex-ante estimation for emission reductions for year y (tCO_2/yr).
BEa_y	Ex-ante estimation for baseline emissions for year y (tCO_2/yr).
PEa_y	Ex-ante estimation for project emissions for year y (tCO_2/yr).
La_y	Ex-ante estimation for leakage for year y (tCO_2/yr).

I. Calculation of ex-ante baseline emissions

As it is explained above, the combined margin approach has been chosen for the estimation of an ex-ante emission factor, to represent the grid of the northern Region.

Following ex-ante estimations, the results for the operating margin, build margin and combined margin values are presented in table 9.

Table 9: Result of the combined margin emission factor.

Emission factor	Value (ton CO_2/GWh
$EF_{OM,2004}$: Operating margin 2004	987
$EF_{OM,2005}$: Operating margin 2005	976
$EF_{OM,2006}$: Operating margin 2006	995
EF_{OM} : Average Operating margin	986
$EF_{BM,2006}$: Build Margin	601
EF_{CM}: **Combined Margin**	**793**

This EF_{CM} is the baseline emission factor in calculating the emission factors through all the years in the crediting period.

The following formula is used to estimate ex-ante annual baseline emissions, related to grid electricity consumption:

$$BEa_y = E_{baseline,y} \cdot EF_{CM} \qquad (2)$$

Where:

$E_{baseline,\,y}$: total annual electricity delivered to the grid in the year y (GWh)

EF_{CM}: Resultant combined margin for the grid, based on ex-ante estimations (tonCO_2/GWh).

$$E_{baseline,y} = E_{t,y} - E_{pl,y} \qquad (3)$$

Where:

$E_{t,\,y}$: total annual electricity generated by the power plant in the year y (GWh)

$E_{pl,\,y}$: total annual electricity for internal consumption of the power plant in the year y (GWh).

$$E_{t,y} = C_{pl} \cdot PLF_{pl} \cdot T_y \qquad (4)$$

where:

Cpl : Capacity of the Tonk Project in GW (0.008 GW)

$PLFpl_y$: Plant load factor in % for the Tonk Project in year y.

T_y : Total hours of a normal year (8760 hours).

12.5 % is assumed as a conservative and representative value for the internal consumption of the power plant. For years 2009 and 2013, a 50% of load is considered, expecting these to be years of drought. This is a conservative assumption based on the report Quick Biomass Assessment Study for Proposed Biomass Power Project in Uniara at the Tonk District in Rajasthan (PRA 2005). A representative and conservative ex-ante estimate of 65% will be used for the rest of the years. This estimate relies on

equipment modifications made to improve the performance of the project's boiler. The operational days are counted under the PLF.

The following table represents the estimated expected electricity generation for this project, considering the internal consumption of the power plant and its variable load.

Table 10: Expected electricity generation[32]

		2008	2009 (drought year)	2010	2011	2012	2013 (drought year)	2014
Grid Emission factor								
EF_{CM}	[tCO2/GWh]	793	793	793	793	793	793	793
Plant Operational data								
Gross capacity	[GW]	0.008	0.008	0.008	0.008	0.008	0.008	0.008
PLF	[%]	65%	50%	65%	65%	65%	50%	65%
Hours of a year	[hours]	8760	8760	8760	8760	8760	8760	8760
Electricity generation	[GWh/yr]	45.6	35.0	45.6	45.6	45.6	35.0	45.6
Auxiliary consumption	[GWh/yr]	5.7	4.4	5.7	5.7	5.7	4.4	5.7
Electricity exported	[GWh/yr]	39.9	30.7	39.9	39.9	39.9	30.7	39.9

II. Calculation of ex-ante project emissions

As it has been stated under B.6.1, no emissions will be included as part of the project scenario. Therefore:

$PEa_y = 0$ ***(5)***

III. Calculation of ex-ante leakage emissions

No leakage emissions are expected for this project activity, as it has been stated under B.6.1.
Therefore:

$La_y = 0$ ***(6)***

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

The table below summarizes the results of the ex-ante estimation of emission reductions for all years of the first crediting period.

[32] Assuming a drought year is to be expected every 4 to 5 years (2009 and 2013)

Table 11: Summary of the ex-ante estimation of emission reductions for the first crediting period.

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2008/2009	0	31,614	0	31,614
2009/2010	0	24,319	0	24,319
2010/2011	0	31,614	0	31,614
2011/2012	0	31,614	0	31,614
2012/2013	0	31,614	0	31,614
2013/2014	0	24,319	0	24,319
2014/2015		31,614	0	31,614
Total (tones of CO2e for the first crediting period)	0	**206,710**	**0**	**206,710**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$E_{t, y}$
Data unit:	GWh /year
Description:	Total measured electricity generation from the CDM project activity during the year y
Source of data to be used:	Based on meter readings, complying with Indian Standards.
Value of data	35.0 GWh for a year with 50% of the load 45.6 GWh for a year with 65% of the load Different loads are considered when droughts over crops can be expected. See separate spreadsheet for more details.
Description of measurement methods and procedures to be applied:	Total electricity generation and electricity dispatch will be measured and monitored through meter readings, complying with Indian Standards. Invoices sent to RVPN and invoice to Third Party, if any, will be covered in a regular audit and used as a backup to compare with the meter readings. Data will be archived and administered by the project developer. Data will be archived during the crediting period and two years after.
QA/QC procedures to be applied:	The following procedures are applicable to measured values of total electricity generation and electricity dispatch QA: Electricity fed into the grid is measured by sealed and certified meters, appropriate assurance is provided to ensure that this will be performed in an accurate way. These meters cannot be manipulated. There is a backup meter. QC: Electricity fed into the grid and unable to be metered will not be registered and invoiced. Monthly joint measurements with the utility authorities for the import and export of electricity are mandatory for the sale of electricity to the utility. Furthermore, invoices to RVPN will be used as backup to compare the dispatched electricity declared in the monitoring plan, as part of the annual audit reports carried out by accountants. Regularly main meter and back meter are tested by representative of metering division, Rajasthan Power Procurement Center (RPPC).
Any comment:	A clear description can be found under the Documented Procedure for the Monitoring of the Tonk Project in Annex 4 of this PDD.

Data / Parameter:	$E_{pl, y}$
Data unit:	GWh /year
Description:	Total annual electricity for internal consumption of the power plant during the year y
Source of data to be used:	Based on meter readings, complying with Indian Standards.
Value of data	4.4 GWh for a year with 50% of the load 5.7 GWh for a year with 65% of the load Different loads are considered when droughts over crops can be expected. See separate spreadsheet for more details.
Description of measurement methods and procedures to be applied:	Internal electricity consumption of the plant will be measured and monitored through meter readings, complying with Indian Standards. Data will be archived and administered by the project developer. Data will be archived during the crediting period and two years after.
QA/QC procedures to be applied:	Regularly meters are tested by representative of metering division, Rajasthan Power Procurement Center (RPPC).
Any comment:	A clear description can be found under the Documented Procedure for the Monitoring of the Tonk Project in Annex 4 of this PDD.

Data / Parameter:	$BC_{y,i}$
Data unit:	Dry Tonnes of biomass/year
Description:	Total consumption of dry biomass category i for year y. Main biomass category 1: Mustard crop residues. Biomass category 2: Juli flora residues (minor use) A small quantity of wood chips is also consumed as a start-up auxiliary fuel although its consumption is of small relevance (less than 100 metric tons per year).
Source of data used:	Estimated based on biomass as received measured with a weighbridge log and moisture. The moisture content is determined by means of frequent lab tests.
Value of data	53,410 tonnes of mustard crop residue per year for a 65% of PLF 41,084 tonnes of mustard crop residue per year for a 50% of PLF
Description of measurement methods and procedures to be applied:	The amount of biomass purchased will be based on invoices/receipts from farmers and the fuel contractor as well as with the weighbridge log.
QA/QC procedures to be applied:	A maintenance contract for the weighbridge will be secured. The process flow chart for the Fuel Transportation System is presented in Figure B.4. Random checks are carried out to monitor the quality of the biomass fuels received (moisture content, purity of the material).
Any comment:	A clear description can be found under the Documented Procedure for the Monitoring of the Tonk Project in Annex 4 of this PDD.

Data / Parameter:	FC_y
Data unit:	Tonnes
Description:	Total consumption of fossil fuels in year y (tonnes).
Source of data used:	Records from KPTL
Value of data	0 tonnes. In first instance, it is not considered the use of fossil fuels.
Description of measurement methods and procedures to be applied:	Appropriate record of the bills will be stored in order to save information regarding the level of consumption of fossil fuels in the power plant.
QA/QC procedures to be applied:	Calculations will be cross checked with records of hours of operation with fossil fuels.
Any comment:	It is not expected to use any auxiliary fossil fuel for the power plant. Still, for the purpose of a conservative analysis on ex-post estimation of emissions, equations to deduct those emissions from the total electricity generation in the project scenario have been included. It is very improbable that fossil fuels will be consumed during the crediting period.

Data / Parameter:	$B_{FLE,n,y}$
Data unit:	Tonnes
Description:	Quantity of biomass residue type n used for heat generation as a result of the project activity during the year y and for which leakage can not be ruled out
Source of data used:	Published literature, official reports, surveys etc
Value of data	To be determined after monitoring.
Description of measurement methods and procedures to be applied:	This value is calculated based on the annual surplus of biomass in the region of the project activity, which is not utilized for year y. Quantity of available biomass in the region (e.g. 50 km radius), should be at least 25% larger than the quantity of biomass that is utilized including the project activity, to neglect this source of leakage. Otherwise this leakage shall be estimated and deducted from the emission reductions.
QA/QC procedures to be applied:	Monitoring of this parameter is done to assess leakages. Additional criteria from more updated versions of AMS.I-D will be considered as available choices to identify this parameter and reproduce this analysis.
Any comment:	

Ex-post emission reductions

The emission reductions are calculated based on the following equation:

$$ERp_y = BEp_y - PEp_y - Lp_y \qquad (7)$$

Where:

ERp_y	Ex-post estimation for emission reductions for year y (tCO_2/yr).
BEp_y	Ex- post estimation for baseline emissions for year y (tCO_2/yr).
PEp_y	Ex- post estimation for project emissions for year y (tCO_2/yr).
Lp_y	Ex- post estimation for leakage for year y (tCO_2/yr).

I Ex-post baseline emissions

Baseline emissions are calculated with the following equation:

Then total annual emission reduction should be updated according to the following equation:

$$BEp_y = (CEG_y - E_{pl,y}) \cdot EF_{CM} \qquad (8)$$

Where:

CEG_y :	Conservative total electricity generation based on exclusively biomass sources for the year y (GWh/year).
$E_{pl,y}$:	total annual electricity for internal consumption of the power plant in the year y (GWh).
EF_{CM}:	Resultant combined margin for the grid, based on ex-ante estimations (tonnes CO_2/GWh).

Baseline methodology AMS-I.D version 11 establishes that the amount of electricity generated using exclusively biomass fuels should be compared with the amount of electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used. The lower of the two values will be used to calculate ex-post emission reductions. Then as follows:

$$CEG_y = Min(TEG_{projectplant,y} , \Sigma_i BCi,_y/SFC_{b,i}) \qquad (9)$$

Where

$TEG_{projectplant,y}$:	Total electricity generation using only biomass fuels (GWh/year)
$BC_{i,y}$:	Total consumption of biomass i for year y (Tonnes of biomass/year)
$SFC_{b,i}$:	Specific fuel consumption of biomass i (Tonnes of biomass/GWh)

It is not expected to use any auxiliary fossil fuel for the power plant. However, for the purpose of implementing a conservative monitoring plan, equations to deduct those emissions from the total electricity generation in the project scenario have been included. It is very improbable that fossil fuels will be consumed during the whole crediting period.

The following equation will define how to deduct electricity generated from fossil fuels to the total electricity produced by the power plant to the grid.

$$TEG_{projectplant,y} = E_{t,y} - EGFF_y \qquad (10)$$

Where:

$E_{t,y}$:	total annual electricity generated by the power plant in the year y (GWh)
$EGFF_y$:	Energy generation during the year y due to fossil fuels co-fired by the generation facility (GWh/year)

If no fossil fuels are consumed for a specific year then:

$$TEG_{projectplant,y} = E_{t,y} \qquad (11)$$

The following equation is applied to determine the electricity generation from the consumption of fossil fuels in the project scenario:

$$EGFF_y = \frac{FC_y}{SFC_{ff}} \qquad (12)$$

Where:

SFC_{ff}:	Specific fuel consumption for fossil fuel (tones/GWh).
FC_y :	Total consumption of fossil fuels in year y (tonnes).

II. Calculation of ex-post project emissions

As it has been stated under B.6.1, no emissions will be included as part of the project scenario. Therefore:

$$PEp_y = 0 \qquad \textbf{(13)}$$

III Calculation of leakage

The monitoring plan will include an annual assessment on the surplus of the biomass fuel in the region of the project activity, which is not utilised. If it is demonstrated (e.g. using published literature, official reports, surveys etc.) that the quantity of available biomass in the region (e.g. 50 km radius), is at least 25% larger than the quantity of biomass that is utilised including the project activity, then this source of leakage will be neglected. Additional criteria from more updated versions of AMS.I-D will be considered as feasible alternatives to estimate this biomass volume and reproduce this analysis.

Otherwise this leakage shall be estimated and deducted from the emission reductions, as stated in the following equation:

$$LP_y = EF_{CO2,LE} \cdot BF_{LE,n,y} \cdot NCV_{MCR} \qquad \textbf{(14)}$$

Where:

$\boldsymbol{EF_{CO2,LE}}$:	CO_2 emission factor of the most probable fuel to replace biomass consumption of other consumers (tonnes CO_2/GJ).
$\boldsymbol{BF_{LE,n,y}}$	Quantity of biomass residue type n used for heat generation as a result of the project activity during the year y and for which leakage can not be ruled out. (tonnes)
$\boldsymbol{NCV_{MCR}}$**:**	Net (Low) calorific value of the mustard crop residues (MJ/kg) on a moist basis, considering it as the main source of fuel for this project.

For the Indian context bituminous coal is the most common solid fuel than can replace biomass in a power boiler (see figure B.3). Coal has an emission factor of 0.0958 tonnes CO_2/GJ based on the reference of the Initial National Communication of India, as it is stated in the CEA database of emission factors.

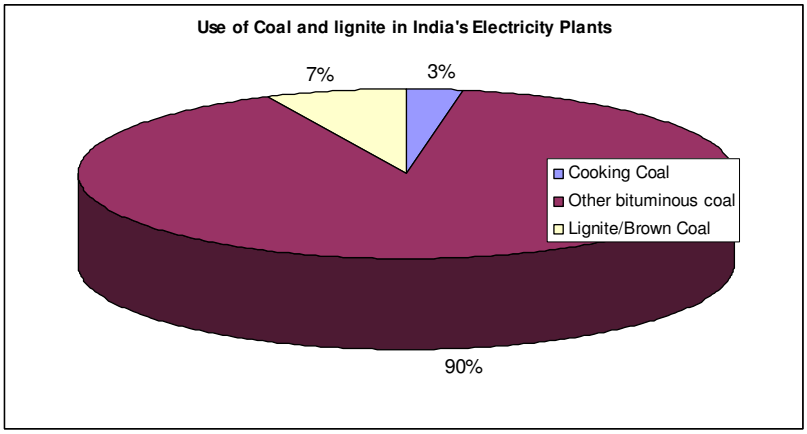


Figure B.3: Use of coal and lignite in India's Electricity Plants[33]

If there is evidence to prove that there is an available volume of biomass surplus, then the leakage value is considered as nil. Therefore:

$LPy = 0$ **(15)**

B.7.2 Description of the monitoring plan:

>>

The monitoring methodology defined by AMS-I.D. version 11 'Grid connected renewable electricity generation' involves metering the electricity generated by the project activity, the measurement of each type of biomass input and the potential consumption of fossil fuel. With this information, a reliable estimate of the amount of emission reductions can be made.

A documented procedure defining roles, responsibility, and authority for the collection, reviewing, verifying and releasing of data has been included in Annex 4 of the Supporting Documentation in this new submission.

Main procedures on maintenance & supervising transportation of biomass fuels

- Equipment performance is periodically reviewed by statutory authorities.
- The following chart describes the process flow needed for fuel transportation system in this project.

[33] Source: IEA database 2004, http://www.iea.org/Textbase/stats/coaldata.asp?COUNTRY_CODE=IN

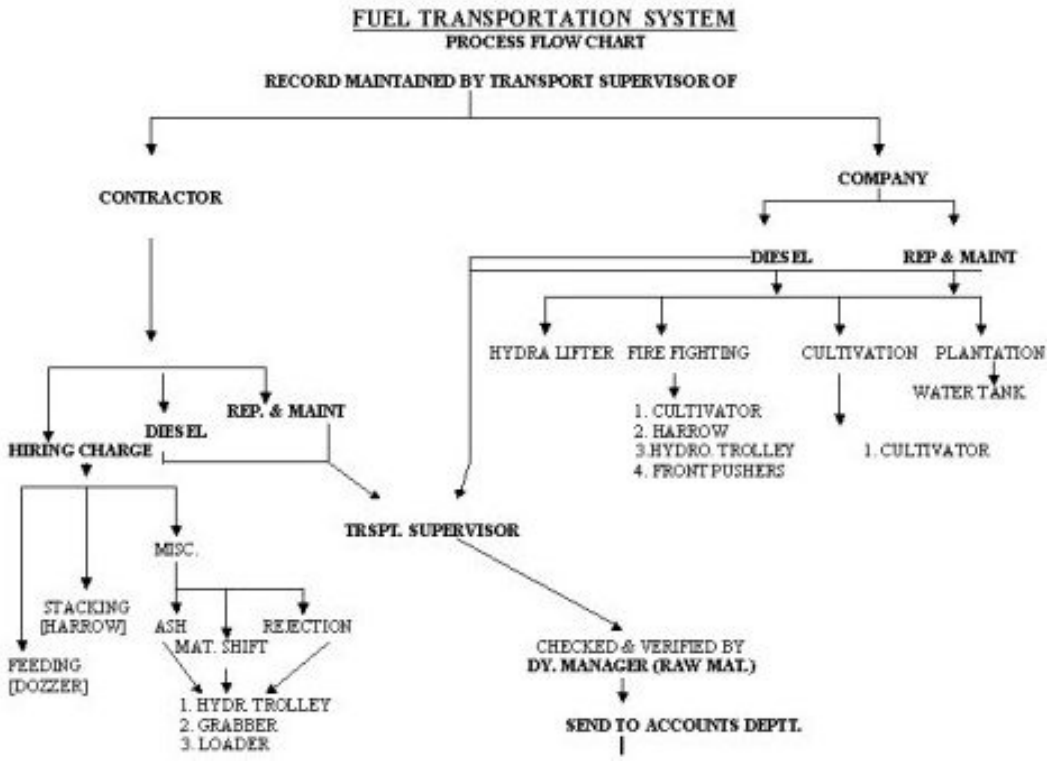


Figure B.4: Process Flow Chart for Fuel Transportation System

- To address all O&M issues, KPTL has recruited an experienced manager to address issues related to Fuel Procurement under the guidance of the Vice President. A team of Supervisors and Field Representatives is responsible of effectively control and monitor the complete process of fuel procurement, quality issues, and the handling and storage of material in the plant area:
  - All undergo classroom sessions by respective experts coupled with "on the job" training all performed by the Vendor's engineers. The routine O&M procedure prescribed by suppliers is part of this routine.
  - Along with maintenance information for the high volume sampler, a proper record of checks is also be maintained. Random checks are carried out to monitor the quality of the biomass fuels received (moisture content, purity of the material).
- Additional training has been given to the surrounding farmers in their local villages, educating them on the benefits of selling their agricultural waste to KPTL rather than burning it on the fields, and ways of transporting their biomass to the site. Qualified local villagers who are aware of local areas and have agricultural backgrounds, are being employed. All training is performed on site.

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

>>

Date of completing the final draft of this baseline section: *19/10/2007*

Name of person/entity determining the baseline:

The baseline has been prepared by Ecofys Netherlands B.V.

Company name: Ecofys Netherlands B.V.
Visiting address: Andrés de Fuenzalida Nº 47, 5th floor, Santiago, Chile
Contact person: Mr. Rodrigo Garcia
Telephone number: + 56 - 2 - 2344104
Fax number: + 56-2 - 335 - 8404
E-mail: r.garcia@ecofys.com

Ecofys Netherlands B.V. is not a project participant.

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:

>>
The starting date of the CDM project is 01/06/2005.

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

>>
25 years.

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

C.2.1. Renewable crediting period

>> The starting date of the first crediting period will be the 5th of May of 2008 or the date of registration, whichever occurs later.

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

>>

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

>>

According to Indian regulation, the implementation of biomass plants do not require an Environmental Impact Assessment. The Ministry of Environment and Forests (MOEF), Government of India notification dated June 13, 2002 regarding the requirement of EIA studies as per the Environment Protection Rule, 1986 (MOEF, 2002) states that any project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. Thermal Power Plants with an investment of less than Rs. 1 billion (US$ 21.7 million) are excluded from this list. As the investment of each of the proposed biomass projects (being a Thermal Power Plant) is less than Rs. 1 billion (US$ 21.7 million), an EIA is not required (neither is a public hearing).

A letter from the Ministry of Environment and Forest is enclosed in Annex 6 of the Supporting Documents, to evidence that the project has not required an Environmental Impact Assessment.

In absence of a full EIA requirement, possible environmental impacts of the proposed project are described here. The following environmental aspects are addressed:

- Emissions to air: Biomass emits considerably less NO_x in comparison to coal, oil and natural gas and SO_x than that of coal and oil.
- Bottom ash: Ash disposal is one of the most significant concerns associated with power generation. The proposed CDM project activity will generate approximately a third of the ash generation per MW/year from coal based units
- Water use: Relatively higher water consumption rate compared to coal plants. Not major environmental impacts in comparison to common fossil fuel power plants. The project has a consumption rate of 154 m3/day/MW of installed capacity compared to 130.8 m3/day/MW of installed capacity for large coal based plants. This is to be expected since the proposed project is small and does not have the advantages of economies of scale. Furthermore, the seasonal fluctuations are not significant (0 – 3 m) and since treated effluents will be used for irrigation on the premises (part of this would result in recharge of ground water), the slightly higher specific water consumption may not be considered unsustainable. The Tonk Project is located 5 kilometres from the Galwa Dam and the company has secured approval in-principle to draw water from the Galwa Dam after the drinking water needs of the area have been met.
- Emissions to water: In the condenser cooling water, residual chlorine of about 0.2 ppm is maintained at the condenser outlet. This chlorine dosing is done mainly to prevent biological growth in the cooling tower system. This value would not result in any chemical pollution of water and also meets the national standards for the liquid effluent.

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:

>>

No significant negative environmental issues have been identified. No Environmental Impact Assessment has been required by the Indian Environmental authorities for the proposed project.

SECTION E. Stakeholders' comments

>>

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

>>

Public participation requirements in India

No permits are pending for the Tonk project, at the date of submission of this PDD.

To design, construct and operate a small-scale thermal power plant like the Biomass plants proposed in this project, there are no specific public consultation requirements. Of course the normal formal procedures need to be followed in order to obtain the required land and operational licenses and permits.

Prior to the construction and operation of the power project, the following permissions were obtained:

Before the plant's construction start date:

- Conversion of land from Agricultural to Non Agricultural – from respective District Collector.
- Department of Factories and Boilers under Department of Industries, GOR.
- Rajasthan Pollution Control Board – Initially Consent to Establish (separately for Water and Air).
- Construction Power –From respective Distribution Companies/Vidyut Vitran Nigams

Before the plant's operation date:

- Irrigation Department, GOR, if the Project seeks water allocation from Irrigation canals/networks
- Rajasthan Pollution Control Board –Consent to Operate the Plant
- Electrical Inspectorate (from Electrical Wing of Public Works Department) before the start generating power.

Note that none of the above permissions include public participation, as is common in Europe (i.e. public hearing or publication of the plans and possibility to comment on the plans or to file a complaint or objection). Public hearings may be necessary only if an Environmental Impact Assessment (EIA) is required. This is not the case for small thermal plants (below investment of Rs 1 Billion), as it is stated in Chapter D.

Stakeholder consultation

KPTL checked the opinion on the project through consultation of stakeholders. The following stakeholders were identified:

- The rural population living in the neighbourhood of the plant
- RREC and RVPN
- Government of Rajasthan

Rural local population

The rural population is directly involved with the project. First of all they where considered in the selection of the site for the construction and operation of a power plant in order not to affect their direct environment. During the project's design, attention was given to maintain a very good relationship with the local population. The project depends on the supply of biomass from the rural farmers and therefore a good and mutually beneficial relation is essential.

Quote from the business plan of KPTL:

A key ingredient for the Biomass Developer would be to become a 'friend of the farmer community'. This would require community development schemes and / or rural education programmes to be conducted, which are also part of the social responsibility of Corporates. There should be a genuine desire to pay 'fair' prices and not exploit the farmers.

The biomass resource assessment studies carried out for this project indicated a strong willingness from the farmers to supply biomass residues to the power plant. Before the development of the two CDM project activities from KPTL, mustard crop residues had little commercial value and were not used to a large extent. Thanks to the project farmers have benefited from the new added value to this resource. Moreover, the Tonk biomass cogeneration project has created numerous jobs in the rural areas, where jobs are most wanted and needed. During all field surveys (done by Progressive Research Aids initially in 2001 and then again in 2005), interviews were held with the over 200 contacts (farmers, biomass traders, transporters etc) at each location and no objections where raised against the project.

To further prove this KPTL has obtained a No Objection Certificate from Khatoli Gram Panchayat. This is the village level body formed out of local farmers and residents. The issued a certificate stated that they are aware of the project and have no objection. This letter is attached as Annex 5 of the Supporting Documentation.

RREC and RVPN
As the main stakeholders in the electricity sector, the approval from RREC is essential for the project. RVPN's acceptance and support to the project appears clear from the Power Purchase Agreement (PPA) and Wheeling & Banking Agreements (WBA) with regard to this project (for an extract of the PPA see Annex 10 of the Supporting documentation).

Government of Rajasthan
The Government of Rajasthan was of course first to be consulted via the formal procedures to obtain all necessary licenses and permits. The Bureau of Investment Promotion (BIP) offers a single window for all clearance in time bound manner for large projects and KPTL is seeking their active assistance.

A number of relevant institutions were also asked for their opinion of the project.
- Secretary of the Government, Department of Energy. Responsible for Energy Sector in the entire Rajasthan State (covering RVPN, RPUVN, VVN's, RREC etc.) and strongly promoting the use of Renewables. See Annex 5 from the Supporting Documentation.
- Collector /Administrator in charge of the Tonk District, highest Administrative Officer in the district where the biomass power plant is installed

E.2. Summary of the comments received:

>>
So far only positive comments have been received. The project is welcomed by all stakeholders because it is environmentally benign, it generates income and jobs, it supports the development of the rural districts and the state, it helps bridging the gap between the demand and supply of electricity, reduces T&D losses, among other benefits. Annex 5 from the Supporting Documentation includes evidence on stakeholder comments that were received.

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

>>
As no negative comments have been received, there was no need to address any particular concerns.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Kalpataru Power Transmission Limited *(Supplier of credits)*
Street/P.O.Box:	101, Kalpataru Synergy, opp Grand hyatt, Santacruz (E)
Building:	
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400055
Country:	India
Telephone:	+91 22 30645000/3120
FAX:	+91 22 30643131
E-Mail:	ajaymunot@kalpataru.com
URL:	http://www.kalpatarupower.com
Represented by:	Represented by:
Title:	Executive Director
Salutation:	Mr.
Last Name:	Munot
Middle Name:	
First Name:	Ajay
Department:	
Mobile:	+91 9821025290
Direct FAX:	+91 22 30643131
Direct tel:	+91 22 30643232
Personal E-Mail:	ajaymunot@kalpatarupower.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the financing of this project. Equity for the project is supplied by KPTL, debt is supplied by a private Indian bank.

Annexure-2

(IS / ISO 9001) ACCREDITED BY THE DUTCH COUNCIL FOR CERTIFICATION

KALPA-TARU POWER TRANSMISSION LIMITED

WORKS & REGD. OFFICE :
101, PART-III, G.I.D.C. ESTATE, SECTOR-28,
GANDHINAGAR - 382 028. INDIA.
PHONE : (079) 23214000, 23211951/55
FAX : (079) 23211960/66/68/71

"TO WHOMSOEVER IT MAY CONCERN "

This is to certify that Our Company is a Public Limited listed company where public shareholders at a large hold 36% stake. This original project cost of Tonk Power Plant is 85% funded by borrowing from ICICI Bank, a private sector Indian bank and balance 15% is funded through internal accruals of the company. The sanction letter of ICICI bank (dated 30-09-2005) is enclosed herewith."

For Kalpataru Power Transmission Ltd.

Authorised Signatory

Mumbai Office : Kalpataru Synergy, 8th Floor, Opp. Grand Hyatt Hotel, Vakola, Santa cruz (E), Mumbai 400 055. India.
Tel : +91 22 30645000 • Fax : +91 22 30643131 • www.kalpatarupower.com

Annexure-3

ICICI Bank

CONFIDENTIAL

July 1, 2005

Kalpataru Power Transmission Limited
Plot No. 101, Part III, GIDC Estate,
Sector 28, Gandhinagar 382028
Gujarat

Kind Attention : Mr. Kamal Jain

Dear Sirs:

Application for financial assistance

Please refer to your application and the subsequent discussions your representatives had with us regarding financial assistance towards financing capital expenditure programme involving Biomass Project at Tonk, Rajasthan as approved by lender.

ICICI Bank Limited, Offshore Banking Unit, Mumbai (the "OBU") is pleased to make an indicative proposal for a US$ 5.80 million foreign currency loan facility of seven (7) years (the "Facility") for your consideration as more particularly outlined in the Summary of Terms and Conditions and Special Conditions as attached with this letter.

Please note that the proposal for the captioned Facility is subject to the provisions and terms outlined in the Summary of Terms and Conditions and Special Conditions as attached with this letter and this letter and attached proposal are strictly confidential and may not be shown to or used as a base for discussion with any third party except with the prior written consent from OBU.

Please communicate your acceptance of the terms and conditions attached and furnish two certified copies of the resolutions duly passed by the Board of Directors of your Company as per the proforma forwarded to you approving the terms as set out in this letter before the expiry of this indicative offer, viz by August 15, 2005.

Please note that this communication should not be construed as giving rise to any binding obligation on the part of the OBU unless the Company communicates to the OBU that the terms and conditions set out herein are acceptable to it before the expiry of this indicative offer and executes the Facility Agreement and other documents relating to the above financial assistance and fulfills all the conditions precedent set out in this letter and/or in the financing documents in such form and manner as may be required by the OBU within 15 days thereafter or such further time as may be allowed by the OBU in its absolute discretion.

ICICI Bank Limited
Offshore Banking Branch
Plot No. 8, Block - II, SEEPZ++
SEEPZ Special Economic Zone
Andheri (E)
Mumbai - 400096, India.

Tel. (+91-22) 28249812
Fax (+91-22) 28249880
Website www.icicibank.com

Regd. Off. : Landmark, Race Course Circle, Vadodara 390007.
Corp. Off. : ICICI Bank Towers, Bandra-Kurla Complex
Mumbai 400051, India. Tel. (+91-22) 2653 1414 Fax (+91-22)

Annexure-3

ICICI Bank

Draft of the aforesaid Facility Agreement and other documents covering the above assistance would be forwarded to the Company after the Company has accepted the terms and conditions set out herein.

We look forward to working with you in successfully completing the transaction and should there be any comments or queries from your side, please do not hesitate to contact the undersigned or Mr. Sunil Rola (at sunil.rola@icicibank.com or 919819797361) or Mr. Rajiv Mehta (at rajiv.mehta@icicibank.com or 919820315813).

Meanwhile kindly acknowledge receipt of this letter.

Yours faithfully,

G.V. S. Ramesh
Joint General Manager

Accepted

For Kalpataru Power Transmission Ltd.

K. V. MANI
Managing Director

Annex 3

BASELINE INFORMATION

Information for the calculation of the Grid emission factor.

The following information has been referenced from the CO2 Baseline Database for the Indian Power Sector

Fuel Emission Factors (EF) (Source: Coal/Lignite - Initial National Communication, Gas/Oil/Diesel/Naphta - IPCC 2006, Corex - own assumption)

	Unit	Coal	Lignite	Gas	Oil	Diesel	Naphta	Corex
EF based on NCV	gCO2 /MJ	95.8	106.2	56.1	77.4	74.1	73.3	0.0
Delta GCV NCV	%	3.6%	3.6%	10%	5%	5%	5%	n/a
EF based on GCV	gCO2 /MJ	92.5	102.5	51.0	73.7	70.6	69.8	0.0
Oxidation Factor	-	0.98	0.98	1.00	1.00	1.00	1.00	n/a
Fuel Emission Factor	gCO2 /MJ	90.6	100.5	51.0	73.7	70.6	69.8	0.0

n/a = not applicable (i.e. no assumptions were needed)

Assumptions at Station Level (only where data was not provided by station)

	Unit	Coal	Lignite	Gas	Oil	Diesel	Naphta	Hydro	Nuclear
Auxiliary Power Consumption	%	8.0	10.0	3.0	3.5	3.5	3.5	0.5	10.5
Gross Heat Rate	kcal /kWh (gross)	2'500	2'713	2'013	2'117	1'975	2'117	n/a	n/a
Net Heat Rate	kcal /kWh (net)	2'717	3'014	2'075	2'193	2'047	2'193	n/a	n/a
Specific Oil Consumption	ml /kWh (gross)	2.0	3.0	n/a	n/a	n/a	n/a	n/a	n/a
GCV	kcal /kg (or m3)	3'755	n/a	n/a	10'100	10'500	11'300	n/a	n/a
Density	t /1,000 lt	n/a	n/a	n/a	0.95	0.83	n/a	n/a	n/a
Specific CO2 emissions	tCO2 /MWh	1.04	1.28	0.44	0.68	0.60	0.64	n/a	n/a

n/a = not applicable (i.e. no assumptions were needed)

Assumptions at Unit Level (by capacity; only for units in the BM, where data was not provided by station)

Coal	Unit	67.5 MW	120 MW	200-250 MW	500 MW
Gross Heat Rate	kcal /kWh	2'750	2'500	2'500	2'425
Auxiliary Power Consumption	%	12.0	9.0	9.0	7.5
Net Heat Rate	kcal /kWh	3'125	2'747	2'747	2'622
Specific Oil Consumption	ml /kWh	2.0	2.0	2.0	2.0
Specific CO2 Emissions	tCO2 /MWh	1.19	1.05	1.05	1.00
Lignite	**Unit**	**75 MW**	**125 MW**	**210/250 MW**	
Gross Heat Rate	kcal /kWh	2'750	2'560	2'713	
Auxiliary Power Consumption	%	12.0	12.0	10.0	
Net Heat Rate	kcal /kWh	3'125	2'909	3'014	
Specific Oil Consumption	ml /kWh	3.0	3.0	3.0	
Specific CO2 Emissions	tCO2 /MWh	1.32	1.23	1.28	
Gas	**Unit**	**0-49.9 MW**	**50-99.9 MW**	**>100 MW**	
Gross Heat Rate	kcal /kWh	1'950	1'910	1'970	
Auxiliary Power Consumption	%	3.0	3.0	3.0	
Net Heat Rate	kcal /kWh	2'010	1'969	2'031	
Specific CO2 Emissions	tCO2 /MWh	0.43	0.42	0.43	
Diesel	**Unit**	**0.1-1 MW**	**1-3 MW**	**3-10 MW**	**>10 MW**
Gross Heat Rate	kcal /kWh	2'350	2'250	2'100	1'975
Auxiliary Power Consumption	%	3.5	3.5	3.5	3.5
Net Heat Rate	kcal /kWh	2'435	2'332	2'176	2'047
Specific CO2 Emissions	tCO2 /MWh	0.72	0.69	0.64	0.60
Naphta	**Unit**	**All sizes**			
Increment to Gas Heat Rate	%	2%			
Gross Heat Rate	kcal /kWh	2'117			
Auxiliary Power Consumption	%	3.5			
Net Heat Rate	kcal /kWh	2'193			
Specific CO2 Emissions	tCO2 /MWh	0.64			

Combined Margin	Unit	
Weight OM	%	50%
Weight BM	%	50%

Conversion Factors	Unit	
Energy	kJ /kcal	4.1868
	MJ /kWh	3.6

Oil		
Specific Emission	gCO2 /ml	2.96

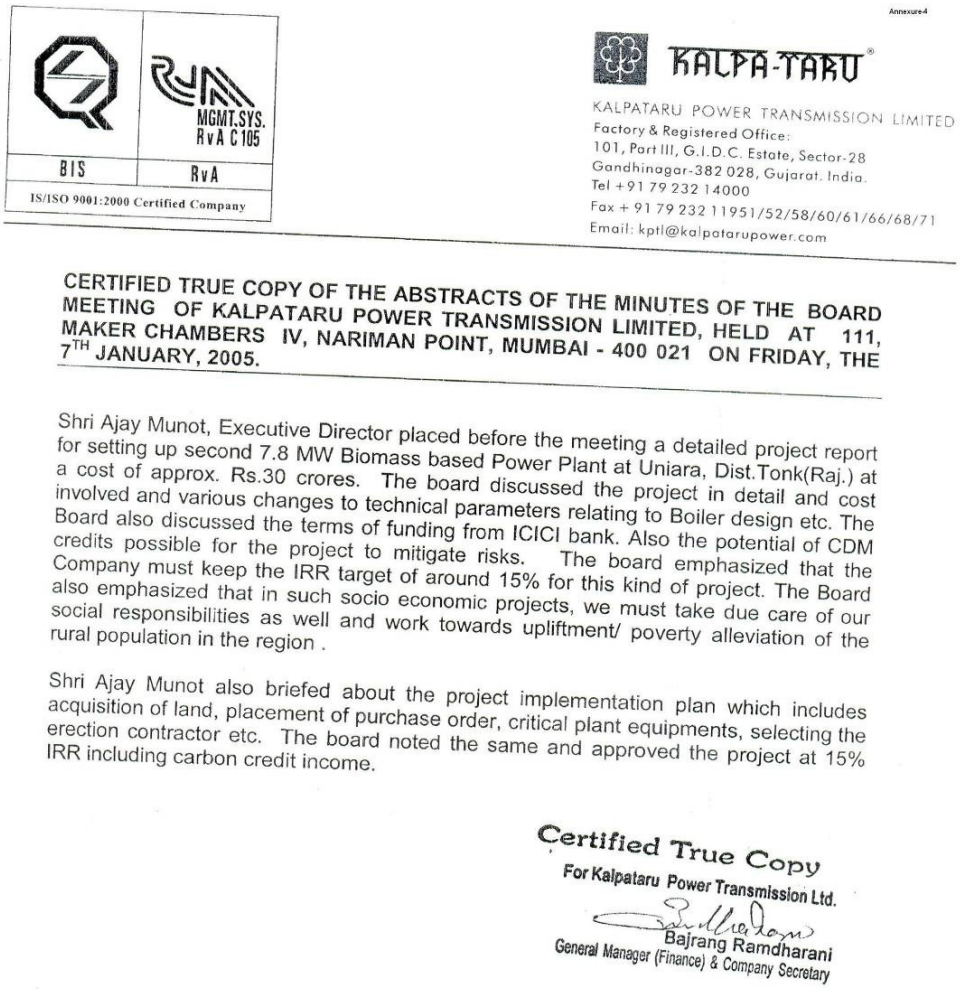
Simple Operating Margin (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.977	0.978	1.000	0.987	0.976	0.995
East	1.220	1.187	1.170	1.196	1.175	1.125
South	1.029	1.000	1.007	1.004	1.000	1.007
West	0.978	1.009	0.983	0.990	1.012	0.993
North-East	0.734	0.710	0.742	0.737	0.840	0.699
India	1.013	1.020	1.017	1.022	1.023	1.019

Build Margin (tCO2/MWh) (not adjusted for imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North					0.534	0.601
East					0.904	0.967
South					0.709	0.711
West					0.770	0.630
North-East					0.146	0.149
India					0.695	0.684

Minute of KPTL's board on investment decision.



BIS RvA MGMT.SYS. RvA C 105
IS/ISO 9001:2000 Certified Company

Annexure-4

KALPA-TARU®

KALPATARU POWER TRANSMISSION LIMITED
Factory & Registered Office:
101, Part III, G.I.D.C. Estate, Sector-28
Gandhinagar-382 028, Gujarat. India.
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CERTIFIED TRUE COPY OF THE ABSTRACTS OF THE MINUTES OF THE BOARD MEETING OF KALPATARU POWER TRANSMISSION LIMITED, HELD AT 111, MAKER CHAMBERS IV, NARIMAN POINT, MUMBAI - 400 021 ON FRIDAY, THE 7TH JANUARY, 2005.

Shri Ajay Munot, Executive Director placed before the meeting a detailed project report for setting up second 7.8 MW Biomass based Power Plant at Uniara, Dist.Tonk(Raj.) at a cost of approx. Rs.30 crores. The board discussed the project in detail and cost involved and various changes to technical parameters relating to Boiler design etc. The Board also discussed the terms of funding from ICICI bank. Also the potential of CDM credits possible for the project to mitigate risks. The board emphasized that the Company must keep the IRR target of around 15% for this kind of project. The Board also emphasized that in such socio economic projects, we must take due care of our social responsibilities as well and work towards upliftment/ poverty alleviation of the rural population in the region .

Shri Ajay Munot also briefed about the project implementation plan which includes acquisition of land, placement of purchase order, critical plant equipments, selecting the erection contractor etc. The board noted the same and approved the project at 15% IRR including carbon credit income.

Certified True Copy
For Kalpataru Power Transmission Ltd.
Bajrang Ramdharani
General Manager (Finance) & Company Secretary

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Annex 4

MONITORING INFORMATION

Documented procedure for monitoring of the Tonk CDM Project

1. Electricity Generation:

1.1. Procedures for measurements and metering

RVPN (Rajasthan Rajya Vidyut Prasaran Nigam Limited) shall own, test and maintain the metering system ("the Main Metering System").

KPTL shall install, test own and maintain meters and metering devices for backup purposes ("the Backup Metering System").

The Main Metering System and the Backup Metering System has been designed to measure outgoing electricity delivered by KPTL to RVPN at the Delivery Point.

RVPN and KPTL shall jointly read the Meters (i.e. "Main Meter" of the Main Metering system and "Backup Meter" of the Backup Metering System) on the first (1) day of every succeeding Billing Month at the Delivery Point.

In the event that the Main Meter is not in service as a result of maintenance, repairs or testing, then the reading of Backup Meter shall be used for Billing during the period the Main Meter is not in service. The monitoring of the operation is carried by the shift engineer or Electrical Manager assistant.

The Meter reading complies with Indian Standards. The Meter reading taken jointly at the appointed date and time will be signed by the representatives of the RVPN and of KPTL. If KPTL's representative is not present, then the RVPN shall provide KPTL with a signed copy of the Meter reading within twenty four (24) hours of such reading of the meter. Such Meter readings shall be treated as the accurate and final measurement, unless proved otherwise, of the electricity supplied to the RVPN by KPTL for the preceding Billing Month for the purpose of payment of Contracted Charges.

In case the power plant uses fossil fuel (after obtaining consent from concerned departments) the shift engineer is responsible to monitor use of fossil fuels. The use of fossil fuels is unlikely to happen.

These considerations are further described the Copy of Power Purchase Agreement mentioning the procedure of meter reading.

1.2 Calibration and Maintenance of the meters

The Main Metering System, the Backup Metering System and the Metering boxes shall be sealed in the presence of RVPN and KPTL.

When the Main Meter and/or Backup meter and/or component thereof is found to be outside the acceptable limits of accuracy or otherwise not functioning properly, it shall be repaired, re-calibrated or replaced by RVPN and/or KPTL, as the case may be, as soon as possible. The responsible for these duties will be the Electrical Manager Assistant.

Seal(s) of the Metering System shall be broken only by the RVPN's representatives in the presence of the KPTL's representative (Electrical Manager Assistant) whenever the Main Metering System or the Backup Metering System is to be inspected, tested, adjusted, repaired or replaced.
Half yearly main meter and back meter are tested by representative of metering division, Rajasthan Power Procurement Center (RPPC). Meter is tested in the presence of KPTL and Grid Substation representatives and the certificate for the same is issued by the RPPC.

Annex 10 of the Supporting document includes the work instruction procedure for calibration of Pressure Gauge, calibration of Thermocouple/RTD, calibration of Pressure/DP Transmitter and calibration of Temperature Gauge.

1.4 Uncertainty Management & Accuracy Levels
There are two meters, one Main Meter and another Back up Meter installed at 132 KV Grid Sub Station at Village Khatoli, Tehsil Uniara. In case the Main Meter fails then only the reading will be taken through the Back up Meter. Both meters have the same specifications and frequency and are approved by Rajasthan Vidyut Prasaran Nigam Limited. This will help to minimize any source of uncertainly.

The meters installed at 132 KV GSS with an accuracy of 0.2 %.
As the monitoring of electricity fed into the grid is done by sealed and certified meters, appropriate assurance is provided to ensure that this will be performed in an accurate way. These meters cannot be manipulated.
The invoices sent to RVPN (compared to meter readings complying with Indian Standards) are covered by a regular audit.

Missing data is only relevant on the level of electricity meters being temporarily out of order. At the 132 kV sub-stations of RVPN at Khatoli there are two meters: the main metering system and a back-up meter. Besides the two meters there will be a meter from KPTL within the plant itself. However this meter is for internal use only and RVPN may not accept these readings for billing purposes. Electricity fed into the grid and unable to be metered will not be registered and invoiced. This will result in less registered emission reductions than actually generated.

1.3 Records
RVPN and KPTL keep complete and accurate records and all other data required by each of them for the purposes of proper operation of the Project. Among such other records and data, KPTL maintain an accurate and up-to-date operating log at the Project site with records of:

a. hourly logs of real and reactive electricity generation, frequency, transformer tap position, bus voltage(s) and any other data mutually agreed;
b. Any unusual conditions found during operation/inspections; and
c. Chart and printout of event loggers, if any, for system disturbances/outages.

All the records are preserved for a period of 36 months.
The responsible for these duties will be the Electrical Manager Assistant.
An example sheet from the log book is attached in Annex 10 of the supporting documentation.
Data will be archived during the crediting period and two years after.

2. Biomass fuel management
2.1. Procedures for measurements and metering
The monitoring of biomass purchased is based on invoices/receipts from farmers and the fuel contractor as well as with the weighbridge log. This will be audited in regular, annual tax and shareholder audits.

The energy content of the biomass is measured on a fortnightly basis with results used to determine the share of energy produced via biomass input in the event of fossil fuels being used

KPTL will recruit an experienced field manager to address all these issues related to Fuel Procurement, fuel handling and monitoring fuel use. Together they will recruit and groom a team of Supervisors and Field Representatives to effectively control and monitor the complete process of fuel procurement, quality issues, and the handling and storage of material in the plant area.

2.2 Calibration and Maintenance of the meters

The Inspector of Weighing and Measurement Department, Government of Rajasthan is regulating the calibration process of the Weigh Bridge. Annually the weighbridge is tested by the Inspector of Weighing and Measurement Department and the Certificate for the same is issued. A copy of the Certificate is enclosed under Annex 10 of the Supporting documentation.

2.3 Records

Along with maintenance information for the high volume sampler, a proper record of checks will also be maintained.

2.4 Uncertainty Management & Accuracy Levels

Random checks will be carried out to monitor the quality of the biomass fuels received (moisture content, purity of the material).

Abbreviations

The following abbreviations have been used throughout the document. Each definition is explained here.

ACC	Associated Cement Company
BIP	Bureau of Investment Promotion
BM	Build Margin
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
CM	Combined Margin
EIA	Environmental Impact Assessment
GoR	Government of Rajasthan
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
KPTL	Kalpataru Power Transmission Ltd.
MCR	Mustard Crop Residues
MNES	Ministry of Non Conventional Energy Sources
MOEF	Ministry of Environment and Forests
MoP	Ministry of Power
OM	Operating Margin
PLF	Plant load factor
PPA	Power Purchase Agreement
PRA	Progressive Research Aids
RERC	Rajasthan Electricity Regulatory Commission
RPPC	Rajasthan Power Procurement Center
RREC	Rajasthan Renewable Energy Corporation
RVPN	Rajasthan Rajya Vidyut Prasaran Nigam Limited
RVUN	Rajasthan Rajya Vidyut Utpadan Nigam Ltd.
SERC	State Electricity Regulatory Commissions
WBA	Wheeling & Banking Agreements