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

CONTENTS

Annexes

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 the small-scale project activity

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

Koppal Green Power Limited Biomass Power Project
Version 07
Date: 25/01/2008

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

Purpose

M/s. KGPL has established a 6.0 MW biomass based power project at Karatagi village, Gangavathi Taluka, Koppal District, Karnataka State. The project activity proposes to supply 354 million kWH of electricity to KPTCL/GESCOM over the next 10 years which otherwise would have been generated from nonrenewable energy resources. Apart providing a much needed relief from power shortages in at decentralized locations, rural and remote areas; KGPL has opened up new avenues of employment in rural areas, through collection, storage and handling of Biomass materials.

Contribution to Sustainable Development

Since power is being generated at KGPL from Biomass it has resulted in export of clean power to Karnataka Power Transmission Corporation (KPTCL). Since this project activity utilizes renewable energy source, it has eased the demand on non-renewable resources like coal/gas/oil limiting their depletion and increasing their availability for other dependent processes for which alternate sources are not available.

Government of India has stipulated following indicators for sustainable development in the interim approval guidelines[1] for CDM projects.

1. Social well being
2. Economic well being
3. Environmental well being
4. Technological well being

Project activity contributes to the sustainable development in following ways:

1. Social well being:

As the project is located in a rural area, the project has lead to the development of the region. The biomass resources were collected and transported to the plant site from the adjoining fields resulting in employment opportunities for the local population.

The power situation of the region is expected to improve as a direct consequence of this project activity. The local population will be able to enjoy continuous power supply. The voltage profile of the region will definitely

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

see an improvement as result of this activity.

2. Economical well being:

The expected growth and development in the region as a result of the proposed activity will provide economic value to agricultural wastes and provide stable and quality power to neighboring small industries, farmers and households. The project will create business opportunities for local stakeholders such as bankers, suppliers, manufacturers, contractors *etc.*

The main resources for power generation are biomass fuels such as rice husk, agro-waste etc. Crop residues are collected from the farmers will be brought to the project site, thus generating additional revenue which are otherwise being under-utilized / burnt so far with no commercial value. The plant in generating commercial value to crop residues would enable the farmers to obtain a better price for their produce and thus augmenting their income.

3. Environmental well being

Combustion of biomass materials in the project result in GHG emissions of CO_2, CH_4 and NOx. The major constituent of GHG emissions is CO_2 which about 98%, whereas CH_4 and NOx constitute the remaining 2%. This can well be evidenced from the typical ultimate analysis of biomass materials, which indicates the Nitrogen content is within 1 to 2%. Hence the CO_2 is considered as the only GHG emissions from the biomass combustion.

Since the biomass is formed by fixing the atmospheric CO_2 by the action of photosynthesis in the presence of sunlight, the CO_2 released due to combustion of biomass is assumed to be equal to the CO_2 fixed by the photosynthesis. Again the CO_2 released during the combustion will be consumed by the plant species for their growth. In view of the above, biomass combustion and growth of biomass and associated CO_2 consumption and release can be treated as cyclic process resulting in no net increase of CO_2 in the atmosphere. Hence, the project will not lead to GHG emissions.

4. Technological well being

KGPL is 6MW biomass power project based on the Rankine cycle. The steam generation unit consists of a high pressure (67 kg/cm^2) and temperature (490^0C) traveling grate boiler of 27 tonnes maximum continuos rating. For the required generation capacity of 6 MW a turbo generator unit rated at 6 MW with inlet steam parameters of 64 kg/cm^2 at 485 ^0C is used. Fuels under consideration are rice husk, paddy straw and other biomass based materials such as cotton stalk, sunflower stalk etc available in the region.

In view of the above the project participant considers that the project activity profoundly 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 participant (Yes/No)

India (Host)	**Koppal Green Power Limited** (Private entity)	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.		

See contact information in Annex-1 to this PDD

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

The project activity is 6.0 MW (gross) capacity grid-connected biomass based renewable energy power plant with high-pressure steam turbine configuration. The plant will be operating at an annual average plant load factor of 85%. KSPCB has issued Consent for Establishment to the project proponent allowing the use of coal up to a maximum of 25% of total fuel used as an alternate fuel during exigencies. However KGPL proposes to use coal in case of exigencies alone. Whenever coal is used it will be monitored and recorded. Further, no transmission and distribution losses are considered while calculating GHG emission reductions, since the project exports power to the KPTCL/GESCOM grid, which is located at about 600 meters from the site.

The power plant has one condensing steam turbo generator unit with a matching boiler with Traveling Grate technology capable of firing multi fuels with rice husk and crop residues as the main fuels. The boiler is sized to produce a maximum of 27 tons per hour of steam. The steam turbine is a straight condensing type machine with uncontrolled bleeds for deaerator feed water heating. The steam conditions at the boiler heat outlet are a pressure of 67 kg/cm^2 and temperature of 490^{0}C. All the steam based power plants operate under the Rankine cycle where it is the combination of the various process like the isentropic compression of water in the boiler feed water pumps, reversible heat addition to the working fluid through the liquid, two phase and superheat states, isentropic expansion of the working medium in the turbine and constant pressure heat rejection to the atmosphere through the condenser and the cooling water system.

The cycle to be adopted for the proposed project activity will be modified Rankine Cycle with the addition of the Regenerative feed water heating. To improve the efficiency of the cycle the feed water from the condenser is heated with the steam extracted from the turbine. Because of the size of the plant there are limitations in the use of the number of stages for heating the feed water, and for this project only one stage of heating is done in a deaerator. Thermodynamically, energy recovery from the Rankine cycle is more dependent on the steam inlet temperature than the pressure and the higher the inlet steam temperature, higher the cycle efficiency.

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

A.4.1.1. Host Party(ies):

India

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

Karatagi Village, Gangavathi Taluka

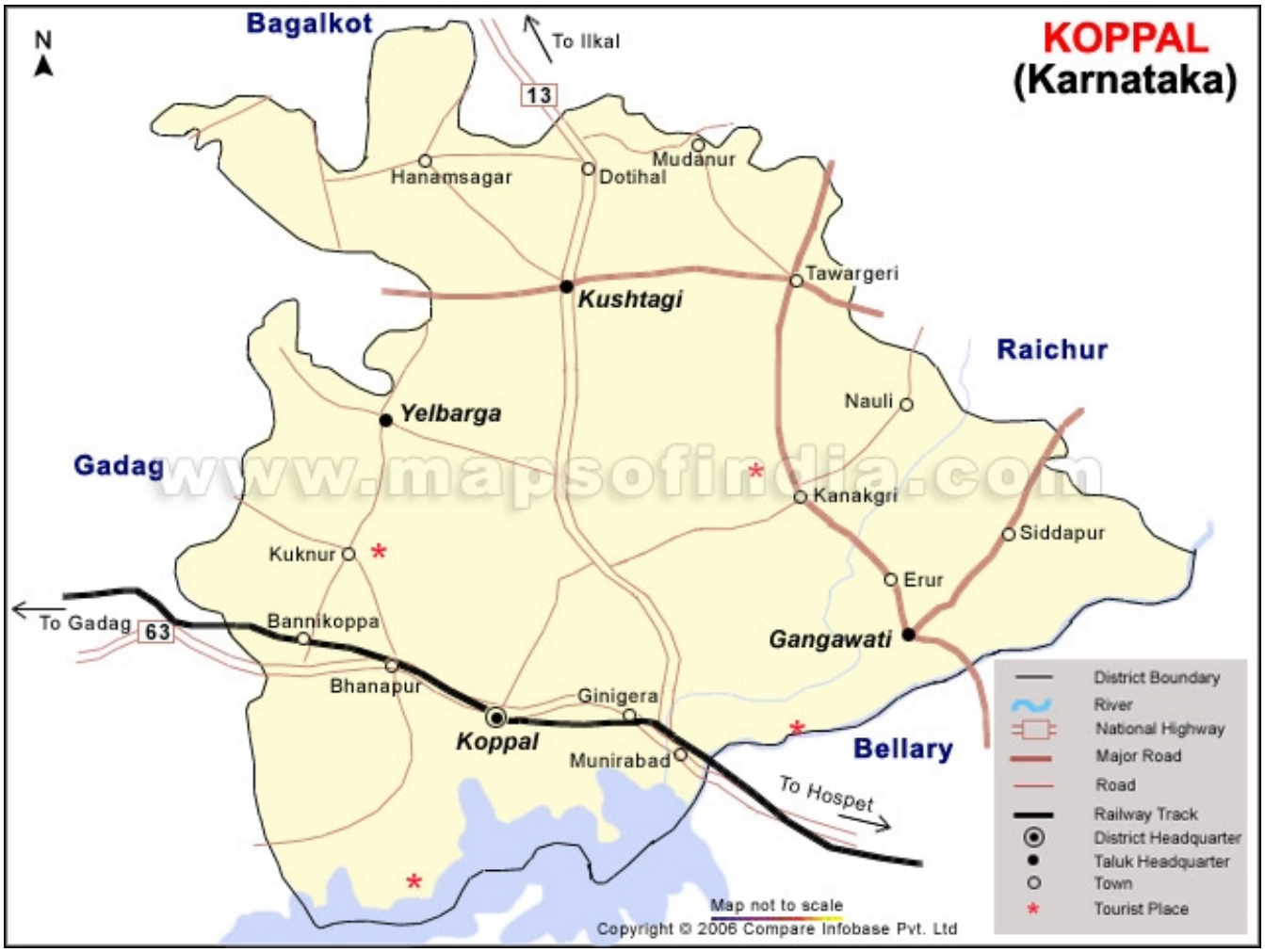
A.4.1.3. City/Town/Community etc:

Koppal District, Karnataka State, India

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

KGPL has been established at Karatagi village, Gangavathi Taluka, Koppal District, Karnataka State. It is located at a longitude of 76° 40' East and latitude of 15° 37' North.

Please refer Appendix – D for the location plan for KGPL. KPTCL/GESCOM grid is located at about 600 meters from the site.



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

As per Clause 2 of Type I.D (Version 10) of Appendix B of **simplified modalities and procedures for small-scale CDM project activities (Version 10: 23 December 2006),** in case of unit which co-fires non renewable biomass or fossil fuel the capacity of the entire unit shall not exceed the limit of 15 MW, for the project to qualify as a small-scale CDM project. Therefore, the proposed project activity can be defined under

Type I: Renewable Energy Project (Small Scale)
Category: "D", Grid connected Renewable Electricity Generation (Biomass based Power Project)

Technology of the project

No technology transfer was required for the project. Steam is generated in a high pressure boiler which is sized to produce a maximum of 27 tonnes per hour of steam. High pressure steam is passed through a straight condensing type machine with uncontrolled bleeds for de-aerator feed water heating to generate power.

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

Years (October 2007 to September 2017)	Annual estimation of emission reductions in tonnes of CO_2e
2007-2008	30299.91
2008-2009	30299.91
2009-2010	30299.91
2010-2011	30299.91
2011-2012	30299.91
2012-2013	30299.91
2013-2014	30299.91
2014-2015	30299.91
2015-2016	30299.91
2016-2017	30299.91
TOTAL	**302999**

Total number of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	**30299.91**

KGPL has received permission form Karnataka State Pollution Control Board (KSPCB) via the Consent for Establishment (CFE) [NO.CFE-CELL/KGPL/NE-231/2005-2006/475 dated 19 May 2005] to use coal up to 25% of total fuel used. However KGPL proposes to use coal in case of exigencies alone. Whenever coal is used it will be monitored and recorded.

If 25% coal is accounted for in Emission Reduction calculations as highlighted in Appendix C, the estimated amount of emission reduction over the crediting period will be 76894 over period of 10 years.

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

No public funding from parties included in Annex I is available to the project. Project is primarily financed by M/s IREDA limited, New Delhi through an extended term loan. Working Capital banker for the project is M/s UCO bank, Regional Office Bangalore.

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

According to Appendix C of Simplified Modalities & Procedures for small scale CDM project activities, 'De-bundling' is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities. A small-scale project activity shall be deemed to be a de-bundled 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 small- scale activity at the closest point.

Thus this small scale project activity is not a de-bundled component of a large scale project activity. With reference to criteria mentioned this biomass power project is not a de-bundled component of a larger project activity as there is no other project activity or an application to register any other project activity within 1.0 Km of this project activity by same project participants.

SECTION B. Application of a baseline methodology:

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

Title:
Grid connected Renewable electricity generation

Reference:
The project activity meets the eligibility criteria to use the simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7.

Details of methodology for baseline calculations for CDM projects of capacity less than 15 MW are available in the "Appendix B of the simplified modalities and procedure for small scale CDM project activities". Reference has been taken from indicative simplified baseline and monitoring methodologies for selected small scale (CDM projects less than 15 MW) project activity categories.

Renewable technologies that supply electricity to the grid are covered in AMS I.D (Version 10). The category comprises renewable such as small hydro, wind, geothermal and renewable biomass that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generation unit.

B.2 Justification of the Choice of the Project category:

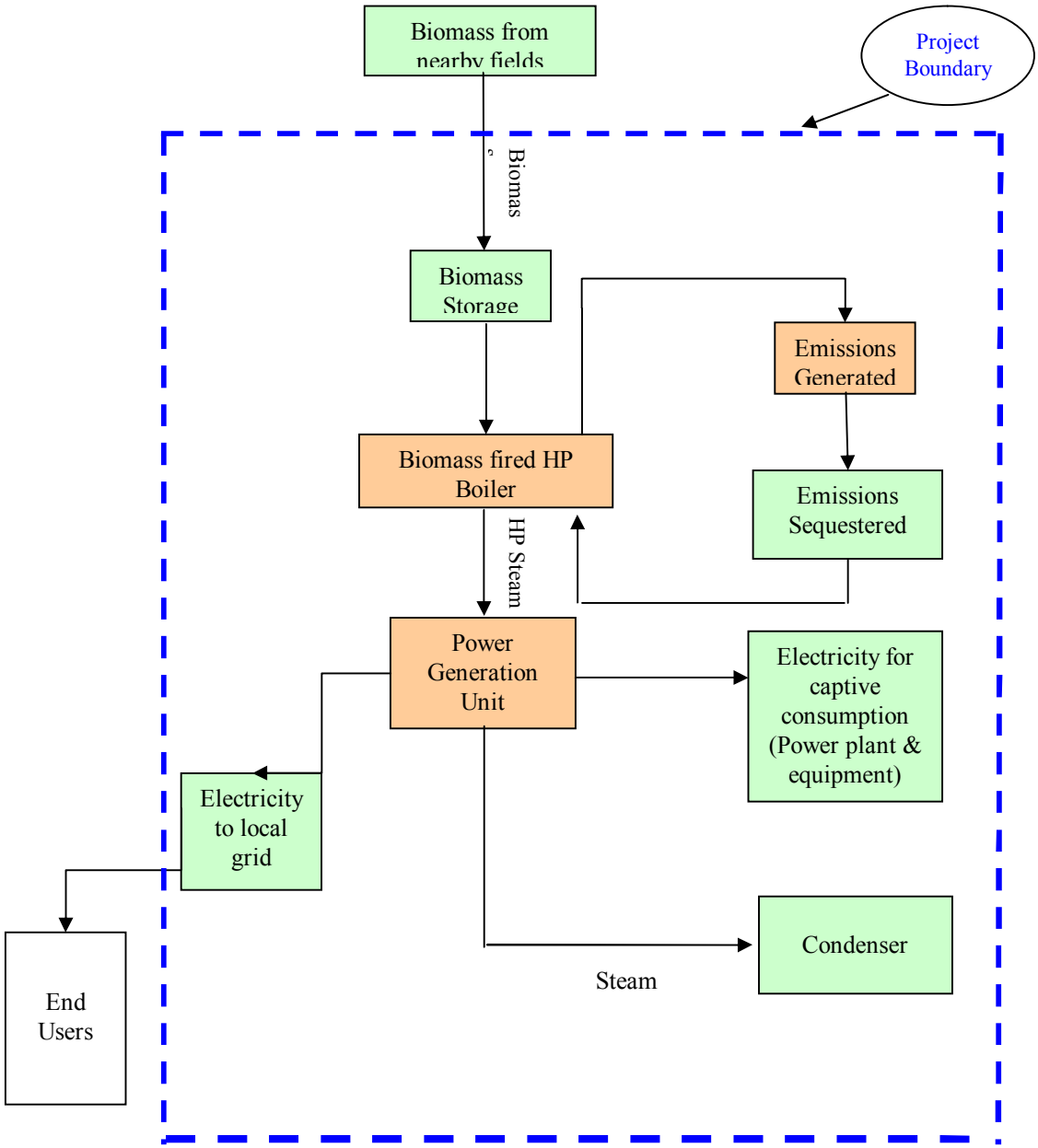
Type I: Renewable Energy Power projects
Category: 'D'- Grid connected Renewable Electricity Generation

As per the Kyoto Protocol (KP) baseline should be in accordance with the additionality criteria of article 12, paragraph 5(c), which states that the project activity must reduce emissions that are additional to any that, would occur in the absence of the certified project activity. Document Annex B to attachment 3 regarding indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, provides guidelines for preparation of Project Design Document (PDD) including baseline calculations.

B.3. Description of the project boundary:

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

Hence, the project boundary covers the physical boundary of the project activity. The system boundary covers the terminal point of electricity generation, transportation to KPTCL/GESCOM grid and for the purpose of calculation of baseline emissions; Southern Regional grid is also included in the project boundary.
Thus, boundary covers fuel storage and processing, boiler, Steam Turbine Generator (STG) and all other power generating equipments, auxiliary consumption units and electricity grid.



B.4. Description of the baseline and its development:

The baseline methodology mentioned in the paragraph no. 9 of AMS I. D (Version 10) of Appendix B of the simplified modalities and procedures for small scale CDM project activities, states that the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh) calculated in transparent and conservative manner as under:

a) A combined margin (CM), consisting of the combination of operating margin (OM) and built margin (BM) according to the procedures prescribed in the approved methodology ACM0002 (Version 06). Any of the four procedures for calculating the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM must be considered;

OR

b) The weighted average emissions (in kgCO_2equ/kWh) of current generation mix. The data of the year in which project generation occurs must be used.

Based on the above guidelines provided in Version 10 of AMS I.D, the baseline emission factor is estimated using the combined margin approach as per the procedures laid in ACM0002 (version 06). As per ACM0002 (version 06) the baseline emission factor is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors. ACM0002 (version 06) provides four options including Simple OM, Simple adjusted OM, Dispatch Data Analysis OM, and Average OM, for calculation of operating margin. It also indicates that Dispatch Data Analysis should be the first methodological choice. However, Dispatch Data Analysis cannot currently be applied in India due to lack of necessary data1.

The Simple Operating Margin approach has been used to calculate the Operating Margin emission factor. As per ACM 0002, Version 06, the Simple OM method can only be used where low cost must run resources constitute less than 50% of grid generation based on average of the five most recent years. The generation profile of the Southern grid in the last five years is as follows:

Generation in GWh	2005-06[2]	2004-05	2003-04	2002-03	2001-02	2000-01
Low cost/must run sources						
Hydro	33298.66	24,951	16,943	18,288	26,260	29,902
Wind & Renewable	6798.08	3,256	1,865	1,607	1,456	1,262
Nuclear	4711.80	4,408	4,700	4,390	5,244	4,331

[1] Source: CEA CO2 Baseline Database for Indian Power Sector User Guide, Version 2.0, http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver2.pdf

[2] http://www.srldc.org/var/ftp/reports/yearlyrep/2005-06-year.pdf

Other sources						
Coal	108411.24	99,010	98,435	92,053	84,032	83,292
Diesel	14507.23	2,434	3,295	4,379	4,155	2,868
Gas		12,428	14,214	13,950	10,331	7,132
Total Generation	167727.01	146,487	139,451	134,667	131,478	128,787
Low cost/must run sources	44808.54	32,615	23,508	24,285	32,960	35,496
Low cost/must run sources	26%	22%	17%	18%	25%	28%

Source: Table 3.4 of CEA General Review 2004-05, 2003-04, 2002-03, 2001-02, 2000-01

From the available information it is clear that low cost/must run sources account for less than 50% of the total generation in the Southern grid in the last five years. Hence the Simple OM method has been used to calculate the Operating Margin Emission factor applicable.

Therefore, Simple OM has been considered for estimated operating margin. AS per ACM0002 (Version 06) Simple OM can be calculated using either of the two following data vintages for years(s) y:

a) (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
b) the year in which project generation occurs, if EFOM,y (Operating Margin Emission Factor in the year 'y') is updated based on ex-post monitoring

Therefore, the simple OM is estimated using the weighted average for the most recent 3 years using the data published by Central Electricity Authority (CEA)[1]. The detailed calculations have been provided in Annex 3.

The baseline methodology has followed the one specified under Project category I.D (Version 10) in Appendix B of the Simplified M&P for small scale CDM project activities. As per the latest guidelines in I.D (Version 10) to estimate the baseline emissions, the emission factor is calculated as per the procedures laid in paragraph 9 (a) & (b). As this methodology suggested to adopt the procedures laid in ACM0002 (Version 06), the same has been considered for calculations.

The baseline emissions and the emission reductions from project activity are estimated based on the quantum of electricity to be exported by the project activity to the grid and the Baseline Emission Factor (BEF) of the southern regional grid calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and built margin (BM) factors. The project proponent wishes to use the BEF calculated Ex-ante, and has fixed the same for the entire crediting period. The BEF prepared and published by the CEA has been provided in Annex 3.

[1] Source: CEA, http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

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:

The project activity meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7.

As per the decision 17/cp.7 Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity. Further referring to Appendix A of Annex B document of indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, project participants shall provide a qualitative explanation to show that the project activity would not have occurred anyway, at least one of the listed elements should be identified in concrete terms to show that the activity is either beyond the regulatory and policy requirement or improves compliance to the requirement by removing barrier(s) ;

1. **Barriers due to prevailing practice:**

Total Sanctioned Capacity by Govt. of Karnataka	437.70 MW
Total project commissioned till inception of KGPL	4.5 MW (1 no.)

The table above illustrates the low penetration of such renewable energy projects at the time of project conceptualization and little willingness of entrepreneurs to change the current operating practices in the region. We may conclude that this project activity is not a common practice in the region. The practice of generating power by using biomass as primary fuel is not business as usual.

The total projects allotted by the Government of Karnataka under the biomass based renewable energy projects is 437.70 MW[1]. During the inception stage of KGPL, only one (1) biomass based power plant (Malavalli Power Plant Private Limited) was commissioned with a capacity of 4.5 MW (date of commissioning was 19 July 2001)[2]. This illustrates the low penetration (1.03%) of such renewable energy projects. We may conclude from the above that the proposed project under discussion was not a common practice in the region. The practice of generating power by using biomass as primary fuel has not penetrated in the region due certain prohibitive barriers to project implementation.

Though the project is not a common practice, the project proponent was keen to take up this new initiative of utilizing biomass as primary fuel by overcoming the various barriers to prevailing practices and set example for

[1] http://www.kredl.kar.nic.in/List%20of%20Biomass%20Projects%20Alloted.xls
[2] http://www.kredl.kar.nic.in/Docs/Biomass%20-%20commissioned%20as%20on%20date.doc

others. However, the project proponent is well aware of the various barriers to project implementation. However the barriers would be overcome with the availability of carbon financing against the sale of carbon credits that would be generated once the project gets implemented.

2. Other Barriers (Policy Related)

The Power Purchase Agreement (PPA) with KPTCL was signed at a tariff of Rs. 2.25 per unit (applicable for the year 1994-1995) with 5% escalation per annum which was to be valid through a period of 10 years on 30 March 2001. KGPL started construction of plant on 01 March 2003. All the finances and economics of the plant were planned based on the returns calculated as per the expected tariff from KPTCL. However KPTCL cancelled the PPA with KGPL vide letter dated 05 July 2003 without assigning any valid reasons. This was a financial blow to KGPL as construction activity was already underway and the purchase orders for all the major equipment were already issued and funds were drawn from the financial institution. The project participant took the risk and continued with the construction of the plant and commissioned the plant on 07 January 2005.

Subsequently the PPA with KPTCL/GESCOM was assigned to KPTCL/GESCOM under electricity act on 10 June 2005. In the meantime KGPL is receiving a tariff of Rs 2.80 per unit from KPTCL/GESCOM. Thus KGPL was forced to sell for a price of Rs 2.80 per unit when the actual tariff to be paid as per the PPA with KPTCL/GESCOM was Rs 4.03 (applicable for the year 2006-2007) per unit. This clearly highlights why CDM funds will prove to be vital for the financial sustainability of this project activity.

Sr. No.	Tariff	Reference
1	INR 2.25 per KWh (1994-1995) with 5% escalation per anum	PPA dated 30 March 2001
2	INR 4.03 per KWh (applicable for the year 2006-2007)	PPA dated 10 June 2005
3	INR 2.80 per KWh (applicable for the year 2006-2007)	Current Tariff

3. Other Barriers (Finance related)

This project activity is primarily dependent on the availability of biomass and hence inflation in the price of biomass will adversely affect the operation and financial sustainability of the project activity. Based on price rise in last two years it can be anticipated that prices will only rise further in the years to come.

CDM funds have been already considered for this project activity at the conceptual stage to mitigate the financial risk arising from inflation of biomass prices due to various external factors. Raw material cost since the inception (say documented at Detailed Project Report (DPR) has increased from average Rs. 498 to Rs.

1400 per Metric Tone (MT) of biomass. This can mainly be attributed to cost incurred during collection transportation and storage of biomass. Exogenous uncontrolled conditions are modulating the quantity of biomass available (agriculture yield, weather patterns etc.) each year. The availability of each biomass is confined to a months in a year. Suitable mix of different types of fuel is required for optimum fuel usage.

This demonstrates the relative complexity of supply of biomass compared to standard fossil fuels. Transportation of biomass over large distances is not profitable and so, supply sources are confined into a strict local area. Hence the project proponent envisaged that in due time they would be is forced to procure the biomass at a higher price to meet the daily requirement of the plant. Hence in spite of the abundant supply of biomass[1] in the region, the complexity involved in collection transportation and storage of biomass the project proponent envisaged inflation in the prices of the biomass in the years to come.

The cost of generation per unit for the year 2005 was calculated to be Rs. 2.56 per kWh. The variable component was estimated to be Rs 1.57 per kWh and the fixed component was estimated to be INR 0.99 per kWh. As per the PPA signed with KPTCL/GESCOM on 03-03-2001 the tariff to be paid to KGPL for the passing year was Rs 3.85 per kWh however the tariff paid to KGPL was Rs 2.80 per kWh. Over and above this the variable cost is expected to rise even further and thus increasing the generation cost for KGPL. The current IRR is expected to increase from 10.79% to approximately 12.03% with the inflow of CDM funds into the project activity.

CDM Benefit

	CERs	**Rate/CER**	**Exchange Rate**	**Million**	**Million KWH**	**Cost per unit (INR)**
		(Euros)		**INR**	**replaced**	
KGPL	302999	8	55	133.31956	354	0.37

The CDM benefit per unit (kWh) of power replaced is about Rs. 0.37. Hence, the total benefit for KGPL including the tariff cost of Rs. 2.80 would amount to Rs. 3.17.

Hence it is very evident that in the absence of CDM funds and any further increase in biomass prices will only further increase the financial burden on the project proponent and thus compel them to other fuels such as coal. Thus the project proponent is justified in seeking CDM funds to sustain the project activity and without doubt qualifies for same.

[1] District wise Biomass Resource Assessment Study, Karnataka State Biomass by Institute for Energy Studies, Anna University, Chennai in February 2002

B.6. Emission Reduction

B.6.1. Explanation of Methodological Choices

Monitoring methodologies / guidelines mentioned in the UNFCCC document of "Annex B of the simplified modalities and procedures for small scale CDM project activities" for small scale projects (Type I: D) is considered as basis for monitoring methodology for the activity. The project activity meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7. Details of approved methodology for baseline calculations for CDM projects of capacity less than 15 MW are available in the "Appendix B of the simplified modalities and procedure for small scale CDM project activities".

As the power plant is of 6.0 MW capacity, reference has been taken from indicative simplified baseline and monitoring methodologies for selected small scale (CDM projects less than 15 MW) project activity categories. Southern Regional grid is considered for baseline analysis and calculation of anthropogenic emissions by fossil fuels during power generation. It is observed that, in the southern regional grid generation mix, coal, diesel and gas based power projects are responsible for GHG emissions. The data published by CEA has been used as the baseline emission factor. The baseline emission factor for southern grid as published by CEA[1] is 0.857 tCO2/MWh.

B.6.2. Data and Parameters that are available at Validation

Data / Parameter	BEF
Data Unit:	tCO_2/MWh
Description:	Baseline Emission Factor for Southern Grid
Source of data used:	CEA[1]
Value Applied:	0.857
Justification of the choice of data or description of measurement methods and procedures actually applied.	Combined Margin data for southern grid
Any Comments	Refer Annex - 3

Data / Parameter	EF of Diesel
Data Unit:	t_{CO2e}/TJ
Description:	CO_2 emission factor for each type of fuel
Source of data used:	IPCC – 2006 Default Value
Value Applied:	74.1

[1] Source: CEA, http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Justification of the choice of data or description of measurement methods and procedures actually applied.	IPCC - 2006 value has been used as no country specific value is available.
Any Comments	-

Data / Parameter	EF of Coal
Data Unit:	t_{CO2e}/TJ
Description:	CO_2 emission factor for each type of fuel
Source of data used:	IPCC – 2006 Default Value
Value Applied:	96.1
Justification of the choice of data or description of measurement methods and procedures actually applied.	IPCC - 2006 value has been used as no country specific value is available.
Any Comments	-

Data / Parameter	OF_{Diesel}
Data Unit:	Not Applicable (Constant)
Description:	Oxidation Factor of each fuel type, i
Source of data used:	IPCC - 2006 default values
Value Applied:	1.00
Justification of the choice of data or description of measurement methods and procedures actually applied.	IPCC - 2006 value has been used as no country specific value is available.
Any Comments	-

Data / Parameter	NCV_{Diesel}
Data Unit:	Kcal/kg
Description:	NCV of Diesel
Source of data used:	Appendix B of User's Guide Version 2[1]
Value Applied:	10200
Justification of the choice of data or description of measurement methods and procedures actually applied.	CEA value has been used as no country specific value is available.
Any Comments	-

Data / Parameter	$Density_{Diesel}$
Data Unit:	Kg/L

[1] CEA, http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver2.pdf

Description:	Density of Diesel
Source of data used:	Appendix B of User's Guide Version 2[1]
Value Applied:	0.83
Justification of the choice of data or description of measurement methods and procedures actually applied.	CEA value has been used as no country specific value is available.
Any Comments	-

B.6.3. Ex-ante calculation of Emission Reduction

Baseline Emissions (Emission Reductions due to displacement of electricity or $ER_{electricity,y}$)

The basic assumptions for calculating baseline emissions of the project activity are due to the displacement of grid electricity. Hence, the following formula is applied for estimation of baseline emissions.

$$\mathbf{ER_{electricity,y} = BEF_{electricity,y} * EG_y}$$

Where,
ERelectricity,y = Emission Reduction
BEFelectricity,y = 0.857 tCO2/MWh.
EGy = Electricity Generated – Electricity Imported – Auxiliary Consumption

The anticipated electricity export from the project activity during the year *y*, multiplied with emission factor as published by CEA (Combined Margin) for southern region grid 0.86 tCO_2/MWh.

Project Emissions

The project proponent uses biomass as fuel. KSPCB has issued Consent for Establishment to the project proponent allowing the use of coal up to a maximum of 25% of total fuel used as an alternate fuel during exigencies. However KGPL proposes to use coal in case of exigencies alone.. Whenever coal is used it will be monitored and recorded. HSD is used for the stand by DG sets only in case of emergency and complete blackout. The project emissions due to use of coal and Diesel will be calculated using the following formulae:

$$\mathbf{PE_{coal} = (Q_{coal} * P_{carbon}) * 44/12}$$

Where,
PE = Project Emission due to coal burning at project, t_{CO2}
Q_{coal} = Total quantity of Coal (Tonnes)
P_{carbon} = Percentage of Total Carbon in coal through ultimate analysis (%)
The project emission due to consumption of HSD in Tractors, Douser will be calculated as follows:

$$\mathbf{PE_{HSD} = HSD_{CONS} * Density_{Diesel} * NCV_{Diesel} * EF_{tCO2\ Diesel} * OF_{Diesel}}$$

[1] CEA, http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver2.pdf

Where

PE_{HSD} = Project Emission due to use of HSD

HSD_{CONS} = HSD Consumption in Liters

$Density_{Diesel}$ = Density of HSD (Ex-ante and fixed during the entire crediting period.)

NCV_{Diesel} = Calorific Value of HSD (Ex-ante and fixed during the entire crediting period.)

$EF_{tCO2\ Diesel}$ = IPCC - 2006 Emission Factor for HSD (Ex-ante and fixed during the entire crediting period.)

OF_{Diesel} = Oxidation Factor for HSD (Ex-ante and fixed during the entire crediting period.)

Leakage

As per the latest general guidance on leakage in biomass projects, for small scale energy CDM project activities involving renewable biomass, there are three types of emission sources that are potentially significant (>10% of emission reductions) and attributable to the project activities. These emission sources may be project emissions (if under the control of project participants, i.e. if the land area where the biomass is grown is included in the project boundary) or sources of leakage (if the source is not under control of project participants). The following table summarises for different types of biomass, the cases where the emission source is relevant and the cases where it is not.

Biomass Type	Activity/Source	Shift of pre-project activities	Emissions from biomass generation / cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	X
	New forests	X	X	-
Biomass from croplands or grasslands (woody or non woody)	In the absence of the project the land would be used as cropland/wetland	X	X	-
	In the absence of the project the land would be abandoned	-	X	-
Biomass residues or wastes	**Biomass residues or wastes are collected and used**	**-**	**-**	**X**

For the project activity, the following are considered to calculate the possible emissions due to leakage:

1. As the project activity uses only biomass residues and wastes, the implementation of activity did not lead to shift of pre project activities.

2. Also, the biomass that is being used in the plant is waste that is generated from various crops. This waste will anyhow be generated even in the absence of the project activity and would have burnt without using

for any other purpose. The plant uses the waste generated and does not need application of fertilizer and clearance of lands. Hence, there are no emissions due to the same.

3. There is sufficient biomass available in the region and the same is revealed in the District wise Biomass Resource Assessment Study, Karnataka State Biomass by Institute for Energy Studies, Anna University, Chennai in February 2002. The results form the same have been depicted in the table below. This indicates the abundant availability of the biomass in the region. The quantity of biomass that is available in the region is more than the quantity of biomass that is utilized including the project activity and hence the leakage can be neglected. Even if 60000 MT/annum of biomass is added to the consumption figures depicted below, the generation figure would be still greater than 1.25 times that of the new consumption figure.

LQ Biomass = [TQ Biomass - (BQ project + BQ other users)*1.25]

Where,

$LQ_{Biomass}$ = Quantity of Biomass less or more than the required 25% larger than combined usage (in Kg)

$TQ_{Biomass}$ = Total Biomass Quantity available in the region in Kg

$BQ_{project}$ = Biomass Quantity utilized by project activity in Kg

$BQ_{others\ users}$ = Biomass Quantity utilized by other users in Kg

In case $LQ_{Biomass}$ is positive (+) then there would be no leakage, hence Leakage (L) will be zero. However, if $LQ_{Biomass}$ is negative (-), then the leakage would be due to the use of equivalent amount of coal in the region and the same shall be calculated using the following formula:

$$L_{Biomass} = \{[-(LQ_{Biomass}) \times NCV_{Biomass}]\} \times EF_{Coal}$$

Where, lower of the two values, i.e., $LQ_{Biomass}$ and Total consumption of the biomass for the project activity, would be considered for leakage calculation

$$L_{Biomass} = \text{Leakage } (t_{CO2})$$

Where

$LQ_{Biomass}$ = Quantity of Biomass less than the required 25% larger than combined usage (in Kg). Lower of the two values, i.e., $LQ_{Biomass}$ and Total consumption of the biomass would be considered for leakage calculation

$NCV_{Biomass}$ = Net Calorific Value of Biomass (in TJ/Kg)

EF_{Coal} = Emission Factor of Coal (IPCC - 2006 Default, tCO_2/TJ). This would be ex-ante and fixed during the entire crediting period.

$$L_{HSD} = (Q_{Biomass} * S_{Equipment}) * Density_{Diesel} * NCV_{Diesel} * EF_{tCO2\ Diesel} * OF_{Diesel}$$

Where

L_{HSD} = Leakage due to use of HSD, t_{CO2}

$Q_{Biomass}$ = Quantity of Biomass procured, which is prepared at the field (MT)

$S_{Equipment}$ = Specific diesel consumption of the equipment (Liters / MT).

Density $_{Diesel}$ = Density of HSD (kg/l). (Ex-ante and fixed during the entire crediting period.)

NCV $_{Diesel}$ = NCVof HSD (Kcal/kg). (Ex-ante and fixed during the entire crediting period.)

$EF_{tCO2\ Diesel}$ = IPCC - 2006 Emission Factor for HSD (tCO_2/TJ). This would be ex-ante and fixed during the entire crediting period.)

OF $_{Diesel}$ = Oxidation Factor for HSD. This would be ex-ante and fixed during the entire crediting period.)

Total Leakage L = $L_{Biomass}$ + L_{HSD}

No.	Biomass	Generation	Consumption
		MT/annum	MT/annum
A	Field Level Biomass	**610864**	**350328**
B	Agro Industrial Residues	**207765**	**104860**
1	Wood Chips	3265	3265
2	Saw Dust	910	910
3	Rice Husk Generation from Rice Mills	196700	100485
4	Groundnut Milling	6890	200
C	Consumption at KGPL	**0**	**60000**
D	Consumption at other biomass Plant	**0**	**135000**[1]
	Total	**818629**	**650188**

Source: District wise Biomass Resource Assessment Study, Karnataka State Biomass by Institute for Energy Studies, Anna University, Chennai in February 2002

1.25 * 650188 MT/annum = 812735 MT/annum < Total generation of 818629 MT/annum.

[1] As per information published by KREDL, http://www.kredl.kar.nic.in/Docs/Allotted%20&%20Commissioned%20list.xls 19.5 MW of biomass power projects have been commissioned in Koppal District out of which 6.0 MW is contributed from KGPL. Based on the the KERC order http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc a total a factor of 1.16 MT of Biomass per MWh generated and 8000 operating hours per annum has been considered to arrive at the biomass consumption for the balance 13.5 MW commissioned in Koppal District.. Though this figure works out to be (13.6*1.16*8000 = 125280) 125280 MT of biomass per annum, a conservative figure of 135000 MT of biomass per annum has been considered.

From the above analysis, it can be concluded that the project activity does not have any sources of leakage due to type of biomass utilised, The leakage activity identified outside the project boundary, which contributes for GHG emissions is transportation of biomass from biomass collection centres to biomass power project site.

The CO_2 emissions from diesel consumption during the biomass preparation at the fields have been calculated in the following manner:

Calculation of leakage has been carried-out as under:

Biomass to be procured	60000	MT
Average Distance between project Site and biomass collection centers	40	Km
Biomass load per truck	10	MT
Number of return trips	6000	
Mileage (Specific Consumption)	2.5	Kmpl
Total Diesel consumption (L per annum)	192000	Litres
Density of Diesel	0.83	Kg/l
Total Quantity of Diesel (MT per annum)	163.2	MT
Oxidation Factor	0.99	
Calorific Value of Diesel	10072	KCal/Kg
CO2 emission factor for Diesel (CEA, www.cea.nic.in)	74.1	t CO2 / TJ
CO2 emission per annum	504.68	t CO2

Since the leakage emission is less than 1% of the total emission reduction, the same has been neglected. Also it the distance between the plant and the primary source of rice husk supplier (adjoining rice mills) is less than 3 km by road. In addition to above, project emissions also occur due to transportation of the fly ash for disposal. Plant generates around 10000 tonnes of fly ash per annum. Number of trips to dispose fly ash to destination is around 3 per day. However, the distance of transport of fly ash from the plant to brick manufacturers in the area is well below 30 km and number of truck trips per annum are less than 900, hence the emissions due to the same have also been neglected.

B.6.4. Summary of ex-ante estimation of Emission Reduction

Operating Years	Project Emissions (t CO_2)	Baseline Emissions (t CO_2)	Estimation of leakage (t CO_2)	Estimation of overall Emission Reductions (t CO_2)
2007-2008	36.51	30336.43	0	30299.91
2008-2009	36.51	30336.43	0	30299.91
2009-2010	36.51	30336.43	0	30299.91
2010-2011	36.51	30336.43	0	30299.91
2011-2012	36.51	30336.43	0	30299.91
2012-2013	36.51	30336.43	0	30299.91

Operating Years	Project Emissions (t CO_2)	Baseline Emissions (t CO_2)	Estimation of leakage (t CO_2)	Estimation of overall Emission Reductions (t CO_2)
2013-2014	36.51	30336.43	0	30299.91
2014-2015	36.51	30336.43	0	30299.91
2015-2016	36.51	30336.43	0	30299.91
2016-2017	36.51	30336.43	0	30299.91
TOTAL	**365**	**303364**	**0**	**302999**

Therefore, conventional energy equivalent of 354 Million kWh for a period of 10 years in Karnataka would be saved by exporting power from the 6.0 MW Biomass based power plant which in turn will reduce 302999 Tonnes of CO_2 emissions considering baseline calculations.

KGPL has received permission form Karnataka State Pollution Control Board (KSPCB) via the Consent for Establishment (CFE) [NO.CFE-CELL/KGPL/NE-231/2005-2006/475 dated 19 May 2005] to use coal up to 25% of total fuel used. However KGPL proposes to use coal in case of exigencies alone. Whenever coal is used it will be monitored and recorded.

If 25% coal is accounted for in Emission Reduction calculations as highlighted in Appendix C, the estimated amount of emission reduction over the crediting period will be 76894 over period of 10 years.

B.7. Application of monitoring methodology and description of monitoring plan

B.7.1. Data and Parameters Monitored

Parameter	E_{Gen}
Unit:	kWh/year
Description:	Electricity Generated
Source of Data:	Tri-vector Energy Meter
Value of Data:	40800000
Brief description of measurement methods and procedures to be applied:	The parameter is measured using a tri-vector energy meter available in the switch yard at KGPL.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The meters will be calibrated as per the standards
Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	E_{Imp}
Unit:	kWh
Description:	Import Consumption

Source of Data:	Tri-vector Energy Meter
Value of Data:	1000000
Brief description of measurement methods and procedures to be applied:	The parameter is measured using a tri-vector energy meter available at KGPL.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The meters will be calibrated as per the standards
Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	E_{Exp}
Unit:	kWh
Description:	Power Export
Source of Data:	Tri-vector Energy Meter
Value of Data:	35480000
Brief description of measurement methods and procedures to be applied:	The parameter is measured using a tri-vector energy meter available in the switch yard at KGPL and KPTCL/GESCOM sub-station.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored at the project site as well as by KPTCL/GESCOM. All relevant records will be checked to ensure consistency. The meters will be calibrated as per the standards.
Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	Q_{bio}
Unit:	Tonnes/annum
Description:	Fuel Used (Biomass of each type will be monitored separately)
Source of Data:	Weigh Bride reading
Value of Data:	60000
Brief description of measurement methods and procedures to be applied:	The parameter is measured using a weigh bridge located at the project site. The truck carrying the fuel will be weighed twice upon entry and exit.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The weigh bridge will be calibrated as per the standards. The differences in entry and exit weight will give the weight of the biomass.
Any Comments	The data on quantity of fuel will be separate for all types of fuels as permitted by the local authorities. The plant only accepts biomass that is permitted by KSPCB. In this regard, a notice board has been displayed at the plant entrance stating that only permitted fuels are procured. When a supplier supplies fuel, the fuel is checked at the main gate. Only if the fuel is permitted, an entry is made in the Material Inward Register. An entry is made in the weighbridge register. Then the vehicle is sent to the fuel yard, where the yard staff inspects the fuel to ensure that only permitted fuel is accepted and unloaded. KGPL measures the daily fuel consumption by calculating the difference of the daily incoming fuel and stock at KGPL. This is periodically verified by cross checking with the conveyer capacity and operating hours of the conveyer.The data will be archived for the entire crediting period + 2 years.

Parameter	$Q_{bio\text{-}generation}$
Unit:	Tonnes/annum
Description:	Biomass Generation
Source of Data:	Annual Biomass Assessment Study
Value of Data:	818629
Brief description of measurement methods and procedures to be applied:	District wise Biomass Resource Assessment Study, Karnataka State Biomass by Institute for Energy Studies, Anna University, Chennai in February 2002
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored annually. All relevant records will be checked to ensure consistency.
Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	$Q_{bio\text{-}consumption}$
Unit:	Tonnes/year
Description:	Biomass Consumption other than Project activity
Source of Data:	Annual Biomass Assessment Study
Value of Data:	650188
Brief description of measurement methods and procedures to be applied:	District wise Biomass Resource Assessment Study, Karnataka State Biomass by Institute for Energy Studies, Anna University, Chennai in February 2002 http://www.kredl.kar.nic.in/Docs/Allotted%20&%20Commissioned%20list.xls http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored annually. All relevant records will be checked to ensure consistency.
Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	$D_{bio\text{-}trans}$
Unit:	Km
Description:	Distance traveled by biomass transportation medium.
Source of Data:	The data will be directly measured and monitored at the project site with the unloading of each
Value of Data:	40
Brief description of measurement methods and procedures to be applied:	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored annually. All relevant records will be checked to ensure consistency.
Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	NCV_{bio}
Unit:	Kcal/kg
Description:	NCV of each type of biomass
Source of Data:	Analysis reports
Value of Data:	3000
Brief description of	Through sample testing in lab which will be done weekly.

measurement methods and procedures to be applied:	
QA/QC procedures to be applied (if any):	The data will be based on the laboratory analysis. The instruments used for the analysis will be checked for their calibration.
Any Comments	Based on the sample tests conducted. The data will be archived for the entire crediting period + 2 years.

Parameter	$Q_{Fossil, i}$
Unit:	Tonnes/year
Description:	Fuel Used (Coal)
Source of Data:	Weigh Bride reading
Value of Data:	15000
Brief description of measurement methods and procedures to be applied:	The parameter is measured using a weigh bridge located at the project site. The truck carrying the fuel will be weighed twice upon entry and exit. The differences in entry and exit weight will give the weight of the fossil fuel.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The weigh bridge will be calibrated as per the standards.
Any Comments	The data on quantity of fuel will be separate for all types of fuels. The data will be archived for the entire crediting period + 2 years.

Parameter	% of Carbon
Unit:	%
Description:	% of Carbon in coal by ultimate analysis
Source of Data:	Laboratory analysis reports / Coal Supplier report / Bureau of Energy Efficiency (Table 1.6)[1]
Value of Data:	41.11
Brief description of measurement methods and procedures to be applied:	Through sample testing in lab which will be done whenever coal is used.
QA/QC procedures to be applied (if any):	The data will be based on the laboratory analysis. The instruments used for the analysis will be checked for their calibration.
Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	$Q_{Fossil, ii}$
Unit:	L/annum
Description:	Fuel Used (HSD)
Source of Data:	Daily records of fuel usage.
Value of Data:	20000
Brief description of measurement methods and procedures to be applied:	Level Gauge indicator for DG Set and diesel day tanks.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency. The level gauge indicator shall be checked for consistency.

[1] http://www.energymanagertraining.com/GuideBooks/2Ch1.pdf

Any Comments	The data will be archived for the entire crediting period + 2 years.

Parameter	NCV_{Fossil}
Unit:	Kcal/kg
Description:	Net Calorific Value of fossil fuel (Coal)
Source of Data:	Lab Analysis
Value of Data:	3900
Brief description of measurement methods and procedures to be applied:	The lab analysis of the coal samples will be done weekly.
QA/QC procedures to be applied (if any):	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure consistency.
Any Comments	The data on quantity of fuel will be separate for all types of fuels. The data will be archived for the entire crediting period + 2 years.

B.7.2. Description of Monitoring Plan

Project proponent implemented the following operational and management structure in order to monitor emission reductions and any leakage effects, generated by the project activity. Project proponent formed a CDM team/committee comprising of persons from relevant departments, which will be responsible for monitoring of all the parameters mentioned in this section. In the CDM team, a special group of operators will be formed who will be assigned responsibility of monitoring of different parameters and record keeping. On daily basis, the monitoring reports will be checked and discussed. On monthly basis, these reports will be forwarded at the management level. Process Owners and Responsibilities have been discussed below:

Plant Manager (PM):
Plant operation with the help of shift-in-charge. One shift-in-charge for each shift and the plant runs for 3 shifts per day. Coordinate with yard-in-charge and yard supervisors to monitor receipt of raw materials and consumptions. Coordinate with time office for staff duties and attendance. Reject any raw material based if not permitted to use.

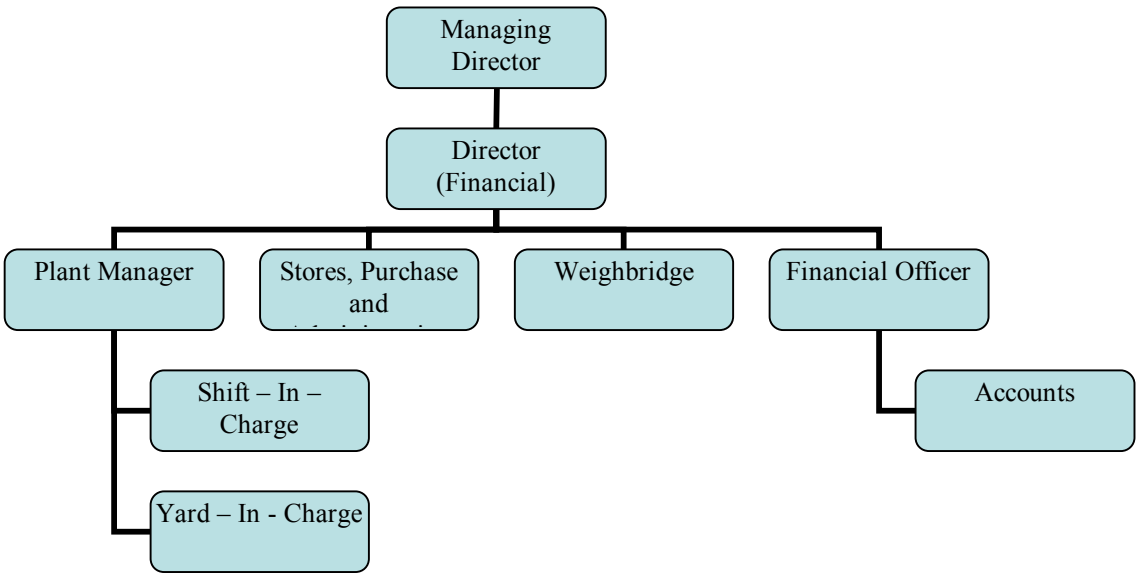
Manager Stores and Purchase:
Purchase of raw materials and equipments such as spares, etc, in consultation with the Managing Director (MD), Financial Director (FD) and PM. Reject any raw material based if not permitted to use.

Weighbridge Operator:
Weighing of raw materials and reporting the same to the FD and PM on shift basis. Reject any raw material based if not permitted to use.

Financial Officer (FO):
Submission of bills, raise invoice, collection of payments from KPTCL/GESCOM in coordination with accounts department. Reports to the FD who in turn updates the MD.

Accounts:

To compile receipts from plant, purchase department, weighment slips, check for quantity and price and verify the bills, report to FO. Final approval is given by the MD after verification by the FD.



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

Date of completing the final draft of this baseline section: 07/09/2007

Name of person/entity determining the baseline: KGPL, who is also the project participant.

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:

Start date of project activity: 12/03/2003

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

Life time of the project : 20 years

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

C.2.1. Renewable crediting period:

Not Applicable

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

Not applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

20/10/2007. However, if the project activity gets registered before or after 20/10/2007, the crediting period will start from the date of registration.

C.2.2.2. Length:

10 years (10-y)

SECTION D.: Environmental impacts:

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

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The project being a renewable energy biomass based power project it does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. As per the government of India notification dated June 13, 2002 based on environment protection rule, 1986, public hearing and EIA is required for those industries/projects which are listed in the predefined list of ministry of environment and forest. Thermal power projects with investment of less than Rs. 100 crores have been excluded from the list. Hence, it is not required by the host party.

The project has taken all the care to follow the rules and regulations for conservation of the environment prescribed by licensing authorities like KSPCB. Detailed below is the Environmental management proposed by KGPL.

This EMP has been prepared based on the existing environmental conditions and the impact appraisal due to the proposed KGPL. The EMP has been prepared for implementation subsequent to the baseline monitoring carried out at the site. Mitigation of even minor impact due to Air pollution, Noise pollution, water pollution, land pollution due to solid waste and thermal pollution are addressed in the EMP.

Air Pollution Management

Air Pollution Management during Construction.

During earthwork (cutting &filling) and unloading of civil construction material dust clouds are expected. These dust clouds will be suppressed by spraying water or dust suppressants. Adequate quantity of construction water and temporary piping with spray nozzles are planned.

Air Pollution Management during Operation.

- Measures adopted by KGPL to minimize air pollution
- Installation of high efficiency ESP having SPM emission rate of 95mg/Nm3. (CPCB norm = 150 mg/Nm3).
- Interlocking of ESP with Boiler operation.

- Elaborate dust suppression and dust collection systems at sources causing fugitive emissions in the work zone.
- Taller chimney and higher exit velocity than specified CPCB norms to increase dispersion area and hence reducing ground level concentration of pollutants.
- Dedicated operation and maintenance team of pollution control systems.
- In house monitoring facilities and laboratory.
- Training of workers and good house keeping.
- Incentives and rewards for best maintenance of pollution levels below CPCB norms.
- Green belt Development.

Water Pollution Management

Water requirement

Water Requirement	**cum/day**
Make-up water for cooling tower	624
DM Plant	70
service water for general use	24
Drinking	2
Total	**720**

Source: KGPL

Effluent Generation

Source	**cum/day**
Cooling Tower Blow Down	415
Boiler Blow Down	26
DM Plant Regeneration and back washes	12
Service Water	24
Total	**477**

Source: KGPL

Minimum of 3.0 ha has been ear marked for Green Belt development

Solid Waste Management

Generally biomass based power plant does not produce solid wastes. The only solid waste is ash from fuel. It is planned to dispose ash to brick industry and other users on a day to day basis. However to meet emergency storage need, 15 day storage off ash is planned.

15 day storage: 15 MT i.e. 900 m^3

Storage Size: 20 x 20 x 2.5 m

Thermal Pollution Management

A close circuit cooling water system with cooling towers has been provided. This eliminates the letting out of high temperature water in to the canals and prevents thermal pollution. Blow down from the cooling tower will be trenched out and ultimately conveyed to the drainage. Hence there is no separate pollution on account of blow down from cooling water system.

Noise Pollution Management

The following mitigative measures have been opted for noise pollution control

Technical Measures:

- By providing silencers on all safety valves and vent valves.
- By selecting low RPM, heavy duty I.D (Version 10), F.D an SA Fans
- To reduce noise transmission by providing silencer and inlet and outlet of noise generation sources
- Checking and plugging all air & steam leakages
- Monitoring of vibration levels of High speed machines
- Thick tree plantation with substantial depth.

Administrative measures:

- Workers will be put on rotational duties
- Regular & periodical medical checkups

Personal protection measures

- Provision of ear plugs
- Provision of ear muffs

Ecology and Green belt Development

A much elaborate green belt development plan has been implemented at the project activity site along the plant boundary, along the road side and around the office and other buildings. The species for plantation had been selected on the basis of oil quality, place of plantation, chances of survival, growth rate, timber value etc. The green belt serves the following objectives:

- Mitigation of fugitive dust emissions including any odor problems
- Noise pollution control
- Controlling soil erosion
- Balancing eco-environment
- Aesthetics

Post plantation maintenance of the green belt is being done by hired local labour as and when required. Any help required in the development of green belt was sought from the Forest Department.

Post Project Monitoring

The monitoring of various environmental parameters is necessary as part of the environmental protection measures. Monitoring is an important feature because the efficiency of control measures can only be determined by monitoring. The following monitoring program is proposed for the proposed power plant:

- Ambient air quality and Stack Monitoring: Once a month
- Water and wastewater Quality: Once a month
- Noise levels within the plant: Once a month

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:

Not Applicable

SECTION E. Stakeholders' comments:

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

The local stakeholder comment invitation and compilation process involved is as follows:

The local stakeholders are immediately affected by the activities of the project. The effect is on the local environment, social life and economics. All the individuals and organizations falling in the above effects are perceived as stakeholders. They can be within the boundaries of the village, district, state or nation.

On deciding above criteria for qualification of the stakeholders, the idea was to decide most appropriate representatives who are covering above. During interaction of the corporate headquarter and the plant management, the stakeholders were identified as:

- Office bearers of the neighbouring villages local bodies
- Biomass suppliers
- Customer (KTPCL)
- Licensing and regulatory authority - KSPCB

KGPL invited the identified stakeholder vide letter to the KGPL site on Tuesday, 27 June 2006 at 09:30 am to give their comments on KGPL project activity. The same has been documented by KGPL.

KGPL has been constantly in touch with all above mentioned stakeholders and other identified stakeholders like licensing and regulatory authorities. Their views are reflected in the form of permissions granted for the project. In this aspect, the permission by KREDL, MoEF, KSPCB and MNES are indication of favorable impression for the project.

Stakeholders Involvement

The village *Panchayat* /local elected body of representatives administering the local area is a true representative of the local population in a democracy like India. Hence, their consent / permission to set up the project is necessary. KGPL 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 local rice mill owners and farmers will be involved in the supply of the biomass and hence the project would be a beneficial project for these stakeholders. In addition to this, the project would also lead to 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 does 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.

The distance between the electrical substation for power evacuation and the plant is around 600 metres only hence installation of transmission lines will not create any inconvenience to the local population.

KSPCB has prescribed standards of environmental compliance and monitors the adherence to the standards as per the Consent for Operation (CFO). The project has already received No Objection Certificate (NOC) from KSPCB to start the plant vide letter No. 67/KSPCB/CFE-CELL/DEO/AEO-3/KOPPAL/F-230/NE/RO-RCH/200-2001/314 dated 06 January 2001.

Karnataka State Renewable Energy Development Limited (KREDL) implements policies in respect of non-conventional renewable power projects in the state of Karnataka and has accorded approval to the project vide letter no. KRED/03/KGPL/01/337 dated 03th March 2001.

As a buyer of the power, the KPTCL/GESCOM is a major stakeholder in the project. They hold the key to the commercial success of the project. KPTCL/GESCOM has already cleared the project and KGPL has already signed Power Purchase Agreement (PPA) with KPTCL/GESCOM on 30 March 2001.

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. The project meets their requirements.

E.2. Summary of the comments received:

>>

As mentioned above, KGPL has already received the approvals and clearances for their project from the following stakeholders:

- Consent order of Establishment from KSPCB
- Power Purchase Agreement with KPTCL/GESCOM;
- Clearance from the Gram Panchayat.

A meeting was conducted with the local stakeholders on 27 June 2006 at the project activity site.

The biomass suppliers and the farmers from the vicinity expressed their gratitude to KGPL for having set such an activity in their vicinity. Previously the rice mill owners in the vicinity could not run their mills due to the huge storage space required to store the rice husk. Sometimes they were forced to give free fuel to encourage

people to come and collect the rice husk from their mills. This created a the financial burden for the rice mill owners. Moreover this activity has enabled local farmers to get additional income for his crop. In short this project activity has turned out to be a boon for the Rs 50 Crore rice mill industry and the local farmers operating in this region.

Over and above this KGPL has directly and indirectly resulted in providing employment for about 1500 people. Around 40 people form the local population has been directly employed by KGPL.

In summary, every stakeholder expressed that the project activity is helping the socio-economic development of the village and nearby area without affecting the local environment.

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

>>

Not applicable. All positive comments received.

ANNEX-1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Koppal Green Power Limited
Street/P.O.Box:	H.No. 1-88/1/102,102, Shanti Vanam
Building:	Kavuri Hills Extension
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 033
Country:	India
Telephone:	91-40-65133344
FAX:	91-40-23112623
E-Mail:	koppalgreen@rediffmail.com
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr
Last Name:	Mohan
Middle Name:	
First Name:	Chandra
Department:	
Mobile:	0091-94481 35286
Direct FAX:	
Direct Tel:	0091-40-55133344
Personal E-Mail:	Chandra_may4@yahoo.com

ANNEX-2

INFORMATION REGARDING PUBLIC FUNDING

No public funding available for this project

ANNEX-3

Simple Operating Margin (tCO2/MWh) (incl. Imports)						
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.98	0.98	1.00	0.99	0.98	0.99
East	1.22	1.19	1.17	1.20	1.17	1.13
South	1.03	1.00	1.01	1.00	1.00	1.01
West	0.98	1.01	0.98	0.99	1.01	0.99
North-East	0.73	0.71	0.74	0.74	0.84	0.70
India	1.01	1.02	1.02	1.02	1.02	1.02
Build Margin (tCO2/MWh) (not adjusted for imports)						
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North					0.53	0.60
East					0.90	0.97
South					0.71	0.71
West					0.77	0.63
North-East					0.15	0.15
India					0.70	0.68
Combined Margin in tCO2/MWh (incl. Imports)						
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.76	0.76	0.77	0.76	0.75	0.80
East	1.06	1.05	1.04	1.05	1.04	1.05
South	0.87	0.85	0.86	0.86	0.85	0.86
West	0.87	0.89	0.88	0.88	0.89	0.81
North-East	0.44	0.43	0.44	0.44	0.49	0.42
India	0.85	0.86	0.86	0.86	0.86	0.85

Considering for the most recent three years (2003 - 04 to 2005 – 06) for the Southern Grid

Simple Operating Margin (tCO2/MWh) (incl. Imports)				
	2003-04	2004-05	2005-06	Average
South	1.00	1.00	1.01	1.004
Build Margin (tCO2/MWh) (not adjusted for imports)				
	2003-04	2004-05	2005-06	Average
South	-	-	0.71	0.711
BEF Considered for Project Activity				0.857

Source: Central Electricity Authority (CEA);

http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

ANNEX-4

Monitoring Plan

All the parameters mentioned in the monitoring plan have been monitoring in the plant but in other formats. The entire process of monitoring has been streamlined and will be made available in the required format during the verification process and for subsequent useful purposes. The Fuel Consumption data, etc are being maintained in different formats. The data formats for CDM have already been finalized and started monitoring accordingly to ensure and demonstrate existence of MVP in the plant.

The calibration of monitoring equipment is being maintained as per the requirement of KPTCL/GESCOM and the same is being done regularly. Power Generation, Export & Auxiliary Consumption, fuel consumption are being recorded daily and the same is being verified and approved by Plant Manager. These records are being sent to Head Office for review by the Director and for corrective actions if necessary.

Further, Internal Auditors also verify the monitoring data. As per the advices of the Internal Audit team, corrective actions will be taken up for more accurate future monitoring and reporting system.

The Plant is equipped with energy meters/export meters for monitoring and control purpose. The energy meters shall be tested and calibrated utilizing a standard meter. The standard meter shall be calibrated once in a year at the approved laboratory of Govt. of India or Govt. of Karnataka per terms and conditions of supply. The tests of meters shall be jointly conducted by authorised representatives of both the parties and the results and correction so arrived at mutually will be applicable and binding on both the parties. The energy meters shall not be interfered with, tested or checked except in the presence of representatives of company and KPTCL/GESCOM. If any of the meters is found to be registered inaccurately, the affected meter will be immediately replaced. The meters will be checked in presence of both the parties on mutually agreed periods. If during the test checks both the meters are found beyond permissible limits of error, both the meters shall be immediately replaced and the correction applied to the consumption registered by the main meter to arrive at the correct energy exported for billing purposes for the period of one month up to the time of test check, computation of exported energy for the period thereafter till next monthly reading shall be as per the replaced meter. Corrections in exported energy shall be applicable to the period between the two previous monthly reading and the sate and time of test calibration in the current month when error is observed.

Power generation, export and auxiliary consumption are being recorded at the plant from the installed meters. However, for applying monthly bill to KPTCL/GESCOM the meter readings will be taken on 1st of every month by KPTCL/GESCOM officials in presence of company representatives and readings will be jointly certified.

The following log sheets are being maintained for the critical equipment of the plant and readings are being recorded on day to day basis:

1. Turbine log
2. Boiler log
3. Electrical log

If both the both main meter and check meters fail to record or if any of the PT fuses are blown out, the export energy will be computed on a mutually agreeable basis for the point of defect.

Power generation, export and auxiliary consumption, fuel consumption are being recorded at the plant daily and the same is being verified by Manager of the plant. These records sent to head office for review by the director and for corrective actions if necessary.

Emission levels are being monitored as per the statutory requirement. Plant emission levels are being monitored and the results are being sent to KSPCB. For this purpose, the service of external agency is being utilized.

KGPL will carry out Biomass Resource Assessment on an annual basis to ascertain sufficient availability of biomass in Koppal district based on the latest available literature / data from the government sources to determine if the biomass is at least 25% larger than the total quantity utilized by the project activity as well as existing users. In the absence of the official data, a biomass assessment study will be carried out by employing third party assessors who have past experience of doing such work.

Instrument Specification at KGPL

Sr. no.	Data description	Procedure for monitoring the parameter	Traceability of calibration method/ standard	Tag no OR equipment serial no of instrument	Service & Tech def. Of instrument and measuring	Make of instrument	Location of instrument	Calibration Method	Least Count and range of instrument	Uncertainty	Linkage with system management, ISO doc number (If system is available)
1	Electricity Generated at KGPL. Jan 05 to May 07 97723300 KWH	Tri-vector Meter Hourly	Standard Yearly Once	SL No 04802450	Nil	L&T	Synchronising Panel	Standard Boosting Method	0 to 10^7	Low	-
2	Electricity Exported from KGPL Jan 05 to May 07 85764700. KWH	Tri-vector Meter Hourly	Standard Every 3 Months	Sr No 04187304	Nil	L&T	Switch Yard	As per KPTCL MRT Div Method	0 to 10^7	Low	-
3	Quantity of Biomass purchased by KGPL Jan 05 to May 07 146824.269 MT	Weigh Bridge For Every Vehicle	Standard Yearly Once	SL NO IPAF/WB 112	Nil	IPA Flowmatics	Weighbridge Room	As per Govt. Of Karnataka Weights & Measures Div	0 to 30 Mt	Low	-

Appendix A

Abbreviations

CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CER	Certified Emission Reductions
Cm	Centimetre
CO_2	Carbon Dioxide
DPR	Detailed Project Report
FBC	Fluidized Bed Combustion
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
IREDA	Indian Renewable Energy Development Agency
Kcal	Kilo Calories
Kg	Kilogram
KM	Kilometer
KP	Kyoto Protocol
KW	Kilowatt
KV	Kilovolts
kWh	Kilowatt hour
LP	Low Pressure
MoEF	Ministry of Environment and Forests
MT	Metric Tonnes
MU	Million Units
MW	Megawatt
NOC	No Objection Certificate
PDD	Project Design Document
PIN	Project Idea Note
PLF	Plant Load Factor
PPA	Power Purchase Agreement
RE	Renewable Energy
SEB	State Electric Board
STG	Steam Turbine Generator
TJ	Tera Joule
KSPCB	Karnataka State Pollution Control Board

Appendix B

REFERENCE LIST

Sr. No	References
1.	Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) **http://cdm.unfccc.int**
2.	Website of United Nations Framework Convention on Climate Change, **http://unfccc.int**
3.	UNFCCC decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol
4.	UNFCCC document: Appendix B to attachment 3, Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories
5.	Detailed project report on 6.0 MW Biomass based power project - KGPL
6.	Website of Central Electric Authority (CEA), Ministry of Power, Govt. of India- **http://cea.nic.in**
7.	CEA published document "16th Electric Power Survey of India"
8.	Website of Ministry Non-Conventional Energy Sources (MNES), Government of India, **http://mnes.nic.in**
9.	Website of Indian Renewable Energy Development Agency (IREDA), **www.ireda.nic.in**
10.	**www.infraline.com/power/**
11.	Website of Climate Change Cell, Ministry of Environment & Forest, Govt. of India. **http://envfor.nic.in**

Appendix – C

ESTIMATED EMISSION REDUCTION WITHOUT THE CONSIDERATION OF COAL

CALCULATION OF EMISSION REDUCTIONS WITHOUT CONSIDERING COAL CONSUMPTION											
Year of offer		**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**	**2012-2013**	**2013-2014**	**2014-2015**	**2015-2016**	**2016-2017**
On-Site Project Emission Reductions											
Generation capacity , KW		6000.00	6000.00	6000.00	6000.00	6000.00	6000.00	6000.00	6000.00	6000.00	6000.00
Plant load factor, %		85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
No. of hours of plant operation per annum		8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	8000.00	8000.00
Million KWh generated in a year	**408**	40.80	40.80	40.80	40.80	40.80	40.80	40.80	40.80	40.80	40.80
Auxilliary consumption per annum	**53**	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32
Million KWh exported to grid	**355**	35.48	35.48	35.48	35.48	35.48	35.48	35.48	35.48	35.48	35.48
T&D losses considered on exportable power	**0**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No. of units imported from the grid, MWh	**1**	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
No. of units replaced in the grid, MWh	**354**	35.40	35.40	35.40	35.40	35.40	35.40	35.40	35.40	35.40	35.40
Baseline emission factor considered, kgCO2/kWh		857.00	857.00	857.00	857.00	857.00	857.00	857.00	857.00	857.00	857.00
Baseline emissions, tonnes	**303364**	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43
Diesel Consumption (kg)		13833.33	13833.33	13833.33	13833.33	13833.33	13833.33	13833.33	13833.33	13833.33	13833.33
Project emissions from Diesel, tonnes	**365**	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51
Coal used as supplimentry fuel (25% max), tonnes		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Project emissions from Coal, tonnes	**0**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Project emissions from Coa and Diesel, tonnes	**365**	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51
Net greenhouse gas emissions, tonnes		30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91
Actual green power to grid, Million KWh	**354**	35.40	35.40	35.40	35.40	35.40	35.40	35.40	35.40	35.40	35.40
Carbon emission reductions in a year	**302999**	**30299.91**	**30299.91**	**30299.91**	**30299.91**	**30299.91**	**30299.91**	**30299.91**	**30299.91**	**30299.91**	**30299.91**
Commitment period											
No. of years of delivery of CERs											
Total number of CERs	**302999**										

ESTIMATED EMISSION REDUCTION CONSIDERING COAL AS 25% OF TOTAL FUEL USED AS PER CFE

CALCULATION OF EMISSION REDUCTIONS CONSIDERING 25% COAL CONSUMPTION											
Year of offer		**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**	**2012-2013**	**2013-2014**	**2014-2015**	**2015-2016**	**2016-2017**
On-Site Project Emission Reductions											
Generation capacity , KW		6000.0	6000.0	6000.0	6000.0	6000.0	6000.0	6000.0	6000.0	6000.0	6000.0
Plant load factor, %		85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0
No. of hours of plant operation per annum		8000.0	8000.0	8000.0	8000.0	8000.0	8000.0	8000.0	8000.0	8000.0	8000.0
Million KWh generated in a year	**408**	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8
Auxilliary consumption per annum	**53**	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Million KWh exported to grid	**355**	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5
T&D losses considered on exportable power	**0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
No. of units imported from the grid, MWh	**1**	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
No. of units replaced in the grid, MWh	**354**	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
Baseline emission factor considered, kgCO2/kWh		857.0	857.0	857.0	857.0	857.0	857.0	857.0	857.0	857.0	857.0
Baseline emissions, tonnes	**303364**	30336.4	30336.4	30336.4	30336.4	30336.4	30336.4	30336.4	30336.4	30336.4	30336.4
Diesel Consumption (kg)		13833.3	13833.3	13833.3	13833.3	13833.3	13833.3	13833.3	13833.3	13833.3	13833.3
Project emissions from Diesel, tonnes	**365**	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5
Coal used as supplimentry fuel (25% max), tonnes		15000.0	15000.0	15000.0	15000.0	15000.0	15000.0	15000.0	15000.0	15000.0	15000.0
Project emissions from Coal, tonnes	**226105**	22610.5	22610.5	22610.5	22610.5	22610.5	22610.5	22610.5	22610.5	22610.5	22610.5
Total Project emissions from Coa and Diesel, tonnes	**226470**	22647.0	22647.0	22647.0	22647.0	22647.0	22647.0	22647.0	22647.0	22647.0	22647.0
Net greenhouse gas emissions, tonnes		7689.4	7689.4	7689.4	7689.4	7689.4	7689.4	7689.4	7689.4	7689.4	7689.4
Actual green power to grid, Million KWh	**354**	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
Carbon emission reductions in a year	**76894**	**7689.4**	**7689.4**	**7689.4**	**7689.4**	**7689.4**	**7689.4**	**7689.4**	**7689.4**	**7689.4**	**7689.4**
Commitment period											
No. of years of delivery of CERs											
Total number of CERs	**76894**										

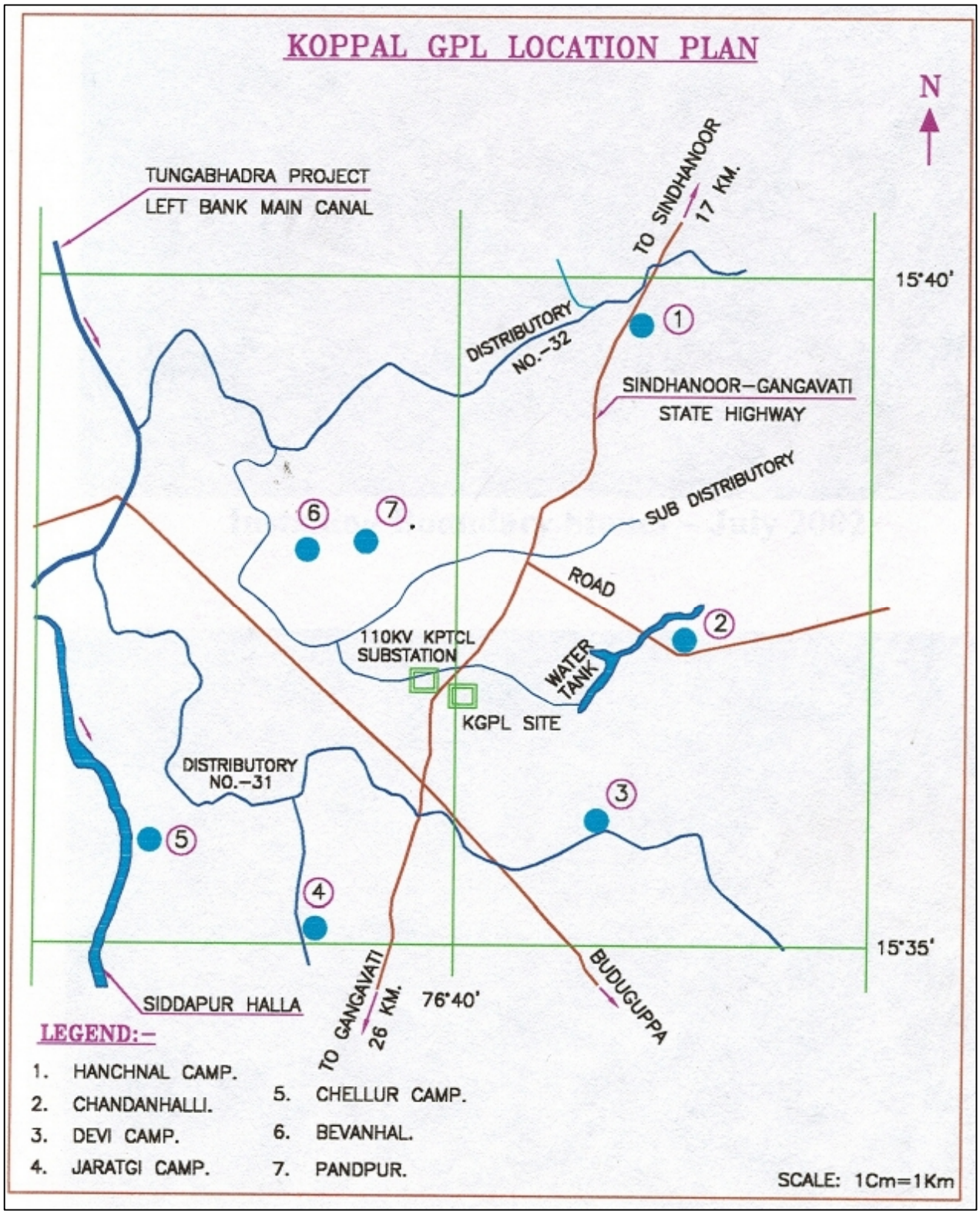
ESTIMATED EMISSION REDUCTION WITHOUT THE CONSIDERATION OF COAL

Year	TOTAL	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Baseline emissions, tCO2	**303364**	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	**303364**
Project emissions, tCO2	**365**	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51	36.51	**365**
Emission reductions, tCO2	**302999**	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	30299.91	**302999**

ESTIMATED EMISSION REDUCTION CONSIDERING COAL AS 25% TOTAL FUEL USED AS PER CFE

Year	TOTAL	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Baseline emissions tCO2,	**303364**	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43	30336.43
Project emissions, tCO2	**226470**	22647.01	22647.01	22647.01	22647.01	22647.01	22647.01	22647.01	22647.01	22647.01	22647.01	22647.01
Emission reductions, tCO2	**76894**	7689.41	7689.41	7689.41	7689.41	7689.41	7689.41	7689.41	7689.41	7689.41	7689.41	7689.41

Appendix – D


KOPPAL GPL LOCATION PLAN
N
TUNGABHADRA PROJECT
LEFT BANK MAIN CANAL
TO SINDHANOOR
17 KM.
15°40'
DISTRIBUTORY
NO.-32
SINDHANOOR-GANGAVATI
STATE HIGHWAY
SUB DISTRIBUTORY
ROAD
110KV KPTCL
SUBSTATION
WATER
TANK
KGPL SITE
DISTRIBUTORY
NO.-31
15°35'
SIDDAPUR HALLA
TO GANGAVATI
26 KM.
76°40'
BUDUGUPPA
LEGEND:-
1. HANCHNAL CAMP.
2. CHANDANHALLI.
3. DEVI CAMP.
4. JARATGI CAMP.
5. CHELLUR CAMP.
6. BEVANHAL.
7. PANDPUR.
SCALE: 1Cm=1Km