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

CONTENTS

Revision history of this document

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

SECTION A. General description of the small-scale project activity

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

Bagasse based power project at Jamkhandi Sugars Limited, Bagalkot, Karnataka

Version 4.0, June 28, 2006

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

Jamkhandi Sugars Limited (JSL) was established in the year 2000 and commenced commercial operations in October, 2001. The sugar mill has installed capacity to crush 2500 tons of sugar cane per day. JSL has set up the 12.3 MW power plant at Bagalkot District of Karnataka with two turbines of 6 MW and 6.3 MW (Project Activity). The power from the 6 MW is used for auxiliary consumption and the power from the 6.3 MW (project activity) is exported to the Karnataka State Electricity Board (KSEB) through Power Purchase Agreement (PPA) contract.

In the process of sugar production, cane is crushed to extract the juice; this juice is then further processed to white or raw sugar. In the process of crushing the by-product bagasse is produced, a fibrous material. The combustion of bagasse, as biomass, will permit the electricity generated from the project to qualify as renewable. The project will use excess bagasse from the factory and purchased biomass (mainly bagasse but some rice husk) for combustion in the boilers with the resultant steam fed to the turbine generator and the sugar production process.

Bagasse from the mill is conveyed through the conveyors to the cogeneration plant and fed to the boiler. Two turbines are installed to utilize the steam – one turbine of 6.3 MW of Shimnippon of Japanese make and a 6 MW of Kessels of Indian make. Boiler of 70 tons per hour, 45 kg/ cm^2, 420 °C, is installed to consume the bagasse. High pressure steam is produced which is passed on to the steam turbines.

Shimnippon turbine is double extraction cum condensing type and Kessels turbine is back pressure type. Both are connected with 11 KV, 3 phase , 50 Hz generators. The electricity is produced at 11 KV. The power required for the sugar mill operations is consumed at 11 KV and the excess power is stepped up to 33 KV and connected to 33 KV substation at nearby Hirepadasalagi village for export to Karnataka Electricity Supply Company.

The purpose of the project activity is to utilize the bagasse available in the plant for effective generation of electricity for supply to state grid to meet the ever-increasing demand for energy in the state. The project activity would reduce the Green House Gas (GHG) emissions produced by the state grid generation mix, which is mainly dominated by fossil fuel based power plants.

Availability of Bagasse

The plant operates for a period of 240 days in a year. The plant operates in the season for 180 days and the balance 60 days during the off season. The sugar mill has a capacity to generate bagasse, which caters for the whole season and also a part of the off season. In case of exigencies, JSL procure Jaggery bagasse and firewood to operate the plant.

Project activity's contribution to sustainable development

Government of India has stipulated social, economic, environmental and technological well-being as indicators for sustainable development in the interim approval guidelines[1] for CDM projects. JSL believes that the project activity has beneficial effect on agriculture, rural industries and employment in the region and has the potential to shape the economic, environmental and social life of the people in the region, specially unemployed educated/uneducated youth with meagre resources.

Social well being:

- Since, the project is in a rural area, it would lead to overall development of the region.
- Since, the sugar cane is collected and transported to the plant site from the nearby fields, employment opportunities are being generated for uneducated people having meager resources like bullock cart only, to collect the material and supply the same.
- Preference was given to employment of local people during construction and operation at project site thereby creating opportunities in the area for skilled and unskilled labour.

Economical well being:

- The project activity helped to create business opportunity for local stakeholders such as suppliers, manufacturers, contractors *etc*.
- Sugar Cane is collected from the farmers and brought to the project site, which otherwise would have had to be sold in the market which is about 25 KM from the fields thereby also enabling the farmers to get better price out of their produce augmenting their income substantially thereby creating a positive impact on purchasing capacity of the individuals.
- Project activity has helped to reduce the demand-supply gap in the power deficit state grid.

Environmental well being

- Since, the project activity uses only bagasse (carbon neutral fuel) for electricity generation it would eliminate an equivalent carbon dioxide which would have been otherwise generated to produce electricity.
- This electricity generation from the project activity would substitute the power generation by thermal power plants, which supply electricity to the state grid. It would contribute towards the reduction in (demand) use of finite natural resource like coal, natural gas etc. minimizing depletion or else increasing availability to other important processes.

Technological well being

- The technology selected for the power plant is a modern and energy efficient one during its commissioning. High pressure steam is produced which is passed on to the steam turbines. Two turbines viz. 6.3 MW of Shimnippon of Japanese make and 6 MW of Kessels of Indian make are installed to utilize the steam .

In view of the above arguments, JSL considers that the project activity contributes to the sustainable development.

A.3. 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

[1] Ministry of Environment and Forest web site: http://envfor.nic.in:80/divisions/ccd/cdm_iac.html

		participant (Yes/No)
India	Jamkhandi Sugars Limited.	No

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

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

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A.4.1.1. Host Party(ies):

India

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

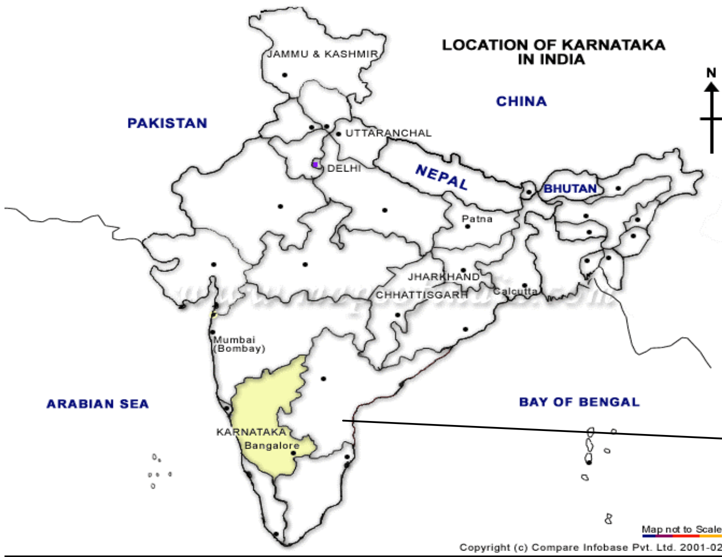
Karnataka

A.4.1.3. City/Town/Community etc:

Village Hirepadasalagi, Jamkhandi Tehsil , Bagalkot District

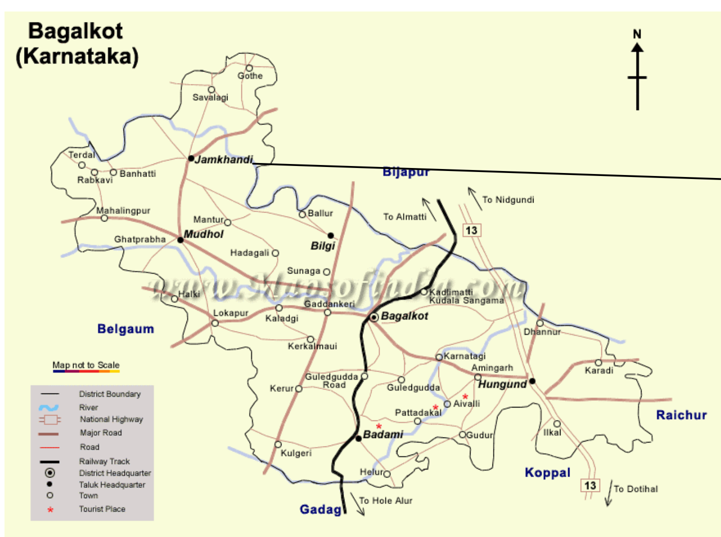
A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

The project activity is located in the Survey number 66, 72, 73, 74, 78, 79 & 80 of Village Hirepadasalagi, Jamkhandi Tehsil , Bagalkot District. Hirepadasalagi village is about 20 Km from Jamkhandi town in Bagalkot district of Karnataka state. Jamkhandi is about 450 Km from Bangalore city, the capital of Karnataka state. The plant is located at an intersection of North Latitude $16^0$31` to $16^0$42` and East Longitude $75^0$18` to $75^0$29`. Sugar mill is located in the close vicinity of sugar cane producing areas. The geographical location of Jamkhandi is detailed in the maps below.



Karnataka State

Bagalkot district



Jamkhandi Sugar mill

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

Type I: Renewable Energy Projects
Category-D: Grid Connected Renewable electricity generation

The project activity is a Bagasse based power plant. The installed/rated capacity of the turbine is only 6.3 MW, which is less than the limit of 15 MW for renewable energy project activities to qualify under Type I project activities.

As per the provisions of Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities, (Version 08: 3rd March 2006) Type ID "comprises renewables, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit".

Project activity comprises biomass based power plant supplying electricity to the Karnatka state grid having emission factor of 0.857 kg CO_2/kWh. With above considerations, the Type I.D. is the most appropriate category for the project under discussion. The project activity does not comprise any electricity generation from non-renewable energy sources.

Technology of project activity

The power plant has boiler sized to produce a maximum of 70 TPH of steam and two turbines of 6.3 MW and 6 MW of double extraction cum condensing type and back pressure type respectively. The 6 MW turbine was installed in October 2001 and the 6.3 MW turbine was installed in September 2002. In order to synchronize both the turbines, the 6.3 MW turbine was also installed with the same operating parameters. The steam conditions at the boiler heat outlet are a pressure of 45 kg/cm^2 and temperature of 420 ^{0}C. The plant and equipment facilities have been designed to comply with the applicable stipulations / guidelines of statutory authorities such as State Pollution Control Board etc. Power is generated at 11 kV at the plant and is evacuated to grid at 33 kV through a 140% capacity transformer.

At 100 % capacity utilisation of boiler about 35 TPH of bagasse (100 % biomass firing) is required. The fuel handling system has been designed for a capacity of 40 TPH. Combustion technology has been selected for the power plant, wherein bagasse is burnt as fuel in a steam generator to produce high-pressure steam, which is then expanded in turbo-generators to generate power.

There is no transfer of technology to the host country since the technology is available in India from reputed manufacturers.

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

The emission reductions from the project will arise directly from exports of electricity to the grid. These exports result directly from the combustion of biomass (bagasse and firewood) which is a renewable source of energy. Hence energy generation from project activity does not lead to any GHG emissions.

The energy supplied by project activity to the state grid would reduce anthropogenic GHG emissions as per the combined margin carbon intensity of the grid, which is mainly dominated by fossil fuel based power plants.

Project activity would supply energy equivalent of approximately 171.71 million kWh to the grid in a period of 10 years thereby resulting in total CO_2 emission reduction of 147,205 tons. In the absence of the project activity equivalent electricity would have to be supplied to the grid customers from a mix of power plants supplying power to grid and consequent CO_2 emissions would occur.

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

Years	Annual estimation of emission reductions in tonnes of CO_2 e	Annual estimation of project emissions in tonnes of CO_2 e
2003-2004	16,117	0
2004-2005	7638	0
2005-2006	15,431	0
2006-2007	15,431	0
2007-2008	15,431	0
2008-2009	15,431	0
2009-2010	15,431	0
2010-2011	15,431	0
2011-2012	15,431	0
2012-2013	15,431	0
Total Credits	147,205	
Total number of crediting years	10 years	
Annual average over the crediting period of estimated reductions ((tonnes of CO_2 e)	14,720	

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

No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

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

The project activity is not a debundled component of a large project activity as the project proponents have not registered or applied to register any small scale project activity:

- in same category; or
- whose project boundary is within 1 km of project boundary of the small scale project activity

SECTION B. Application of a baseline methodology:

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

Main Category: Type I - Renewable Energy Projects
Sub Category: I.D.-Grid connected renewable electricity generation
The reference has been taken from the list of the small-scale CDM project activity categories contained in 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 8, 3rd March 2006'

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

Appendix B of the simplified M&P for small-scale CDM project activities (Version 8) provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. As per this document the project activity falls under Category I.D.-Renewable electricity generation for a grid.

Baseline for projects under Type I.D has been detailed in paragraph 7 of Type I.D. described in Annex B of the simplified modalities and procedures for small-scale CDM project activities. It states that the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in $kgCO_2/kWh$) calculated in a transparent and conservative manner as:

a) The average of the "approximate operating margin" and the "build margin", where:
   i. The "approximate operating margin" is the weighted average emissions (in $kgCO_2equ/kWh$) of all generating sources surviving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;
   ii. The "build margin" is the weighted average emissions (in $kgCO_2equ/kWh$) of recent capacity additions to the system, defined as the higher (in MWh) of most recent 20% of plants built or the 5 most recent plants;

OR

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

Considering the available guidelines and the present project scenario, Karnataka state grid has been chosen for baseline analysis by selecting "The average of the approximate operating margin and the build margin (combined margin)" for baseline calculations. Further details of the baseline are given in section B.5.

The operating margin estimates the effect of the project activity on the operation of existing power plants and the build margin estimates the effect of the project activity on the building of future power plants. There is a gap between demand and supply in the Karnataka grid so there is likely addition of more power plants in the grid mix. Combined margin is calculated as average of operating and build margin, which takes into account the trend of the types of power plant coming up in the grid, thus the uncertainties get addressed by taking the said approach for baseline calculation

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

The implementation of the bagasse based project activity is a voluntary step undertaken by JSL with no direct or indirect mandate by law. The main driving forces to this 'Climate change initiative' have been:

- GHG reduction and subsequent carbon financing against sale consideration of carbon credits.
- Rural Development of the region by creating job opportunities for the local people.
- Demonstration of developing such projects to the other entrepreneurs.

However, the project proponent was aware of the various barriers associated to project implementation. But it was felt that the availability of carbon financing against a sale consideration of carbon credits generated due to project activity would help to overcome these barriers.

This project activity is a renewable energy project with net zero CO_2 emission due to the carbon sequestration. Plants, which are sources of biomass are re-grown at the same rate as it is being harvested, act as a sink for atmospheric carbon dioxide and the net flux of CO_2 to the atmosphere is zero. The power generated by the project activity will replace the State electricity and an analysis of the State grid generation mix gives the conservative baseline CO_2 emission factor of 0.857 $kgCO_2/kWh$ for the credit period. Therefore the project activity will reduce the anthropogenic emissions of greenhouse gases by sources below those that would have occurred in absence of the registered CDM project activity.

The barriers faced by the project activity are discussed below:

Barriers

Although it is well known fact that, power generation with biomass fuels has various advantages, however, it is still not widely applied, particularly in the developing countries like India. For private parties to venture into such an unexplored area, it is a steep diversification from their core industrial economics to power sector economics, where the project proponents needs to meet requirements and challenges of power policies, delivery/non-delivery of power, techno-commercial, social, environmental problems etc. associated with the power project.

Although there is a good potential for IPP's to implement such power projects in India very few have adopted for the similar project activity. The project overcomes the various barriers by taking up the risk of implementing power project, which is not a core business of the promoter group. Further, as per the Electricity Act 2003, the projects that have the lowest tariff will be the market players in future as it encourages competitive tariffs. In this view, the cost of generation of unit with coal will be lower due generation at higher capacity and with use of advanced technologies. Therefore, as a result of enactment of the Electricity Act 2003, the new power projects that would come up will be of coal based so as to be feasible and be competitive in market. This is a policy related threat to the project activity.

As per the attachment A to Appendix B of the simplified M&P for small-scale CDM project activities of the UNFCCC CDM website, to prove that the project is an additional, explanation regarding the project activity would not have occurred anyway due to at least one of the following barriers is required:

(a) Investment barrier
(b) Barrier due to prevailing practice
(c) Other barriers

In this view, the significant barriers to the project that JSL has over come and continue to face and operate the power plant are as under:

a) Investment Barrier to project implementation

In order to implement the project, the project proponent was required to Secure Financial Closure

High upfront cost, lack of easy and long-term financing, project cash flows *etc.* are the known investment barriers to the high efficiency renewable energy projects. Due to restrictions like institutional barriers and low penetration in the region, the accumulation of sufficient funds to finance a high investment and capital-intensive project, such as the CDM renewable energy project is a quite difficult proposition.

Financial closure for the project activity has been achieved at high interest costs. In JSL project too, the restrictions like high upfront cost, technological issues to project implementation, institutional aspects related to project cash flows and no prior experience in power generation with biomass as primary fuel and in selling power to the grid are some of the reasons for the delay in financial closure. The various roadblocks to project implementation have been detailed below. Carbon financing over the 10-year crediting period as one of the cash in flows of the project will add more credibility to JSL's loan repayment capability.

Prevailing practice barrier:

The Business As Usual (BAU) situation for power generation in Karnataka can be considered as coal based thermal power generation with dominating share of more than 55% in the total power generation. At present, power generation with Biomass (bagasse) as a fuel, is not a common prevailing practice in India and Karnataka State also. The barriers inherent in bagasse cogeneration projects may also be highlighted by the lack of projects that have come up. Before the project activity was implemented there were only few sugar mills in the state of Karnataka operating either at the same or lower operating parameters. The table below shows the status of the cogeneration projects commissioned as on December 2004 in the state of Karnataka, which is after the commissioning of the project activity. It is very evident from the table below that the project activity was not a business as usual during its commissioning.

Table B1: Common Practice Analysis for JSL project activity

Total number of Sugar Mills in Karnataka (as on Dec 2004)	46
Cooperative Sugar Mills	21
Sugar Mills under private sector	22
Sugar Mills under joint sector	3
Sugar Mills with co-generation and export of power to grid (as on December 2004)	10
Karnataka Renewable Energy Development Limited (KREDL)	

This illustrates the low penetration of such renewable energy projects and little willingness of entrepreneurs to change the current operating practices in the region. We may conclude from the above statistics that the proposed project under discussion was not a common practice in the region.

Costs of electricity generation from the project activity

In estimating costs of generation from the project activity, a price for bagasse must be input. Determining a national price is difficult as high transportation costs result in a regional bagasse market. In the south of India, the lack of biomass results in some paper companies purchasing bagasse and installing coal fired boilers for sugar mills to generate power and steam. In north India there is also quite an active market for surplus bagasse, again due to the paper industry. In other areas, manufacturing units with captive power units may be the determining factor for the price of biomass.

We have calculated a cost of bagasse from purchases the factory has made in the past year (records of these will be made available to the validator). The following table shows the range of prices achieved during the 2003/04 season:

Table 1: Price of biomass purchased

Type		INR/Tonne
Jaggery Bagasse	High Price	150
	Low Price	500
	Average	325
Juliflora	High Price	700
	Low Price	1200
	Average	950

The average cost of generation per unit from the project activity for the past three years has been INR 2.75/kWH.

The above project cost of generation must be compared with those of alternative relevant generating technologies. Alternative generation expansion facilities for the Karnataka grid are the import of coal-based power from pit-head power stations and the installation of a coal fired power station at Mangalore port (this would therefore utilise imported coal). Coal has been chosen as this currently dominates the Karnataka grid.

The annualised cost of electricity generation from a 100 MW coal plant using imported coal is INR 2.24/kWh[2].

The cost of generation from the JSL project activity is greater than that of the alternative generation options available for expansion of the grid (INR 2.75/kWh v. INR 2.24/kWh). Based on the above outline of the national energy policies and circumstances the most likely scenario would be the least cost alternative and therefore conclude that the project activity is not likely to be the baseline.

b) Institutional barriers:

Electricity generation in India is primarily managed by privatised companies that were previously state run electricity boards. The Electricity Act, 2003 is now the main driver of reform in the electricity sector. The Electricity Act, 2003 consolidated the laws relating to the generation, transmission, distribution and trading of electricity and generally sought to put in place measures to promote the development and supply of electricity across India.

[2] PDD of Registered project of Shree Renuka Sugars, India

The Electricity Act, 2003 consolidated: the Indian Electricity Act, 1910; the Electricity (Supply) Act, 1948; and the Electricity Regulatory Commissions Act, 1998. The Indian Electricity Act, 1910 granted licences for the supply of electricity and provided the general framework for distribution. The Electricity (Supply) Act, 1948 mandated the creation of State Electricity Boards (SEB), each with the responsibility for supplying electricity in the state. Each state through successive Five Year Plans undertook expansion through the utilisation of Plan funds. Over time the performance of SEBs deteriorated due to a number of factors notably the ability to set tariffs and the political implications of such a measure.

To break this link the Electricity Regulatory Commissions Act, 1998 was enacted which created the Central Electricity Regulatory Commission which permits State Governments to create State Electricity Regulatory Commissions. In conjunction with these reforms some states have undertaken reforms of their own, unbundling supply into separate generation, transmission and distribution companies.

In Karnataka the Karnataka Electricity Reform Act was introduced in 1999, which provided the basis for reform of the electricity sector in the state. It split the existing generating, transmission and distribution company up into separate entities. The first wave of reform in April 2000 privatised some generation facilities and placed these under the control and management of a new company Visvesvaraya Vidyuth Nigam Ltd (VVNL). The remaining generators were placed under the control and management of the Karnataka Power Corporation Ltd (KPCL), which remained under the ownership of the state. The Karnataka Power Transmission Corporation (KPTCL) was established at the same time with responsibility for transmission and initially distribution. (This latter function was separated and four distribution companies established within the state in June 2002.) The Electricity Act, 2003 goes further than most state legislation, introducing new elements like open access and power trading into the sector.

Whilst the Electricity Act, 2003 does not explicitly set any targets for renewable energy it does mention that the National Electricity Policy should develop the power sector with regard to the optimal utilisation of resources and renewable is mentioned. It also states that the Central Government should, in consultation with State Governments, set out a national policy "permitting stand alone systems (including those based on renewable sources of energy and other non-conventional sources of energy) for rural areas"[3]. There are certain incentives for bagasse cogeneration projects from the Ministry of Non conventional Energy. There are interest subsidies if the boiler pressures are above 60 bar, in the case of the JSL bagasse cogeneration this does not apply.

JSL is selling power to KSEB through a 10 year Power Purchase Agreement (PPA) contract. For their cash in-flows the project proponent depends on the payments from KSEB against the sale of electricity to the grid. KSEB need to pay JSL against the sale of electricity within a period of one month. However, since the project has exported power to state electricity board, there has been a delay of about 2-3 months in the payment. This has resulted in delay of payment by JSL to the financial institutions, for which JSL is paying additional interest on the interest. This delay of payment from the SEB, has resulted JSL to incur heavy financial losses in the tune of INR 50 Million (INR Fifty Million). It is envisaged that the delay in payment from KSEB would continue which would result in a financial burden to JSL. Further, JSL has signed a PPA with KPCL for the power exported with a base price of INR 3.32/kWH with 5% escalation every year. However, for the past two years there has been no escalation and JSL is being paid the same base price of INR 3.32/kWH. This has resulted in a loss of about INR 5.0 Million (INR Five Million) to

[3] The Electricity Act, 2003, Part II, paragraph 4

JSL. The CDM funds therefore would ensure a financial stability to the project and would also ensure that JSL do not incur heavy financial losses.

c) Other Barriers

Expected policy effects:

The project will have a major effect of The New Electricity Act-2003. This Act consolidates laws relating to electricity generation, transmission, distribution and trading.

As per this Act, bulk purchase of power by SEB's should be routed through tendering process with selection of power supplier offering lowest rate on competitive basis. Since, this Act supports the power generation with lower tariffs, the power generated by the cheaper but carbon emissive fossil fuels like coal and lignite will be purchased by the SEB's and individual bulk consumers with preference. As a result, the power generated using renewable fuels like biomass will get lower priority from these buyers as its generation cost is higher than the generation cost from conventional fuels like coal and lignite.

Due to this new Electricity Act 2003, promoters of JSL may be required to compromise on the selling price of electricity, which will adversely affect the economics of the project. This is a policy related threat to this project.

In such scenario, where the promoter may get forced to offer much lower tariff than the present PPA, CDM funds will certainly help to reduce the gap between the tariff offered by the project activity and the other power generators/suppliers which generate power with lower cost but high carbon emissive fuels like coal and lignite.

This further justifies the need of CDM funds for the project activity, which will help to improve the project feasibility and financial sustainability if the electricity tariffs reduce in future.

Increased Fuel Prices

JSL had set up the project activity with an intention of procuring bagasse from outside during the off season and operate the plant at its full capacity as it was financially viable for JSL to purchase the fuel. However, with the increasing prices of the fuel for the past few years, it was and is not financially viable for JSL to purchase fuel and operate the plant for the whole year at its 100% capacity. JSL, presently operates the plant at 70% capacity, though it could operate at its full capacity and export more to the grid thereby replacing more fossil fuel power. The increasing prices of the fuel have been illustrated above. The CDM funds, if available, would ensure JSL operates the plant at its full capacity and export more green power.

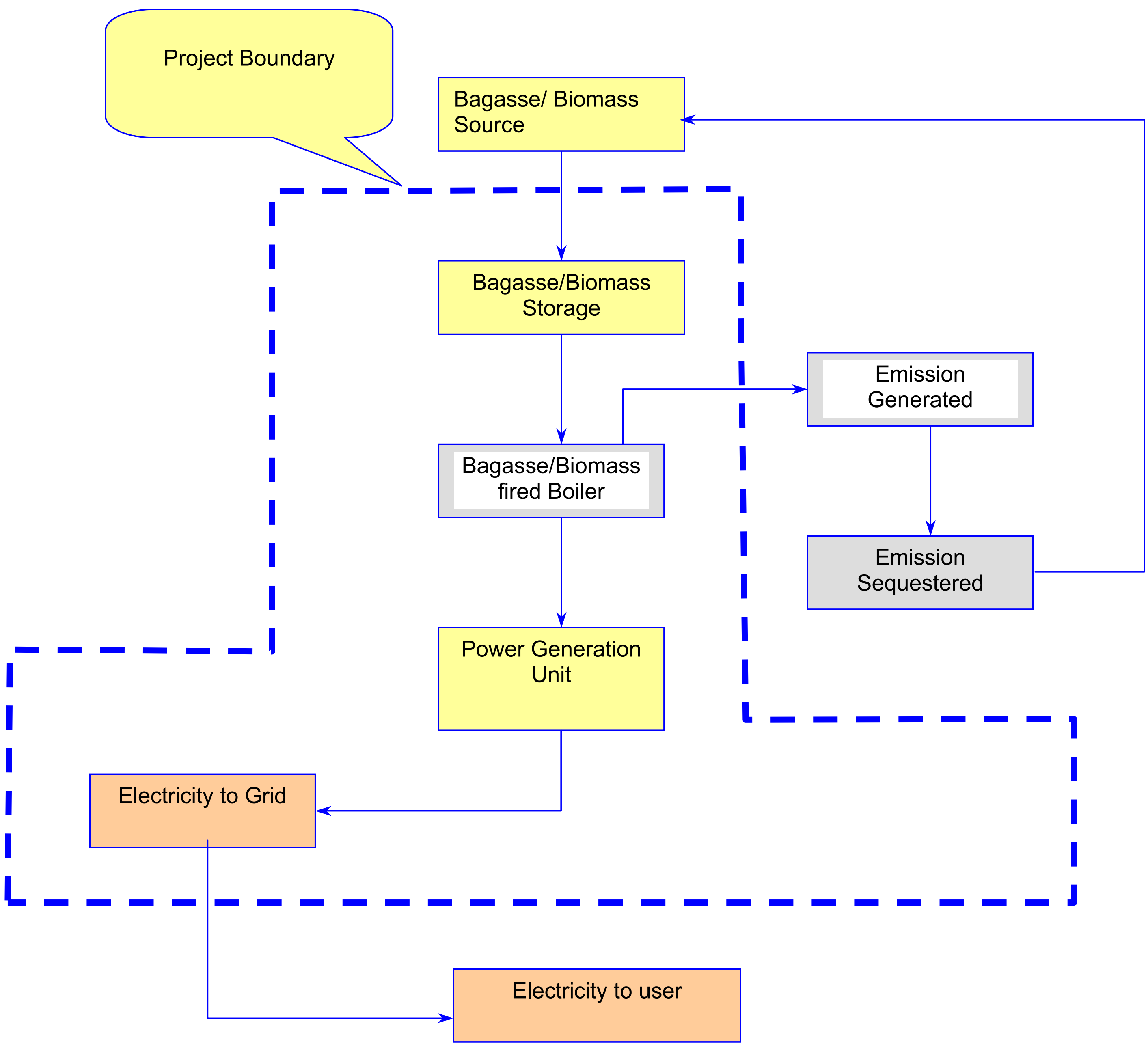
Above barriers are strong enough to affect the decision of project implementation and in case if due to any of the above reason project implementation cancels, the proposed grid to which the project will feed power will alternatively get the power from the project alternatives as discussed above. Since, these alternatives are more GHG emissive, project option only can reduce the GHG emissions. Although there is a good potential for IPP's to implement such power projects in India very few have adopted for the similar project activity due to above strong barriers. Therefore, the proposed renewable energy project is an additional activity as it over comes the above barriers by taking up additional risk of implementation.

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

As mentioned under paragraph 4 of Type I.D. of '*Annex-B of the simplified modalities and procedures for small-scale CDM project activities'*, project boundary encompasses the physical, geographical site of the renewable generation source. For the project activity the project boundary is from the point of fuel storage to the point of electricity supply to the grid interconnection point where the project proponent has full control.

Thus, project boundary covers fuel storage, boiler, steam turbine generator and all other accessory equipments. However, for the purpose of calculation of baseline emissions, Karnataka state electricity grid is also included in the boundary.

Flow chart and project boundary is illustrated in the following diagram:


Project Boundary
Bagasse/ Biomass Source
Bagasse/Biomass Storage
Emission Generated
Bagasse/Biomass fired Boiler
Emission Sequestered
Power Generation Unit
Electricity to Grid
Electricity to user

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

Using the methodology available in paragraph 7 of Type I.D. described in Annex B of the simplified modalities and procedures for small-scale CDM project activities, **the average of the approximate operating margin and the build margin** (in kgCO_{2e}qu/kWh) of current generation mix of Karnataka state grid is used for the calculation of baseline.

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

Project will supply power to KPTCL grid. The methodology demands extensive background data for analysis and application. For detailed analysis, data/information was collected from government/non-government organisations and other authentic sources; Above-mentioned methodology of baseline analysis is used as under for baseline emission factor estimation and estimation of resulting CO_2 emission reduction due to the project.

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

Base line data

Carbon emission factor of grid

Karnataka's present generation mix, sector wise installed capacities, thermal efficiency, and emission co-efficient are used to arrive at the net carbon intensity/baseline factor of the chosen grid. As per the provisions of the methodology the emission coefficient for the electricity displaced would be calculated in accordance with provisions of paragraph 9 of Type I.D. mentioned in Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities for grid systems.

The provisions require the emission coefficient (measured in kg CO_2equ/kWh) to be calculated in a transparent and conservative manner as:

(a) The average of the "approximate operating margin" and the "build margin" (or combined margin)
OR
(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

Complete analysis of the electricity generation has been carried out for the calculation of the emission coefficient as per paragraph 9 (a) given above.

Combined Margin

The baseline methodology suggests that the project activity will have an effect on both the operating margin (i.e. the present power generation sources of the grid, weighted according to the actual participation in the state grid mix) and the build margin (i.e. weighted average emissions of recent capacity additions) of the selected grid and the baseline emission factor would therefore incorporate an average of both these elements.

Operating Margin

The "approximate operating margin" is defined as the weighted average emissions (in kg CO_2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

The project activity would have some effect on the operating margin of the Karnataka State Grid. The carbon emission factor as per the operating margin takes into consideration the power generation mix of 2004-2005 excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation of the selected grid, thermal efficiency and the default value of emission factors of the fuel used for power generation.

The consumer of a state of Karnataka gets a mix of power from the different sources. The figures of installed power capacity, share of the state in the central pool, and actual plant availability decides the content of power. The real mix of power in a particular year is however based on actual units generated from various sources of power. KSEB is operating major thermal and hydel power stations in Karnataka. The state also gets share from the central sector generating plants and interstate power projects. The data collected and used are presented in Table-1 of Annex 3.

The formulae are presented in Section-E and the calculations are presented in an excel sheet as Enclosure

1. Carbon Emission Factor of grid as per Operating Margin is 0.915 kg CO_2/kWh electricity generation.

Build Margin

The "build margin" emission factor is the weighted average emissions (in kg CO_2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants. In order to calculate the build margin, most recent 20% of the existing plants is taken into consideration, the details of which are given in excel sheet enclosed.

Carbon Emission Factor of grid as per Build Margin is 0.799 kg CO_2/kWh electricity generation.

Net Carbon Emission Factor Grid as per combined margin = (OM + BM)/2 = 0.857 kg of CO_2 / kWh generation respectively. (Refer to Excel Sheet Annex 3).

The emission factor for the southern grid is 1.089 kg of CO_2/kWh and that of the Karnataka grid is 0.857 kg of CO_2/kWh. Taking a conservative value, the emission factor of the Karnataka Grid is considered.

B.5.2 Date of completing the final draft of this baseline section *(DD/MM/YYYY*):
10/09/2005

B.5.3 Name of person/entity determining the baseline:

Jamkhandi Sugar Limited and associated expert consultants

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

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

>>

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

23/10/2002

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

25y

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

Project activity would use fixed 10 year crediting period

C.2.1. Renewable crediting period:

>>

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

1/1/2003

C.2.2.2. Length:

10y-0m

SECTION D. Application of a monitoring methodology and plan:

>>

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

Title: Monitoring Methodology for the category I D – Grid Connected Renewable electricity generation

Reference: 'Paragraph 9' as provided in Type I.D. of 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 8, 3rd March 2006'

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

As established in Section A.4.2, the project activity falls under Category I.D and can use the monitoring methodology for type I.D project activities.

The methodology requires the project-monitoring plan to consist of metering the electricity generated by the renewable technology. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for Karnataka grid, would form the baseline for the project activity.

GHG SOURCES

Direct On-Site Emissions

Direct on-site emissions after implementation of the project arise from the combustion of bagasse in the boiler. These emissions mainly include CO_2. However, CO_2 released is taken up by the sugar cane when it grows, therefore no net emissions occur.

Direct Off-Site Emissions

Direct off-site emissions in the project activity arise from the biomass transport. The same type of CO_2 emission occurs during transportation of coal from coal mines to thermal power plants (supplying power to Karnataka state grid) and distance between the coal mine and power plant is much higher as compared to the average transportation distance considered between project site and biomass collection centres and hence higher CO_2 emissions. No Direct off-site emissions in the project activity are envisaged.

Indirect On-Site Emissions

The indirect on site GHG source is the consumption of energy and the emission of GHGs involved in the construction of power plant. Considering the life of the cogeneration plant and the emissions to be avoided in the life span, emissions from the above-mentioned source is too small and hence neglected.

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

Indirect Off-Site Emissions

The indirect off-site emissions include GHG emissions resulting from the erection of the HT lines from the point of generation to the nearest HT lines. Considering the life of the power plant and the emissions to be avoided in the life span, emissions from this source is also too small and hence neglected.

D.3 Data to be monitored:

a. Parameters affecting the emission reduction potential of the project activity

ID Number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	For how long is archived data to be kept?	Comment
1	Power	Total electricity generated	kWh	m	Continuous	Total	Electronic	2 years	Measured in plant premises and monitored and recorded continuously through PLC.
2	Power	Power export	kWh	m	continuous	Total	Electronic	2 years	Measured at supply and receiving end.

b. Fuel related parameters

ID Number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	For how long is archived data to be kept?	Comment
1	Fuel	Bagasse Quantity	MT	M	Hourly	100 %	Paper	2 years after end of crediting period	-
2	Fuel	Biomass (other than bagasse) Quantity	MT	M	Hourly	100 %	Paper	2 years after end of crediting period	-

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

Data	Uncertainty level of data (High/Medium/Low)	Are QA/QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned.
D.3.(a)1	Low	Yes	This data will be used as supporting information to calculated emission reductions by project activity.
D.3.(a)2	Low	Yes	This data will be used for calculation of emission reductions by project activity.
D.3.(b)1	Low	Yes	This data will be used as supporting information to calculated emission reductions by project activity.
D.3.(b)2	Low	Yes	This data will be used as supporting information to calculate emission reductions by project activity.

Key Project Parameters affecting Emission Reductions

Total Power generated by the project: The power exported by JSL would be monitored to the best accuracy and as per the table given in section D.3.

Auxiliary consumption:

There is no auxiliary consumption from the project activity.

Net Power exported to the grid:

The project revenue is based on the net units exported by JSL.

The general principles for monitoring above parameters are based on:

- Frequency
- Data recording
- Reliability
- Experience and training

Frequency

Monthly joint meter reading of main meters installed at interconnection point are taken and signed by authorised officials of JSL and KSEB on the first day of every month. Hourly data recording by the shift in-charge of JSL will be there at generation end.

Data recording

Records of this joint meter reading is maintained by JSL and KSEB. Daily and monthly reports stating the generation, auxiliary consumption, and net power export is prepared by the shift in-charge and verified by the plant manager.

Reliability

For measuring the delivery and import of energy by JSL one main meter is maintained at interconnection point and one check meter is maintained at grid substation of KSEB. Main meter reading would form the basis of billing and emission reduction calculations, so long the meter is found to be within prescribed limits of error during half yearly check.

Monthly joint meter reading of main meters installed at interconnection point is taken and signed by authorised officials of JSL and KSEB on the first day of every month. Records of this joint meter reading is maintained by JSL and KSEB.

JSL would keep requisite sets of metering equipment, duly tested/calibrated, as spares, for replacement as and when required. Main or Check meter would be replaced by spare set of meter with, mutual consent of the parties when a faulty meter is required to be removed.

The Main and Check meter installed at interconnection point would be jointly inspected and sealed on behalf of the parties and shall not be interfered with, by either party except in presence of the other party.

The main and check meter would be test checked for accuracy every six months at KSEB's laboratory and sealed by KSEB and JSL jointly.

If during half yearly test check, main meter is found to be within permissible limits of error and check meter is found to be beyond permissible limits, then billing as well as emission reduction calculation would be as per main meter as usual. However, the check meter would be calibrated and replaced with spare tested calibrated meter, as may be necessary.

If during half yearly test check, the main meter is found to be beyond permissible limits of error but check meter is found to be within permissible limits, then billing as well as emission reduction calculation for the month and upto date and time of the calibration/replacement of defective main meter shall be as per check meter. The main meter would be immediately calibrated and replaced with spare tested calibrated meter, as may be necessary where after billing as well as emission reduction calculation would be as per main meter.

If during half yearly test checks, the main meter and check meter are both found to be beyond permissible limits of error, then both meters would be immediately replaced with spare calibrated meters and correction would be applied to data recorded by main meter to arrive at correct energy figures for billing as well as emission reduction calculation purposes for period of the month and upto time of calibration/replacement of defective meter. Corrections in billing whenever necessary shall be applicable to the period between date and time of previous test calibration and date and time of test calibration in current month when error is observed and correction would be for full value of absolute error. For the purpose of correction to be applied the meter shall be tested at 100, 75, 50, 25 and 10 % load at 1.0, 0.85 and 0.75 lag power factors. Of these fifteen values, the error at load and power factor nearest the average monthly load served at the point during the period shall be taken as error to be applied for correction.

In case main meter at interconnection point becomes defective, billing and emission reduction calculation would be based on readings of check meter installed at grid sub-station. The defective equipment would be immediately replaced by JSL.

If both, main and check meters become defective, then emission reduction calculations for the month would be based on hourly generation and auxiliary consumption data recorded by JSL at generation end.

The meter installed at generation end would be test checked for accuracy every six months. If during half yearly test check, meter is found to be beyond permissible limits, then the meter would be calibrated or replaced with spare tested calibrated meter, as may be necessary.

JSL shall archive and preserve all the monthly invoices raised against net saleable energy, for at least two years after end of the crediting period. JSL shall also archive the complete metering data at generation end on paper and all the data would be preserved for at least two years after end of the crediting period.

The amount of biomass purchased, will be based on invoices / receipts from fuel contractors. The amount of biomass fed to the boiler would also be verified through audit reports.

All the records shall be kept at site itself.

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

The Chief Engineer and the Deputy Chief Engineer (Electrical) are responsible for the operation and maintenance of the power plant. Four mechanical engineers for the operation and maintenance of the power plant assist the chief engineer. Similarly, four electrical engineers assist the Deputy Chief Engineer – Electrical for the power generation. The Chief Engineer would be a qualified diploma/degree engineer with 5-7 year experience in power industry. The Managing Director would be overall responsible for the operation and maintenance of the power plant.

Deputy Chief Engineer (Electrical) is responsible for the hourly data recording of JSL at generation end. The Daily and monthly reports stating the generation and net power export would be prepared by the Engineer and verified by the Deputy Chief Engineer – Electrical, who would maintain the records. Records of joint meter reading would be maintained at site. The Chief Engineer maintains records with regard to the operation and maintenance of the boiler and turbine.

As and when required and identified, people are sent to short term training courses on operation and maintenance of the power plant. Similarly, in house training is also provided on need basis. The General Manager – Works and the chief engineer are responsible for identifying the training needs and maintaining the undergone training records.

Adequate fire fighting and safety equipment are installed as per the guidelines of the Directorate of Factories. The Assistant Manager - Personnel and Chief engineer are responsible for the upkeep of the safety and fire fighting and maintain necessary records.

Calibration of the main meters recording the power exported is done by KPTCL every year and necessary records are maintained by both KPTCL and JSl. Similarly, calibration of the weigh bridge recording the quantity of fuel, is done by department of weights and measures every year and the monitoring is done every month. The Assistant Manger- Personnel department maintains records of the same.

In order to ensure that the project emissions are being regularly monitored and to ensure the function of the monitoring system, the General Manager- Works would carry out an audit every six months and maintain necessary records of the same. Necessary corrective and preventive action based on the audit findings would be carried out.

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

Jamkhandi Sugars Limited has determined the monitoring methodology and they are project participant as listed in Annex 1 of this document.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

Since category I.D. does not indicate a specific formula to calculate the GHG emission reduction by sources, the formula is described below in E.1.2

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

>>

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

The project activity leads to GHG on-site emissions in the form of CO_2 emissions from combustion of bagasse. The project activity uses an environmentally renewable resource as fuel for power generation. The plantations, representing a cyclic process of carbon sequestration, will consume the CO2 emissions from bagasse combustion process. Since the bagasse contains negligible quantities of other elements like Nitrogen, Sulphur etc. release of other GHG emissions are considered negligible. GHG emissions during on-site construction work are negligible compared to GHG reductions in the project lifetime and are not accounted for. Similarly emissions associated with transportation of construction materials are ignored. Hence there would be zero emissions from the project activity.

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

As prescribed in Appendix B of the Simplified Modalities and Procedure for small-scale CDM project activities, for Category I.D leakage estimation is only required if there has been any transportation of either any equipment or fuel. As biomass is transported from nearby area, leakage due to the transport of fuel is taken into account.

Emissions due to transportation of biomass		
Total biomass required	Ton/year	32500
Biomass transported by tractor trolly	Ton/year	32500
Biomass load per truck	Ton	10
Total no. of trips		3250
Average distance between project site and collection centres	Km	50

Consumption of diesel per trip (to and fro)(@5km/lit)	Litres	20
Total diesel consumption	Litres	65000
Calorific value of diesel	TJ/lit	0.0000283
Emission factor for diesel	t CO_2/TJ	74.1
Emissions due to transportation of biomass	**t CO_2 /year**	**136**

The same type of GHG emissions occur during transportation of coal from coal mines in Andhra Pradesh to respective thermal power plants in Karnataka. Since the distance between the coalmines and power plant (avg. 750 kms.) is much higher as compared to the transportation distance of biomass, the GHG emissions would be higher in the earlier case. Considering the transportation leakages for the 2 fuels, there is a net positive addition on the baseline emission, which will result in net increase in CO_2 reduction from the project. To be on conservative side, this CO_2 emission due to coal transportation and biomass transportation has not been considered while calculating the baseline emissions and project emissions respectively.

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

Zero project activity emissions are envisaged.

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

KPTCL grid is considered for baseline analysis and calculation of anthropogenic emissions by fossil fuels during power generation. As mentioned in Chapter B, in the KPTCL generation mix, coal and gas based power projects are responsible for GHG emissions. We have considered here the average of the approximate operating margin and the build margin (Combined Margin) for baseline calculations

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

Scenario I: The average of the approximate operating margin and the build margin **(Combined Margin Method)**

- **Baseline Power generation**

$$P_{wlc} = P_{tot} - P_{lrc}$$

Where,
P_{wlc} - Power generation by all sources, excluding hydro, biomass and nuclear.
P_{tot} - Power generation by all sources of grid mix.
P_{lrc} - Power generation by hydel, nuclear, biomass projects

- **Sector wise baseline Power generation**

$$P_{fuel} = \frac{P_f}{P_{wlc}} x100$$

Where,

P_{fuel} - Share (in %) of power generation by each fuel used (coal, gas and diesel in present scenario), out of total power generation excluding P_{lrc}

P_f - Power generation by fuel used. (in Million kWh units)

- **Calculation of Operating Margin emission factor**

$OM_{bef} = \sum P_{fuel} \, x \, E_{fuel}$ for base year for Scenario 1

Where,

OM_{bef} - OM Emission factor of baseline for base year (kg/kWh)

E_{fuel} - Emission factor (actual or IPCC) for each fuel type considered (*e.g.* coal, gas, etc.).

- **Calculation of Build Margin emission factor for each source of baseline generation mix**

BM_{yr} = weighted average of emissions by recent 20% capacity additions.

Where

BM_{yr} = Build Margin for base year.(kg/kWh) = $\left(\frac{\sum P'_f E'_f}{\sum P'_f} \right)$

Where

P’$_f$ - Generation capacity from specific fuel in the most recent 20% power plants

E’$_f$ - Emission factor for the specific fuel in the most recent 20% power plants built

- **Combined Margin Factor**

CMF for crediting period

= $(OM_{bef} + BM_{yr}) / 2$ (in Kg/kWh)

[Refer to Baseline Excel sheet in Annex 3]

- **Power generation and export by project activity**

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

Where,

TP_{gen} - Total power generated

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

TP_{loss} - T & D Loss

(all power units are in Million kWh)

The metered value of power export to grid is to be used for further estimations.

- **Emission Reduction by project activity**

$$ER = TP_{\exp} x\left(NEF_B - NEF_P\right) - PE - EL$$

Where,
ER - Emission reduction per annum by project activity (tones/year)
TP_{exp} - Total clean power export to grid per annum
NEF_B - Final Emission Factor of baseline
NEF_P - Net Emission Factor of project activity [= 0]
PE – Project emissions
EL – Emission Leakage (tones/year) [= 0]

- **CO_2 equivalent Emission Reduction by project activity**

$$ER = TP_{\exp} x\left(WA_{bef} - NEF_P\right) - PL - EL$$

Where,
ER - Emission reduction per annum by project activity (tonnes of CO2 equ/year)
TP_{exp} - Total clean power export to grid per annum (MU)
WA_{bef} - Final Emission Factor of baseline
NEF_P - Net Emission Factor of project activity baseline
PL – Project Emission Leakage (tonnes/year)
EL – Emission Leakage (tonnes/year)

Since there is a gap in demand and supply scenario in Karnataka, the export of power to grid will replace or get absorbed to partially fulfill the Karnataka State power requirement. If the same amount of electricity would have been generated by a mix of coal and gas based power project, it will add to the emissions that is getting reduced by the project activity. Hence, the baseline calculated using above method would represent the anthropogenic emissions by sources (due to use of carbon emissive fuels) that would occur in absence of the proposed project activity.

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

Following formula is used to determine Emission reduction

CO_2 emission reduction due to project activity	=	Baseline emission	–	Project Activity emission

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

Emission reductions by project activity for 10-year crediting period have been calculated and tabulated below:

Table E.2.1: Emission Reductions

Sr. No.	Operating Years	Net Baseline Emission Factor (kg of CO_2 / kWh)	Baseline Emissions (Tons of CO_2)	Project Emissions (Tons of CO_2)	Emission Reductions, (Tons of CO_2)
1.	2003-2004	0.857	16,117	0	16,117
2.	2004-2005	0.857	7,638	0	7,638
3.	2005-2006	0.857	15,431	0	15,431
4.	2006-2007	0.857	15,431	0	15,431
5.	2007-2008	0.857	15,431	0	15,431
6.	2008-2009	0.857	15,431	0	15,431
7.	2009-2010	0.857	15,431	0	15,431
8.	2010-2011	0.857	15,431	0	15,431
9.	2011-2012	0.857	15,431	0	15,431
10.	20012-2013	0.857	15,431	0	15,431
		Total CERs			**147,205**

Therefore a conventional energy equivalent of 171.71 million kWh for a period of 10 years would be saved by exporting power from the project activity, which in turn would reduce 147,205 tons of CO_2 emissions considering baseline calculations.

SECTION F.: Environmental impacts:

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

A detailed Environmental Impact Assessment report highlighting the impacts arising from the project has been prepared and submitted to the Karnataka State Pollution Control Board (KSPCB). On reviewing the EIA report, the KSPCB has accorded the 'Consent to Operate'.

The design philosophy of this project activity is driven by the concept of providing the energy with no impact on the environment. The environmental aspects of the project activity are discussed below.

The pollutants generated from the power plant include:

- Dust and particulate matter
- Fly ash from the hoppers
- Effluent from water treatment plant
- Sewage from the plant

Control methods for air pollution

Dust and particulate matters

The pollution control norms stipulate a maximum dust concentration of 115mg//Nm^3. The power plant has proposed to install Air Pollution control equipment, which separates the dust from the flue gas and dust concentration is the flue gas meets the prescribed standards.

The dust concentration level in the chimney is periodically monitored. Corrective steps are taken, if the concentration is not as per the acceptable limits.

Sulphur-di-oxide and Nitrogen-di-oxide

The main fuel in the power plant is bagasse, which does not have significant amount of sulphur in it. Hence, the sulphur dioxide is not produced. However, the stack height is as per the local pollution control board stipulations.

The nitrogen-di-oxides are not produced in firing.

Fly Ash and Bottom Ash

The ash collected from the bottom of furnace (bed ash) is taken to an ash silo through a series of conveyors. The ash from the silo is disposed off to farmers, who use the ash as manure for the crops.

Control methods for water pollution

Effluents from Water Treatment Plant

JSL has installed an Effluent Treatment Plant to treat the effluent generation. The treated effluent meets the statutory requirements and is used for gardening.

Boiler Blowdown

In order to maintain the solid concentration in the boiler feed water, two types of blowdown are employed in the boiler. One type is continuous blowdown and the other intermittent blowdown.

Sewage from the Power Plant Buildings

The sewage from the various power plant buildings is taken to a common septic tank through trenches. The sewage from the septic tank is disposed off manually.

Control methods for noise pollution

The major source of noise pollution in the power plant power plant is from the following:

- Rotating equipments like ID, FD and SA fans
- Feed pumps
- Boiler and superheater safety valves
- Start up vent
- Steam turbine

As per OSHA standards, the rotating equipments are designed to keep sound level between 85 to 90 dBA. The start up vent, safety valve outlets and the DG sets are provided with silencers to reduce the noise level to the acceptable limits. The power house building has been constructed suitably to keep the noise level within the acceptable limits.

SECTION G. Stakeholders' comments:

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

JSL organised stakeholder consultation meetings with individual village panchayat (elected body of representatives administering the local area) in the area with the objective to inform the interested stakeholders on the environmental and social impacts of the project activity and discuss their concerns regarding the project activity. Invitation for stakeholder consultation meetings were sent out requesting the members of village panchayat to participate and communicate any suggestions/objections regarding the project activity in writing. On the day of meeting, JSL representatives presented the salient features of the company and the project activity to the participants and requested their suggestions/objections.

The other stakeholders identified for the project activity are as under:

- Elected body of representatives administering the local area (village *Panchayat*)
- Karnataka Power Transmission Corporation Limited (KPTCL)
- Karnataka Electricity Regulatory Commission (KERC)
- Karnataka Renewable Energy Development Agency Limited (KREDL)
- Karnataka Pollution Control Board (KPCB)
- Environment Department, Government of Karnataka
- Ministry of Environment & Forest (MoEF), Government of India
- Ministry of Non Conventional Energy Sources (MNES)
- Ground water / Irrigation department
- Non-Governmental Organisations (NGOs) of the nearby area
- Project Consultants
- Equipment Manufacturers / Suppliers

Stakeholders list includes the government and non-government parties, which were involved in the project activity at various stages. At the appropriate stage of the project development, JSL consulted them to get the comments. The comments received are available on request.

G.2. Summary of the comments received:

The village Panchayat /local elected body of representatives administering the local area is a true representative of the local population in a democracy like India. Hence, their consent / permission to set up the project is necessary. JSL has already completed the necessary consultation and documented their approval for the project.

Local population comprises of the local people in and around the project area. The role of the local people are as a beneficiary of the project. They supply raw material *i.e.* sugar cane for sugar mills and biomass for cogen plant. In addition to this, it also includes local manpower working at the plant site. Since, the project will provide good direct and indirect employment opportunities the local populace is encouraging the project.

The project will not require displacement of any local population. In addition, the local population is also an indirect consumer of the power that is supplied from the power plants. This is essentially because the power sold to the grid is expected to improve the stability in the local electricity network. Since, the distance between the electrical substation for power evacuation and the plant is not very high, installation of transmission lines will not create any inconvenience to the local population.

Thus, the project will not cause any adverse social impacts on local population rather will help in improvising their quality of life.

Karnataka Pollution Control Board (KPCB) and Environment Department of Government of Karnataka have prescribed standards of environmental compliance and monitor the adherence to the standards

As a buyer of the power, the KPTCL is a major stakeholder in the project. They hold the key to the commercial success of the project. KPTCL has already cleared the project and JSL has already signed Power Purchase Agreement (PPA) with KPTCL.

The government of India, through Ministry of Non-conventional Energy Sources (MNES), has been promoting energy conservation, demand side management and viable renewable energy projects including wind, small hydro and bagasse cogeneration / bio-mass power.

Project consultants are to be involved in the project to take care of various pre contract and post contract project activities like preparation of Detailed Project Report (DPR), preparation of basic and detailed engineering documents, preparation of tender documents, selection of vendors / suppliers, supervision of project implementation, Successful commissioning and trial runs.

Equipment suppliers will be supplying the equipments as per the specifications finalized for the project and will be responsible for successful erection & commissioning of the same at the site and for performance.

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

JSL in a meeting with the local pollution control board (Karnataka State Pollution Control Board) highlighted the various environmental issues with regard to the project. After evaluating the project, KSPCB granted the ‘Consent to Establish’ and “Consent to Operate”. This detailed and thorough process ensures proper stakeholders consultation.

In view of various direct and indirect benefits (social, economical, environmental), no concerns were raised during the consultation with stakeholders, hence it is not required to take due account of the comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Jamkhandi Sugars Limited
Street/P.O.Box:	Hirepadasalagi village , Jamkhandi Taluk,
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Direct FAX:	--
Direct tel:	--
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

Annex 3

Baseline and CER calculation excel sheets
Separate File attached

Table-1
Generation Details

Generation Mix	2002-2003	2003-2004	2004-2005
	MU	MU	MU
Thermal Coal Based-State	9391.10	10415.27	9799.11
Thermal Coal Based-Central	7571.21	6949.04	8081.35
IPP-Coal Based	0.00	0.00	0.00
IPP-Gas (Naphtha) Based	1178.18	866.37	630.27
IPP-Diesel Based	418.75	277.13	277.35
VVNL-Diesel Based(State)	684.98	523.78	573.53
Hydro-State	7062.54	7364.49	8152.98
IPP-Mini Hydel	185.55	158.09	315.74
VVNL-Hydro (State)	250.23	191.35	209.52
Hydro - TB Dam	14.75	6.91	28.01
Nuclear Based-Central	1010.73	926.72	871.14
IPP-Co-Generation	330.32	383.36	515.00
IPP-Biomass	45.33	52.98	176.39
IPP-Wind	94.74	269.63	489.53
Imports	516.5	2337.2	2493.9
Total	**28754.91**	**30722.32**	**32613.82**

Source: Karnataka Power Corporation Limited

Annex-4
ABBREVIATIONS

BAU	Business As Usual
BESCOM	Bangalore Electric Supply Company Limited
BM	Build Margin
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reduction
CO_2	Carbon dioxide
CPU	Central Power Units
DPR	Detailed Project Report
EIA	Environment Impact Assessment
EPS	Electric Power Supply
GHG	Greenhouse gas
INR	Indian Rupees
IPCC	Inter Governmental Panel On Climate Change
IPP	Independent Power Producer
IREDA	Indian Renewable Energy Development Agency
ISPLAN	Integrated System Plan
JSL	Jamkhandi Sugar Limited
Kg	Kilogram
Km	Kilometer
KERC	Karnataka Electricity Regulatory Commission
KPCL	Karnataka Power Corporation Limited
KPTCL	Karnataka Power Transmission Company Limited
KREDL	Karnataka Renewable Energy Development Agency Limited
KSPCB	Karnataka State Pollution Control Board
KSEB	Karnataka State Electricity Board
KW	Kilo watt
KWh	Kilo watt hour
MNES	Ministry of Non Conventional Energy Sources
MoEF	Ministry of Environment and Forest
MOU	Memorandum of Understanding
MW	Mega watt
MWh	Megawatt Hour
NGO	Non Government Organization
OM	Operating Margin
PDD	Project design document
PLF	Plant Load Factor
PPA	Power Purchase Agreement
SEB	State Electricity Board
SGS	Shivanasamudram Generation Station
SHR	Station Heat Rate
SPM	Suspended Particulate Matter
TPH	Tons per Hour
T&D	Transmission & Distribution
UNFCCC	United Nations Framework Convention on Climate Change
VVNL	Vishweshwrayah Vidhut Nigam Limited

ANNEX-5
LIST OF REFERENCES

Sl. No.	Particulars of the references
1.	United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
2.	UNFCCC document: Clean Development Mechanism, Simplified Project Design Document For Small Scale Project Activities (SSC-PDD), Version 02
3.	UNFCCC document: Simplified modalities and procedures for small–scale clean development mechanism project activities
4.	UNFCCC document: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, Version 05
5.	UNFCCC document: Determining the occurrence of debundling
6.	Ministry of Power (MoP), Govt. of India, www.powermin.nic.in
7.	Central Electricity Authority (CEA), Govt. of India, www.cea.nic.in
8.	Emission Baselines-Estimating the Unknown, International Energy Agency
9.	Ministry of Environment and Forest, http://envfor.nic.in/cdm/host_approval_criteria.htm
10.	Detailed Project Report for Jamkhandi Sugars Limited.
11.	Project Design Document of Renuka Sugars,

ENCLOSURE - I :

CURRENT POWER SCENARIO & POLICIES

Power generation is the harbinger of economic growth and industrial development of any country. Although it is a life stream of country like India, it contributes to the GHG emissions as the fossil fuels have major share in total power generation. This section covers the current power situation in India and Karnataka State (KS), development of renewable energy sources, central and state policies, future energy projections, current power delivery system *etc.*

1.0 National Power Scenario

Indian power sector is facing challenges and despite significant growth in generation over the years, it has been suffering from shortages and supply constraints. Energy and peak load shortages were 7.8 % and 13 % respectively in the year 2000-01. The per capita electricity consumption in India is about 400 kWh/year, which is significantly lower than the world average of around 2,100 kWh/year. As GDP growth accelerates to an ambitious 8 to 10 %, the shortage of power will become more severe (source: Reference No. 25)

The power situation in India is characterised by demand in excess of supply, high Transmission and Distribution (T&D) losses, low Plant Load Factor (PLF), peak demand and energy shortages, poor financial health of the State Electricity Boards (SEBs) and severe resource crunch. The power sector reforms in the country and consequent privatisation of generation, T & D have been sluggish, due to complexities involved. The Ministry of Power has been making continuous efforts for promoting reduction of T&D loss and re-structuring of SEBs. The electricity regulatory commissions, recently formed as a part of the reforms, have been still learning to exercise adequate control on power tariffs.

With reference to above power and energy scenario, Ministry of Power (MoP) and Ministry of Non-conventional Energy Sources (MNES), Government of India, has been promoting viable renewable energy technologies including wind, small hydro and biomass power, energy conservation, demand side management *etc.* MNES has been promoting various sources of renewable energy since 1990.

Wide spread need of power generation has created the need for a cheap and readily available commercial fuel for generating electricity at low cost. Coal was the first to be selected in India as a commercial fuel in early thermal power stations and is still king of the power market.

Central Electricity Authority (CEA) has initially projected a shortfall of 1,50,000 MW in 15 years and therefore, a capacity addition target of 10,000 MW every year, the actual capacity addition has been far short of targets. The CEA has recently revised the capacity addition target to 1,00,000 MW from earlier target. This implies an annual addition of 8,500 MW as against earlier fixed of 10,000 MW. Capacity addition in the last five years including financial year 2000 was average 3,000 MW per year. Out of the total capacity added during last five years, 49% was added by the states and balance by central plants, excluding only 4% contributed by private sector. This indicates that, the states have been the largest contributors to incremental capacity.

The sustained economic development in India has created a critical need for additional power generation capacity. To augment the existing installed capacity of about 101,154 MW (year 2000-01), the Government of India has encouraged private sector participation in the power generation.

To assess the all India capacity requirements by the end of eleventh plan to meet the demand projected by 15th Electric Power Survey (EPS) report, Central Electricity Authority (CEA) carried out planning studies using updated version of Integrated System Plan (ISPLAN) model, which optimises generation capacity additions in an integrated manner with power transmission and fuel transportation. The studies are based on updated data base, keeping in view the development in power sector in recent past, likely achievement during 9th Plan, the perspective plans prepared by Central Power Units (CPUs) and also latest status of Independent Power Producers (IPP) and state sector projects.

The CEA report "Power on Demand By 2012" has indicated that the level of satisfaction would be 85% only with the identified installed capacity of about 2,10,000 MW by the end of eleventh Plan (2011-12), leaving a gap of about 22,600 MW in demand. Additional projects to the tune of 30, 000 MW capacity need to be identified to meet the full peaking requirements. On the other hand, if the demand in terms of peak as well as energy is reduced by 15%, then the present level of identified projects including projects covered in CPUs perspective plan is found to be adequate. Hence, energy conservation activities and power generation from renewable sources have an important role in management of demand and energy requirement.

Out of total existing generation capacity, nearly 72% is contributed by thermal power. With a need for sustainable economic growth, the Government of India, through the Ministry of Non-Conventional Energy Sources (MNES), is encouraging and catalysing the growth of renewable energy based power including biomass, wind, hydro, solar photo-voltaic *etc.* It is expected that a judicious mix of centralised fossil fuel power plants and decentralised renewable energy based power plants will lead to an environmentally friendly augmentation of the power sector in India. In addition to this central government and all the State Governments are encouraging the Energy conservation activities in all the sectors like industrial, domestic, commercial, agricultural *etc.* Implementation of electrical energy conservation projects / programmes at various sectors will also help in reduction of peak demand along with the financial gains through reduction of energy consumption.

2.0 Power From Renewable Energy Sources

Renewable energy technologies based on the inexhaustible resources of sunlight, wind, water and biomass are considered to offer sustainable energy alternatives to a world beset by serious environmental problems and volatile fossil fuel politics. An increasing share of global energy needs is expected to be met by renewable in the years ahead. (Source: Reference No. 25)

India is abundantly endowed with renewable energy resources viz. solar energy, wind energy, biomass and small hydro, widely distributed across the country, and can be utilised through commercially viable technologies to generate power. Increasing use of these sources will also be instrumental in simultaneously achieving environmental objectives like reduction of GHG emission. Details of renewable energy potential and achievement as on March, 2003 is presented in Table-2.1.

TABLE – 2.1 : RENEWABLE ENERGY POTENTIAL & ACHIEVEMENT

Sr.No.	Source / Technologies	Approximate Potential	Achievement
1.	Wind Energy	45,000 MW	1,870 MW
2.	Small Hydro (up to 25 MW)	15,000 MW	1,509 MW
3.	Biomass / Bagasse	19,500 MW	483.9 MW

Sr.No.	Source / Technologies	Approximate Potential	Achievement
	Co-generation		
4.	Solar PV	20 MW / km^2	***121 MW***
5.	Urban & Industrial Waste	1,700 MW	25.8 MW
6.	Biogas Plants	120 Millions	3.5 Millions
7.	Biomass gasifiers	-	53.4 MW
Source: mnes.nic.in/ach1.htm			

From above table, around 4063 MW (around 3.5 % of total installed capacity) capacity of Renewable Energy (RE) projects have been installed in the country. India is planning to add about 12,000 MW power generating capacity from renewable by the end of 11th plan (2011-2012). Almost half of it is expected to come from wind, 3,500 MW from biomass and 2,000 MW from small hydro.

As per CEA's Fourth National Power Plan, anticipated capacity additions from Non-Conventional energy sources is presented in following Table-2.2

TABLE – 2.2 : CAPACITY ADDITIONS FROM NON-CONVENTIONAL ENERGY SOURCES

Sr.No.	Source of Energy	PROGRAMME CAPACITY IN MW		
		9th plan	**10th plan**	**11th plan**
1.	Wind Power	3,000	6,000	9,000
2.	Small Hydro	1,000	2,000	3,000
3.	Biomass Cogeneration	1,000	2,000	3,000
4.	Solar Thermal Power	300	600	900
5.	Solar Photovoltaic	200	400	600
6.	Bio energy / Biomass Power	1,000	2,000	3,000
	TOTAL	**6,500**	**13,000**	**19,500**
Source: CEA report on fourth national power plan				

Although, India is implementing one of the world's largest programmes on renewable energy, the present output from "renewable", in the national energy scene, is less than two per cent of the installed capacity, it has not matured into a major alternative. The major barriers and bottlenecks for development of renewable energy includes following:

- High captive investment and low commercial viability
- Lack of adequate capital at affordable cost
- Limited access to financial resources and high cost of finance

- Lack of awareness (e.g. bagasse is available with farmers with no exposure of power sector economics)
- Lack of large scale production facilities

If the projects get the financial benefit under flexibility mechanisms of Kyoto Protocol then above barriers can be overcome to some extent.

3.0 Biomass Power Generation in India

Total Potential – 19500 MW

Considering above potential for environment friendly biomass power in India, the major stakeholders of power sectors like, industry, SEBs and policy makers started the developmental efforts in the early eighties.

In spite of having huge potential, the actual achievements till date are very poor due to major barriers related to initial capital, low cost financing, state and central regulatory policies and other barriers related to technology, social factors, specialised experience etc. Statewise installed capacity of biomass/cogeneration power projects is as under

Table – 3.1 : State wise Installed capacity (As on June 30, 2003)

STATE	INSTALLED CACITY IN MW
Maharashtra	24.50
Uttar Pradesh	46.50
Tamil Nadu	150.50
Karnataka	109.38
Andhra Pradesh	169.05
Gujarat	0.50
Punjab	22.00
Haryana	4.00
Chattisgarh	11.00
Total	**537.43**
Source: Ministry of Non-conventional Energy Sources (MNES), India	

4.0 Karnataka's Current Delivery System[4]

Indian power grid system is divided into five regions namely Northern, North Eastern, Eastern, and Southern and Western Regions. The state of Karnataka is situated in the southern part of India and forms a major constituent of southern region. These regions have independent load dispatch centres that manage the flow of power in their jurisdiction. At present, the inter-regional flows of

[4] *Sources: 1) KPTCL Statistics report and other available KPTCL related authentic documents.*
2) Website of Karnataka Power Transmission Corporation Limited (KPTCL)

power are quite low. Hence, each region may be considered as an island due to which the power generated in each region is distributed in their jurisdiction only.

Each state will have their own power generation plants (State Government owned) managed by respective State Electricity Boards / Corporations. In Karnataka, power transmission and distribution is managed by Karnataka Power Transmission Corporation Ltd.(KPTCL), Bangalore. State governments power generation plants are managed by the state authority Karnataka Power Corporation Limited (KPCL) and Vishweshwrayah Vidhut Nigam Limited (VVNL).

In addition to the state govt. owned power generation plants, there are private owned power generation plants exporting power to KPTCL and central government (Government of India) owned power generation plants managed by Government of India Enterprises like National Thermal Power Corporation Ltd., Nuclear Power Corporation Ltd., National Hydro Electric Power Corporation Ltd. *etc.* Power generated by all generation units is being fed to the grid (Southern Grid), which is accessible to all states forming part of the southern grid. Power mix may be thermal, hydro, wind, nuclear. In India, nuclear power generation is allowed only by central sector organisations.

Power generated by state owned generation units and private owned generation units would be consumed totally by respective states. But the power generated by central sector generation plants will be shared by all states forming part of the grid in fixed proportion.

5.0 Karnataka Power Scenario

5.1 Present Fuel Mix in Electricity Generation and Power Deficit

As mentioned above KPTCL distribution network gets major portion of power from KPCL and VVNL respectively along with the central sector generation plants and from private sector power generation /cogeneration plants and ultimately distributed to the consumer / end users.

Source wise present installed capacity and power generation in Karnataka shows that the share of KPTCL coal based power projects is around 38 % of total installed capacity and 55% of total generation capacity in the state. Detailed energy source wise break-up is as per the table 5.1.1 above.

(1) TABLE - 5.1.1: INSTALLED CAPACITY AND POWER GENERATION IN KARNATAKA

Sr. No.	Energy Source	Installed Capacity in MW	Net Generation in MkWh
1.	Coal/Lignite (KPCL+Central+Private)	2256	15435.93
2.	Diesel/FO/ (VVNL+Private)	271	1385.55
3.	Hydro (KPCL+VVNL+Private)	2903	9351.00
4.	Nuclear (Central)	129	1058.00
5.	Renewable Energy(Small hydro, Wind, Biomass,Bagasse Cogen, Solar and other	330	1070.90
	TOTAL	5889	28301.39

Source: KERC website, KPTCL statistics report and other available documents			

Above table shows that present share of the Karnataka generation mix is dominated by coal with substantial share of hydropower i.e around 49 % in installed capacity and 33% in generation. Balance is shared by Nuclear projects, Renewable Energy projects (Wind, small hydro, bagasse / biomass based cogenerations) *etc*.

With respect to present power scenario, energy shortage of around 9 % was observed in Karnataka which may further increase in future due to ever increasing demand of power in the State.

5.2 Private Sector Participation

Private sector participation is currently still very limited in India. When the Indian power sector opened up in 1991, more then 250 Memorandum of Understanding (MoUs) were submitted by Independent Power Producers (IPPs). However, only few IPPs have been set up since then.

Total IPP capacity amounts to about 6,000 MW, compared to a total installed capacity in India of 103,000 MW (Indian Infrastructure May 2002). Only few IPPs are listed for the State of Karnataka. In addition to the poor financial condition of the SEBs, IPPs faces additional challenges:

- Doubt about sanctity of contracts (PPA)
- Uncertainty on tariff stability
- Difficulty in obtaining funding from banks/financial institutions
- Discouragement by the State Government of third party sales/captive use.