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

CONTENTS

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

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

4.5 MW Biomass (low density Crop Residues) based Power Generation unit of Malavalli Power Plant Pvt Ltd.
Date: February 13, 2006

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

Purpose

The purpose of the project is to utilise the available low-density crop residues (cane trash/coconut fronds) and other biomass fuels in the region effectively for generation of power. The generated power from a 4.5 MW biomass power plant is sold to the state grid for sustainable economic growth, conservation of environment through use of biomass fuels and green house gases (GHG) emission reductions. The project will also help to reduce the ever-increasing demand and supply gap of electricity. The project also produces organic fertilisers (with ash from Biomass Power Plant as input) and distributes to farmers from whose fields the crop residues are collected.

Malavalli Power Plant Pvt. Ltd. (MPPL) had a primary business mission of pioneering the utilisation of low density crop residues which are otherwise burnt on the fields (leading to high particulate emissions) or allowed to decompose (leading to methane release). After intensive period of desk/field research (1997 to 2000) MPPL constructed the pilot plant which was commissioned in August 2001. This plant fired only biomass and with over 70% of the fuel being low density crop residues (primarily cane trash/coconut fronds).

The plant location was kept at Kirugaval village in Malavalli Taluka of Mandya District, Karnataka for the following reasons.

* There was adequate availability of cane trash/coconut fronds in the vicinity.

* The plant location is 35 km from the city of Mysore and 125 km from the city of Bangalore. This facilitates the building up of engineering resource and O&M organisation (with the required technical skills) to undertake a pioneering project.

The following local benefits are also envisaged due to the setting up of project:

- Proper utilisation of surplus biomass;
- Generation of eco-friendly green power;
- Avoidance of burning of agriculture waste;
- Reduction of CO_2 emissions
- Encouraging use of organic fertilisers
- Creation of local jobs in crop residues supply chain (approx 450 jobs)
- Creation of local jobs in biomass Power Plant and Organic Fertiliser O&M (approximately 200 jobs)
- Developing a participating model (involving local community) for rural electricity distribution. Thereby contributing to reduction of losses as well as sensitising the local community on the need to pay user charges/prevent thefts.

Contribution to Sustainable Development

The project is renewable energy project for power generation and export of clean power to the state grid substituting the use of conventional fossil fuel's power generation in the grid. Hence it

will positively contribute towards the reduction in (demand) use of finite natural resource like coal/gas/oil, minimising depletion or else increasing its availability to other important processes.

Government of India has stipulated the following indicators for sustainable development in the interim approval guidelines, Ministry of Environment and Forest for CDM projects.

1. Social well being

- The project creates 650 direct jobs, since the biomass resources are to be collected and transported to the plant site from the fields, opportunities are being generated for the people to collect and transport biomass.
- The project acts as a catalyst (and also provides support structures through a sister company Grameena Abhivrudhi Mandali) for rural entrepreneurial development and thereby secondary jobs creation.
- The project contributes approximately Rs. 45 million (USD 1 million) to the rural economy/year through the Biomass Supply Chain. It is emphasised that value is created for crop residues which was otherwise wasted in the fields (cane trash, coconut fronds etc.)
- The project (through its sister company *Grameena Abhivrudhi Mandali*) undertakes services related to rural electricity distribution and thereby ensures better quality of service to the consumers while ensuring higher revenues/collections to the Distribution Utility.

2. Economic well being

- The project activity generates employment in the local area. The project will also provide economic value to crop residues and provides stable and quality power to industry, farmers and households.

- The main resources for power generation are biomass fuels such as cane trash/coconut fronds etc. Crop residues are collected from the farmers out of their field and brought to the project, thus generate additional revenue on account of supply of these crop residues to the project, which are otherwise being under-utilized / burnt so far with no commercial value. In other words, the plant is generating commercial value to crop residues enabling the farmers to get better price out of their produce augmenting their income. The above benefits due to project activity ensure that the project would contribute to the social and economic well being in the region.

3. Environmental well being

- Since, the project uses only biomass materials for power generation, which otherwise would have been a fossil fuel such as coal, lignite and gas, the project does not lead to GHG emissions. Combustion of biomass materials in the project result in GHG emissions of CO_2, CH_4 and NO_x. The major constituent of GHG emissions is CO_2 which about 98%, whereas CH_4 and NO_x 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%, therefore CH_4 emission is negligible. Hence, the CO_2 is considered as the only GHG emissions from the biomass combustion.

- The project fires 100% biomass and thereby replaces the firing of fossil fuels which in the Indian context would have been high (35-45%) ash content coal or high (4-5%) sulphur content fuel oil.

- The project reduces the burning of cane trash in fields which otherwise result in high particulate emissions as well as contamination of ground water.

- The project reduces the release of methane through decomposing of coconut fronds at the edge of coconut fields

- The project encourages organic farming through production of organic fertiliser and distributing the same to farmers from whose field's crop residues have been collected.

- The project (through its sister company *Grameena Abhivrudhi Mandali*) sensitises farmers on energy conservation and thereby reduces ground water extraction through wasteful farming practices.

4. Technological well being

- The technology selected for the proposed project is a more energy efficient technology due to the following features. The project uses a steam turbo generator with matching boiler of travelling grate type capable of firing multiple fuels. This is a more efficient than the Fluidized Bed Combustion (FBC) system. The auxiliary power consumption for travelling grate type is much less (11.5%) than the FBC type (16%).
- The plant has not been built to incorporate any coal handling equipment such as coal bunkers, coal mills, coal conveyers etc. Hence this plant can be operated only using biomass fuels. In case of non availability of biomass, particularly during heavy rains, the plant is shutdown.

In view of the above, the project activity profoundly contributes to sustainable development and also meets the approval guidelines for CDM projects stipulated by the Government of India.

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 Country)	Malavalli Power Plant Pvt. Ltd.	No
Switzerland (Annex I Country)	myclimate	No

Details are provided in Annex-1

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

The project activity is a 4.5 MW (gross) capacity grid connected biomass (low density crop residue) based renewable energy power plant with high-pressure steam turbine configuration. On an annual average basis, the project has potential to export around 27 GWh to the KPTCL grid by considering auxiliary power consumption of 11.5%. The Plant generated 29.82 GWh and exported 26.54 GWh during April 2003-March 2004.

Though as per MNES guidelines use of coal as a back up fuel is allowed (maximum up to 30%). The plant has never fired any fossil fuel. Furthermore, the project developers steadfastly focused on their mission of firing low density crop residues as primary fuel, even though this resulted in significantly lower levels of generation and plant outages during operations stabilisation phase (April 2001-March 2003). The plant is now performing satisfactorily with low density crop residues as primary fuel.

The power plant has one condensing steam turbo generator unit with a matching boiler of travelling grate type capable of firing multi fuels. The boiler was specifically designed to burn 100% agricultural residue (cane trash, coconut fronds, toppings of plantation wood, corn cob/maize stalks). All necessary auxiliary facilities of the power plant are provided. The boiler is

sized to produce a maximum of 22 tonnes per hour of steam. The steam turbine is a straight condensing type machine with one bleed off to deaerator for feed water heating. The steam conditions at the boiler heat outlet are at a pressure of 42 kg/cm^2 and temperature of 440 $\pm$ 5° C.

Technical details:

Type of steam generator:	Travelling grate
Fuel:	Sugar Cane trash, Coconut fronds, Corn Cobs, toppings of Plantation Wood
Fuel firing rate:	6.00 TPH
Main steam flow rate:	22.00 TPH
Main steam pressure:	42 ata
Main steam temperature:	440°C
Power generation capability:	4.5 MW
Condenser vacuum:	0.1 bar
Cooling water temperature:	32°C
Dust collection equipment:	Electrostatic Precipitator
Outlet dust concentration:	< 150 mg/Nm^3

Additional environmental and technical information:

1. There is 78% boiler efficiency. The biomass has on average 3000 kcal/kg heating capacity, and fuel consumption is around 1.4. kg/kWh.
2. The emission of NO_x is negligible as the temperature in the furnace is lower than 1000^0 C.
3. CO emission is negligible since the combustion efficiency in the boiler is 78%.
4. The greenhouse gas CO_2 that is emitted as a major gas during the firing of the plant, is reabsorbed by the agro-waste during its growth phase.
5. The sulphur content in biomass is 0.13% maximum.
6. The detrimental effect of SO_2 and NO_x is negligible but further mitigated by a greenbelt around the boundary of the plant.
7. The particulate emissions from the plant are controlled by the use of high efficiency (99%) Electrostatic Precipitators (ESP).
8. There is some contribution to thermal pollution of the atmosphere through the discharge of hot flue gases. The effect at ground level is minimal as the heat is dissipated to the higher levels of the atmosphere through the chimney.
9. Solid wastes include ash generated by the plant. This is drenched with water to avoid dust hazard, and is transported in closed containers. This ash used in an organic fertiliser production unit from where it is distributed to the farmers from whose fields, crop residues are collected. The ash percentage is only 6 % so there is 100% ash utilisation.
10. Liquid wastes from the power plant will result mainly from the boiler blow down and demineralised plant. These liquid wastes are treated in an effluent treatment plant (ETP) and is used for the greenbelt inside the plant.
11. Noise pollution is relatively low, however tight sealed doors are provided between the turbine hall and control room to prevent any abnormal noise.

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.:

Karnataka

A.4.1.3. City/Town/Community etc:

Kirugavalu Village, Malavalli Taluka

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

The Plant is located at Kirugaval village, Malavalli Taluka, Mandya District, Karnataka. The site is adjacent to the highway Bangalore – Kanakpura – Malavalli – Mysore. The site is generally plain and solid with alluvial soil. The Cauvery river flows through Mandya district and there is a wide spread canal network. The Mandya region receives rainfall intermittently for 7 months period from June to December, due to the confluence of the South West Monsoon and North East Monsoon in this region. As such, there is adequate ground water recharging in the Mandya region. The plant meets its water requirements from bore wells, for which purpose approval from the Central Ground Water Board of India has been obtained. The plant has also got approval from the Irrigation Department to draw water from adjacent canal but till date there have been no necessity to draw canal water.

Power generated from the plant is being evacuated through 66/11 KV MUSS at DG Koppalu of KPTCL (Karnataka Power Transmission Corporation Limited) which is located 1.1 km from the plant.

The bearings of the project location are:
Latitude: 12 deg – 28 N
Longitude: 77 deg – 8 E

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

Project Type : Type I. RENEWABLE ENERGY PROJECTS
Category : I.D. Renewable electricity generation for a grid (according to: Appendix B of the simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories).

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 power plant uses environmentally sustainable grown biomass. The GHG emissions of the combustion process, mainly CO_2 are consumed by plant species, representing a cyclic process. Since, the biomass contains only negligible quantities of other elements such as lime Nitrogen, Sulphur etc., the release of other GHGs are considered as negligible. The biomass is CO_2 neutral and thus environmentally benign as it limits the greenhouse effect.

Conventional energy equivalent of around 193.1GWh for a period of 7 years in Karnataka would be replaced by generating power from the 4.5 MW non-conventional renewable sources biomass based power plant thereby resulting in CO2 emission reduction of around 144,840 tonnes. In the absence of the proposed activity, the same energy load would have been taken-up by thermal power plants and emission of CO2 would have occurred due to combustion of conventional fuels like coal / gas.

The Karnataka Power Transmission Corporation Ltd (KPTCL) has responsibility for power purchase and transmission in Karnataka State where the present project activity is located. The main generation capacity is provided by plants built owned and operated by Karnataka Power Corporation Ltd. In addition, power is purchased from central government generating stations as KPCL is not in a position to provide adequate power generation capacity for the needs of the state. Karnataka was a pioneer in the development of hydropower and had a power surplus situation till the seventies. Due to rapid industrialization and other structural problems it is facing acute power shortage. In 2001-02, against an unrestricted demand of 31208 MUs, as per the 15th Power Survey Report of the Central Electricity Authority, generation from the State grid is 21630 MUs leaving a gap of 9578 MUs. After the contribution of Central Stations & imports from neighboring States to the extent of 7065 MUs, the State is left with an annual deficit of 2513 MUs. It is therefore necessary that steps for further power development be initiated immediately. As per Karnataka Electricity Regulatory Commission last Tariff Order 2003, the mix of Thermal to Hydro/Non Conventional Energy (NCE) was 66:34. There are severe limitations in expanding large hydro capacity due to the relatively high level of already exploited resources (2901.4 MW). Consequently, the energy/peak load shortfall is planned to be met largely from large coal fired Power Plants (viz. from NTPC Talcher / Ramagundam, NLC Neyveli, KPCL Bellary, Nagarjuna Power Mangalore) with continued uncertainty in hydro power generation (which is closely linked with rainfall) it is expected that in the coming 3 to 4 years the mix of Thermal to Hydro/NCE is expected to be 70:30.

The power plant is not only justified due to the shortage of power availability and energy but also due to eco-friendly power generation.

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

The chosen crediting period for the project activity is renewable crediting period i.e., renewable after every 7 years. It is estimated that the project activity would generate about 144,840 CERs over the first crediting period. Annual estimates of emission reductions by the project activity during the above crediting period are furnished below.

Year (April to March)	Annual estimation of emission reductions in tonnes of CO_2 e
2001-2002 (from August 2001)	11175.82
2002-2003	18663.23
2003-2004	22385.23
2004-2005	16453.89
2005-2006	22846.89
2006-2007	22846.89
2007-2008	22846.89
2008-2009 (up to July 2008)	7621.63
Total estimated reductions (tonnes of CO_2 e)	**144,840**
Total number of crediting Years	7 years
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**20,691**

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

No public funding is involved in financing of this project. (Annex - 2)

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

As highlighted in Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

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

On basis of the above, the MPPL project cannot be considered a debundled component of a larger 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:

Title: Renewable electricity generation for a grid

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.

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

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

According to Appendix B of the simplified M&P for small scale CDM project activities: Category I.D. "comprises renewables, such as photovoltaics, hydro, tidal/wave, wind, geothermal and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit". The proposed small-scale CDM project comprises a biomass plant that supplies electricity to the grid is thus applicable for project category 1.D.

Considering the available guidelines in the baseline methodology mentioned in the point no.7 of Type I.D. of Appendix B of the simplified modalities and procedures for small scale CDM project activities: Southern grid of the India has been chosen for baseline analysis by selecting "The weighted average emissions" for baseline calculations.

The applicable category of SSC CDM projects for this is AMS I.D. which states that for projects replacing grid power the baseline shall be either average of approximate operating margin and build margin or weighted average emissions of current generation mix. The latter is chosen since availability of data on operating margins and build margins is quite difficult to obtain especially for the past years. This may lead to loss of accuracy and hence incorrect estimation of baseline emissions. Also, the small size biomass project would actually replace an average rather than marginal unit supplied in the grid.

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 anthropogenic GHG emissions by sources are reduced below what would have occurred in the absence of the proposed CDM project because if it were not for this project the users of electricity who are drawing power in Malavalli and surrounding area from this plant, would otherwise be drawing this power from the grid. In Karnataka, Hydro and other renewables together would account only 30% of total power purchase in the immediate future. Furthermore, the incremental electricity supply, in the future, will be over 90% from coal fired power plants. Thus by substituting the power from the grid with biomass power, the emissions associated with fossil fuels (Indian coal) are avoided.

Further referring to the document of indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, project participants have identified the following barriers to show that the project would not have occurred anyway.

a) Investment Barrier:

The project pioneered the utilization of low density crop residues, which otherwise are burnt in the fields causing environmental pollution (and not contributing to any economic activity). Successful implementation of the project has created 450 rural jobs and adds Rs. 45 million to the rural economy per year.

In view of the pioneering nature the project was sized as 4.5 MW as against the more standard rating (for Biomass Power Plants in India of 7.5 to 8 MW). This results in higher cost of generation due to

- Approximately 9% higher heat rate (resulting in higher fuel cost of approximately Rs. 0.20/kWh)
- Approximately 10% higher unit capital cost (resulting in approximately Rs. 0.10/kWh higher capital servicing costs during first 10 years)

- Same fixed O&M costs (resulting in approximately Rs. 0.15/kWh higher unit O & M costs)

- Higher unburnts, lower availability and higher plant O & M costs in view of slagging/corrosion in the Boiler (resulting in approximately Rs. 0.05/kWh higher O&M costs).

Consequently MPPL's "pilot plant", rated 4.5 MW, firing low density crop residues as primary fuel has higher cost of generation of Rs. 0.50/kWh as compared to a more standard biomass power plant, rated 8 MW, firing mill residues (rice husk, bagasse)/wood.

On account of the project's pioneering nature there were various incremental costs that had to be incurred during the units stabilisation phase (August 2001 – March 2003). During this period MPPL suffered a loss of Rs.37.77 million. This increased the financial costs and thereby cost of generation. Attached financial report (as on 31 March, 2004) gives audited figures, which substantiates the above facts.

The Project Promoters avoid any use of forest wood and/or coal, to meet their goal of show casing a techno-economically viable crop residue fired Power Plant.

From the above, it is clear that a financially more viable alternative of an 8 MW rice husk/bagasse/wood cum coal fired power plant would have been an economically more attractive alternative for the project developers but with significantly lesser contribution to sustainable development. (Annex - 3).

(b) Technological Barrier:

Firing of low density crop residues as primary fuel required various technological innovations related to fuel beneficiation systems as well as boiler design/O & M protocols.

Furthermore, the project implemented a 100% ash utilization scheme involving the production of organic fertilizer and distributing it to farmers from whose fields the crop residues were collected.

The above technological innovations resulted in the project incurring loss of Rs. 34.77 million between August 2001 to March 2003 (plant operations stabilisation phase).

Such developmental costs had been anticipated and the funding was expected through CDM.

(c) Barrier due to prevailing practice:

The project meets the electricity needs of surrounding 47 villages comprising 10,500 consumers.

The prevailing practice is to have energy generated from centralized coal power plants transported through transmission and distribution networks (losses of 34%) and sold at subsidized rates (average tariff Rs. 1.10/kWh) with low collection efficiency (46%).

The project encouraged involvement of the local community in the crop residues supply chain as well as initiatives related to organic fertilizer production and electricity distribution.

Thereby the project is sensitizing the local community on the costs of electricity generation as well as need to pay user charges. In the process energy conservation is also being achieved.
The above goals undoubtedly involve higher project risks but significantly reduce GHG emissions.

(d) Other Barriers :

(i) SHORTFALL IN ANTICIPATED PROJECT FUNDING

The project is the first plant in India to adopt low density crop residues as primary fuel. As with any pioneering project there are significant developmental activities/costs, beyond normal plant construction costs.
The Government of Karnataka (GOK) had recognised the pioneering elements and more significantly sustainable development contribution of the project. Consequently, the following GOK support was anticipated by MPPL.

- Preference Capital contribution by Karnataka Renewable Energy Development Ltd. (KREDL) to the extent of Rs. 16.8 million. Towards this effect communications were exchanged between MPPL and KREDL on September 6th, 1999 and this matter was discussed on KREDL's Board of Directors meeting on February 19th, 2000 and June 29th, 2000.

  On this premise MPPL promoters proceeded with construction of the project. Unfortunately, KREDL finally made equity contribution of only Rs.4.62 million. KREDL Letter No. KRED/ 03/ MPPL/ 00/ 1082 dated October 19th, 2000. (Evidence provided to and verified by DNV).

- Capital Subsidy of Rs. 10 million. Towards this effect, Government of Karnataka passed GO No. DE 17 NCE 98 dated May 28th, 1999.

  The nodal agency KREDL recommended, vide its letter ref. KRED/03/MPPL/01/393 dated November 20th, 2001 to the Principal Secretary, Dept. of Energy, Government of Karnataka that Rs.10 million Capital Subsidy may be released to MPPL . (Evidence provided to and verified by DNV).

  Unfortunately this amount was not released.

  As such, the project suffered a shortfall of Rs. 22.18 million from anticipated funding towards the developmental costs of a pioneering sustainable development project.

(ii) SHORTFALL IN RECEIPTS FROM KPTCL (POWER PURCHASER)

Furthermore, KPTCL (State owned Power Utility) has not been honouring the contracted Power Purchase Agreement, resulting in overdues of Rs. 11.18 million, as on March 31st, 2005.

(iii) PROCEDURAL DELAYS IN HOST COUNTRY APPROVAL

The project participants anticipated unforeseen development costs in both the construction as well as operations stabilisation phases of this pioneering project.

CDM funds were a key assumption. Towards this end the Chairman of MPPL visited SENTER and had discussions with Mr. Looijenstein during April 2001. Copies of relevant correspondence were submitted to DNV.

The project developers obtained the CERUPT tender documents and made all efforts for participation. However, the same could not be successfully pursued on account of lack of clarity in procedural approvals at that time.

The project has received host country approval dated March 23rd, 2005 from Ministry of Environment & Forests (Indian DNA). (Evidence provided to and verified by DNV).

SUMMARY

All the above circumstances have placed the project in a very precarious financial position. Without receipt of CDM funds the project may be obliged to close down.

Such closure would automatically result in the local electricity needs (27 million kWh/year) being met from coal fired Power generation and thereby results in higher GHG emissions.

Furthermore MPPL pioneering project has acted as a catalyst for biomass power plants in South India and more importantly has showcased how biomass power plants should be integrated with rural community development initiatives. It would hence be a shame if such a project is obliged to close down due to liquidity crisis caused by shortfall in anticipated developmental funding and lack of CDM funds.

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 per the guidelines mentioned in Type 1. 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 point of fuel supply to the point of power export to the grid where the project proponent has a full control. Hence, project boundary is considered within these terminal points. Thus, boundary covers fuel storage and processing, boiler, Steam Turbine generator (STG) and all other power generating equipments, and auxiliary consumption units.

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

Since the project activity is feeding power to Karnataka state electricity grid which is a part of southern region electricity board, the baseline for this project activity is the function of the generation mix of southern region grid. Using the methodology available for small-scale project activities as discussed in section B2 above, simple weighted average of current generation mix (in $kgCO_2eq/kWh$) of Southern Grid of India is used for the calculation of baseline.

Baseline Data:

The methodology adopted is the "simple weighted average of current generation mix". The generation data for the year 2001 (the year in which the present project started its generation) is considered as the basis for designing the baseline.

Fuel	Generation GWh	Emissions (tCO_2)
Thermal	93819	98420009
Hydro	30283	0
Nuclear	4399	0
other RE	0	0
Total	128501	98420009

Baseline Emission Factor: 765.9 tCO_2eq/GWh

Detailed Baseline information attached in Annex - 4.

Date of completing the final draft of this baseline section *(DD/MM/YYYY)*: 30/08/2005

Name of person/entity determining the baseline: **Zenith Corporate Services Pvt. Ltd.**
The contact information for the entity that has determined the monitoring methodology is given below:

Organization:	ZENITH CORPORATE SERVICES (P) LTD.
Street/P.O. Box, Building:	10-5-6/B, MYHOME PLAZA, MASABTANK,
City:	HYDERABAD
State/Region:	ANDHRA PRADESH
Postfix/ZIP:	500028
Country:	INDIA
Telephone:	+91 40 2337 6630, 2337 6631
FAX:	+91 40 2332 2517
E-Mail:	zenithenergy@sancharnet.in
URL:	www.zenithenergy.com
Represented by:	
Title:	DIRECTOR
Salutation:	MR.
Last Name:	REDDY
Middle Name:	MOHAN
First Name:	ATTIPALLI

The above entity is not included as project participant in Annex.1.

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

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

Operational lifetime: 25y-0m
Length of first crediting period: 7y-0m

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

The construction of the project activity is started after 1 April 2000 and is operational since 1 August 2001. (Evidence provided to and verified by DNV).

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

The expected operational lifetime of the project activity is 25y-0m

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

As per the data provided in paragraphs 12 and 13 of decision 17/CP.7 and as the project activity is started after 1 January 2000 the project proponents decides that a project activity can be eligible for validation and registration as a clean development mechanism project activity if submitted for registration before 31 December 2005. Therefore the crediting period of the project activity can be prior to its registration, starting from the operational date of the project activity.

C.2.1. Renewable crediting period:

Renewable crediting period is applicable as crediting period for the present project activity.

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

01/08/2001

C.2.1.2. Length of the first crediting period:

7y-0m

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

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:

Monitoring methodology mentioned in the UNFCCC document of "Appendix B of the simplified modalities and procedures for small scale CDM project activities" (Type I: D) is considered as basis for monitoring 4.5 MW Biomass Power Project.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale 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 the power plant is of 4.5 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.

D.3 Data to be monitored:

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
D.3.1.	Power	Electricity generated	KWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	The energy metre is the instrument which records the power generation.
D.3.2	Power	Power Export	KWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Meter is Calibrated and Regularly inspected by KPTCL.
D.3.3	Fuel	Biomass used	MT	m	Daily	100%	Paper	minimum of two years after last issuance of CERs	Biomass deliveries are weighted and build upon receipt at the plants
D.3.4	Fuel	Avg. Calorific value of Biomass used	Kcal/kg	m	Daily	100%	Paper	minimum of two years after last issuance of CERs	A third party does testing every month
D.3.5	Fuel (diesel)	Avg. emissions from transportation of biomass	kL/year	e	Daily	100%	Paper	Crediting period plus 2 years	A fuel receipt note is maintained that records besides other information, the type of transport and quantity of biomass delivered to the plant each day

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:		
1	Low	Electricity production will be measured and monitored through invoices to MPPL and invoice to Third Party, if any. The energy metre is the instrument which records the power generation. Meter is Calibrated and Regularly inspected by KPTCL.
2	Low	Meter is Calibrated and Regularly inspected by KPTCL
3	Low	The amount of biomass purchased will be based on invoices/receipts from farmers and the fuel contractor as well as with the weighbridge log.
4	Low	The energy content of the biomass is measured on a batch wise basis with results used to determine the share of energy produced via biomass input in the event of fossil fuels being used.

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

The primary responsibility for the data measurement as per the monitoring plan will be carried out by the Plant Manager and necessary reports will be generated for the management i.e. Board of Directors or its committee for review. (Evidence provided to and verified by DNV).

Monitoring of emissions from transport: MPPL maintains a document called the Fuel Receipt Note which contains the following information (amongst other information), based on biomass supply to the Plant. (Evidence provided to and verified by DNV).

1. Supplier Name
2. Security Register
   - Vehicle No.
   - Vehicle Type (Lorry, 4-Wheel Trolley, 2-Wheel Trolley, Bullock Cart)
3. Weightment Details
   - Receipt No.
   - Date
   - Fuel Type (named in the local language to include cane trash, coconut fronds, groundnut husk, rice husk, toppings of various types of plantation wood etc.)
   - Gross Weight
   - Tare Weight
   - Net Weight
   - Moisture %

Based on the information contained in the Fuel Receipt Notes, MPPL is able to monitor and estimate the emissions from transport that contribute to leakage from biomass supply to the Plant. (Annex - 5).

The management will review the data collected and also suggest corrective actions wherever required. Management will also examine the internal audit reports independent of the Plant manager's report. Management will in particular take note of deviations in data over the norms and monitor that the corrective actions have resulted in adherence to the standards. It will also be the responsibility of Plant Manager to report to the management about compliance with management's instructions on corrective actions.

The company will introduce an internal audit system for the GHG compliance. The internal auditor appointed for the purpose will be an individual with necessary experience exclusively in GHG audits. The person so appointed as an internal auditor will be given clear instructions about his scope of work and reporting requirements. He will carry out his work on monthly basis or as required by the monitoring plan. His report will indicate the compliance requirements and achievements. He will work directly under the control of the Board of Directors and all his reports will be addressed to the Board directly. The internal auditor in particular will report to the management any non-compliance with corrective actions by the operating staff.

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

The monitoring methodology is determined by the project participant along with M/s. Zenith Corporate Services (P) Limited

The contact information for the entities that has determined the monitoring methodology is given below.

Organization:	Malavalli Power Plant Pvt Ltd.
Street/P.O. Box, Building:	3rd Floor Gupta Towers, 50/1 Residency Road, 1st Cross
City:	Bangalore
State/Region:	Karnataka
Postfix/ZIP:	560025
Country:	INDIA
Telephone:	+91 80 25586425
FAX:	+91 80 25582696
E-Mail:	krishan@mpppl.com
URL:	www.mpppl.com
Represented by:	
Title:	Chairman & Managing Director
Salutation:	MR.
Last Name:	Krishan
Middle Name:	
First Name:	Kolluru
Organization:	Zenith Corporate Services (P) Limited
Street/P.O. Box, Building:	10-5-6/B, My Home Plaza, Masabtank,
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500028
Country:	INDIA
Telephone:	+91 40 2337 6630, 2337 6631
FAX:	+91 40 2332 2517
E-Mail:	zenithenergy@sancharnet.in
URL:	www.zenithenergy.com
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Mohan
First Name:	Attipalli

The above party is not a Project participant.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

Not applicable, as no formula is included in Appendix B.

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 is a CO_2 neutral biomass-based power plant designed to supply electricity to the grid. Therefore, no additional anthropogenic emissions of GHGs due to the project activity are expected to be generated within the project boundary.

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

Two sources of leakage have been considered:

- Leakage from transportation
- Leakage from diversion of biomass from other uses to the project.

Leakage from transportation: Leakage from transportation of biomass to the power plant has been calculated based on actuals.

The leakage values have been calculated based on the average transportation distance *times* average load of biomass carried by transport type *times* specific fuel consumption of the transportation type *times* CO2 emission factor for diesel according to IPCC values. (Evidence provided to and verified by DNV).

The total leakage due to project activity has been estimated at 3054.53 tCO_2eq.

In order to monitor the emissions from transport MPPL maintains a document called the Fuel Receipt Note which contains the following information (amongst other information), based on biomass supply to the Plant. (Evidence provided to and verified by DNV).

4. Supplier Name
5. Security Register
   - Vehicle No.
   - Vehicle Type (Lorry, 4-Wheel Trolley, 2-Wheel Trolley, Bullock Cart)
6. Weightment Details
   - Receipt No.
   - Date

- Fuel Type (named in the local language to include cane trash, coconut fronds, groundnut husk, rice husk, toppings of various types of plantation wood etc.)
- Gross Weight
- Tare Weight
- Net Weight
- Moisture %

Based on the information contained in the Fuel Receipt Notes (evidence provided to and verified by DNV), MPPL is able to monitor and estimate the emissions from transport that contribute to leakage from biomass supply to the Plant.

Leakage from diversion of biomass from other uses to the project: Leakage may also occur in the event agricultural residue would lead to a switch in household fuel, from agricultural waste to fossil fuels. However, because only a small part of the available biomass residues will be used in the proposed projects no diversion in fuel is anticipated, a concern alleviated, in part, through the positive feedback of shareholder commentary.
(Evidence provided to and verified by DNV).

As it stands, the current practice is to leave the agri-wastes in the fields to be burnt.
(Evidence provided to and verified by DNV).

To summarise that there is no leakage from diversion of biomass from other uses to the project:

1. The biomass was not collected, nor did it have any use, prior to the project being set up.
2. Project developers conducted a detailed survey of biomass availability in the region prior to setting up the plant. From the survey, it was clear that enough and more biomass would be available.
3. Proir to the project being set up, no market existed for the agri-residues being utilized in the project.

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

E.1.2.1 = 0
E.1.2.2 = 3054.53 tCO_2eq.
Therefore the project activity emissions are estimated at 3096.75 tCO_2eq.

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:

The proposed baseline taken from Appendix B of the simplified modalities and procedures for small-scale CDM project activities (version 4) comprises Option 7 (b): The weighted average emissions of the current generation mix (in t CO2/GWh). The following formula is used to estimate the total emissions were the project to not take place:

CO_2 Emission Factor tCO_2/MWh	=	Sum of all CO_2 emissions from grid (tCO_2)	÷	Grid electricity generated (MWh)

CO_2 Emissions (tCO_2/yr)	=	Electricity Exported To grid (MWh/yr)	x	CO_2 Emission Factor (tCO_2/MWh)

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:

Total resulting emissions from E.1.2.4 is estimated at **144,840 tonnes** of CO_2 over the course of first crediting period.

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

	Years (April to March)	Baseline Emission Factor (tCO_2e/ GWh)	Electricity Exported to Grid (GWh)	Baseline Emissions (tCO_2e)	Project Emissions (tCO_2e)	Leakage (tCO_2e)	Certified Emission Reductions (CERs)
1.	2001-2002 (from Aug 2001)	765.9	15.04	11519	0	343.18	11175.82
2.	2002-2003	765.9	25.04	19178	0	514.77	18663.23
3.	2003-2004	765.9	29.90	22900	0	514.77	22385.23
4.	2004-2005	765.9	21.99	16842	0	388.11	16453.89
5.	2005-2006	765.9	30.337	23235	0	388.11	22846.89
6.	2006-2007	765.9	30.337	23235	0	388.11	22846.89
7.	2007-2008	765.9	30.337	23235	0	388.11	22846.89
8.	2008-2009 (upto July 2008)	765.9	10.12	7751	0	129.37	7621.63
	Total		**193.1**	**147, 898**	**0**	**3054.53**	**144,840**

Therefore, a conventional energy equivalent of 193.1 ***GWh*** for a period of 7 ***years*** in Karnataka would be saved by exporting power from the 4.5 MW Biomass based power plant which in turn will reduce **144,840 tonnes** of $_{CO2}$ emissions based on the 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:

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. 1000 million have been excluded from the list. Hence, 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 KPCB

It fires less than 20% of the total fuel fired as wood and that too only toppings of plantation wood (Eucalyptus & Casuarinas *spp*.).

Also, the project has received host country endorsement form Designated National Authority, Ministry of Environment and Forest, Government of India.

SECTION G. Stakeholders' comments:

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

The local stakeholders' comments invitation and compilation process adapted was as follows:

All the individuals and organisations that are impacted by the project 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 approval was to select the most appropriate representative body.

The following were identified as stakeholders of the project

- Local community / Administrative authorities
  1. Village Panchayat
  2. District Commissioner
  3. Biomass Suppliers
- Customer (KPTCL)
- Licensing and regulatory authorities like
  1. KREDL
  2. KSPCB (Karnataka State Pollution Control Board)
  3. MoEF (Ministry of Environment & Forest)
  4. CGWB (Central Ground Water Board)
  5. Electrical Inspectorate

The views of Local Community / Administrative Authorities were ensured through creation of "Grameena Abhivrudhi Mandali" which has nominees of the Taluka/Grama Panchayats and essentially is a representative body of the local community.

The views of the *customer* are enshrined in the Power Purchase Agreement that was signed with KPTCL in September 2000. (Evidence provided to and verified by DNV).

The views of *licensing/ regulatory authorities* are enshrined in approvals obtained from them. (Evidence provided to and verified by DNV).

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. MPPL 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 roles of the local people are as a beneficiary of the project. The local population are involved in the supply of the biomass and hence the project would be beneficial project for the local population. 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 encouraged the project.

Involvement of the village Panchayat and local population is ensured through creation of a not for profit society *Grameena Abhivrudhi Mandali* which is responsible for managing the Biomass Supply Chain, Organic Fertiliser distribution as well as provide sub-contract services to MESCOM (local Electricity Distribution Utility). The supervisory/governing boards of Grameena Abhivrudhi Mandali have nominated members from the Taluka Panchayat and Grama Panchayat.

The project did not involve displacement of any local population. In addition, the local population is a direct beneficiary through jobs created (650 in number) as well as reliable electricity supply from MPPL's 4.5 MW unit.

The distance between the electrical substation for power evacuation and the plant is 1.1 km, as such; installation of transmission lines did not create any inconvenience to the local population.

Karnataka Pollution Control Board (KPCB) has prescribed standards of environmental compliance and monitors the adherence to the standards. The project has received No Objection Certification (NOC) from KPCB to start and operate the plant.

Non-Conventional Energy Development Agency of Karnataka (KREDL) implements policies in respect of non-conventional renewable power projects in the state of Karnataka and has accorded approval to the project. Furthermore, KREDL is a minority share holder in MPPL.

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 cleared the project and signed Power Purchase Agreement (PPA) with MPPL (which has been duly approved by the Karnataka Electricity Regulatory Commission).

Designated National Authority under Ministry of Environment and Forest has provided host county approval to the project.

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

G.2. Summary of the comments received:

The overall response to the stakeholder consultation meet was very positive. It is fair to report that the Project has greatly improved the standard of living in at least 48 villages, through the distribution of reliable power of good quality.

Before the Malavalli Power Plant (MPP) was set up, the area received electricity for an average of 6 hours in 2 days, at a voltage of around 180-200 V. After MPP was set up, these same areas have a reliable electric supply for 18 hours every day at an improved voltage of 420 V. This has resulted in the expansion of existing industries as reported by Zakriya Khan, owner of Model Binny Rice Industries and Village Panchayat member. Mr. Khan is now able to run his rice mill upto 18 hours a day. Subsequently, he was even able to purchase a sophisticated paddy dryer.

Due to the increased availability of water for irrigation, farmers are able to grow more than 1 crop a year. As MPP uses mostly cane trash and coconut fronds i.e. agricultural waste, as fuel, the farmers can now sell what would have otherwise been waste material. New industries such as saw mills are also becoming prevalent in the area, by virtue of the improved power supply.

It appears that one of the greatest assets of the Project has been the number of new jobs it has created. At least 500 new jobs including those for power plant staff and labour, from the biomass supply chain, and from power distribution, maintenance and revenue collection can be attributed directly to MPP. Employees at the Plant are familiar with emergency procedures and are required to attend a complete health check-up at a nearby clinic, once every two months.

In the past, locals were busy only 3 months of the year, during the cropping season. They now have work all year round, which has increased income generation and the ability to own income generating assets. Where according to them, “the bank was for the rich man”, they now have enough income to make transactions at the bank themselves.

On a social level, men have stopped idling away 9 months of the year in drinking, gambling and other social vices. The locals claim that women feel safer to walk on the roads due to the 24-hour activity at the Plant, as well as the improved lighting in villages. MPP has put Kirugaval Village on the map. There is now a permanent bus stop just near the Plant and regular bus services are now available in the area.

The MPP management is focused in its goal of sustainable development in the area. They maintain a practical and transparent relationship with all stakeholders and have created a fair and profitable working environment. Local stakeholders appear to be aware of the problems MPP has faced in the past. They appear committed to working together with the management in continuously improving the Project and thus reaping its benefits. (Evidence provided to and verified by DNV).

As mentioned previously, MPPL has already received the approvals and clearances for their project from all stakeholders, and in particular

- Consent from Central Ground Water Board
- Consent order of Establishment from Karnataka Pollution Control Board:
- Power Purchase Agreement with KPTCL
- Clearance from the Gram Panchayat
- Host country endorsement from DNA, MoEF, Government of India

Concerns related to environmental pollution, ground water extraction, employment of locals were expressed and adequately addressed. MPPL meets all performance norms stipulated by statutory/regulatory authorities. Reports to statutory bodies are submitted regularly and license renewals are obtained as required.

The Grama Panchayat's concerns of local employment are more than adequately met as more than 80% of MPPL's staff is locals.

Furthermore MPPL has addressed the concerns of the *local community* and ensured their active involvement through Grameena Abhivrudhi Mandali (GAM).

GAM has created over 550 rural jobs in Biomass Supply Chain, Organic Fertiliser Production/Distribution, and Biomass Power Plant O & M and BPO services related to Electricity Distribution. GAM also contributes over Rs. 45 million/year to the rural economy.

Since GAM has in its Governing/Supervisory Board nominees of the Taluka/Grama Panchayat, it ensures that local community needs are understood and catered to the maximum extent feasible.

The *Government of Karnataka (GOK)* is another key stakeholder. KREDL (a unit under the Energy Department of the Government of Karnataka) is a shareholder in MPPL and KREDL, Managing Director is a nominee in MPPL's Board of Directors. MPPL's unit was the first Biomass Power Plant to be commissioned and KREDL's primary requirement was for MPPL to act as a catalyst for growth of Biomass Power Generation in Karnataka. MPPL fulfilled this role through permitting potential developers of Biomass Power Plants to visit its facilities and guiding them on Project Development.

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

In the foregoing paragraph G.2, we have listed out the comments/concerns of stakeholders and how MPPL addressed the same. Monthly meetings with local community and Government of Karnataka officials ensures that there is an ongoing process of receiving feedback as well as course corrective actions (where required).

MPPL website: www.mpppl.com also receives comments and the company takes appropriate steps to meet stakeholders' expectations. On the whole, stakeholders are satisfied with the results of MPPL's pioneering project which has contributed significantly to the socio-economic development within Mandya District. This is documented in the following:

* Report by CPRI (a unit under Union Ministry of Power), prepared during Nov 2002, which was funded by GTZ.
* A film on MPPL's initiatives produced during Nov 2004, which was aired on BBC World during Feb 2005.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Malavalli Power Plant Pvt Ltd.
Street/P.O. Box:	3rd Floor Gupta Towers
Building:	50/1 Residency Road, 1st Cross
City:	Bangalore
State/Region:	Karnataka
Postcode/ZIP:	560025
Country:	INDIA
Telephone:	+91 80 25586425
FAX:	+91 80 25582696
E-Mail:	krishan@mpppl.com
URL:	www.mpppl.com
Represented by:	
Title:	Mr.
Salutation:	Mr.
Last Name:	Krishan
Middle Name:	
First Name:	Kolluru
Department:	-
Mobile:	+ 91 98450 71534
Direct FAX:	+91 80 25582696
Direct TEL:	+91 80 25598573
Personal E-Mail:	krishan@mpppl.com

Annex I country project participant:

Organization:	myclimate Foundation – The Climate Protection Partnership.
Street/P.O.Box:	Technoparkstr. 1
City:	Zürich
Postcode/ZIP:	8005
Country:	SWITZERLAND
Telephone:	+41 44 633 77 50
FAX:	+91 44 633 15 85
E-Mail:	projects@myclimate.org
URL:	www.myclimate.org
Represented by:	
Title:	Mr.
Salutation:	Mr.
Last Name:	Heuberger
Middle Name:	
First Name:	Renat
Department:	-
Direct tel:	+41 44 633 79 18
Personal E-Mail:	renat.heuberger@myclimate.org

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in this project activity.

Annex 3

Financial Comparison of 8 MW and 4.5 MW Biomass Power Plants			
		4.5 MW	**8.0 MW**
A.0	**Capital Norms**	**Crop residues fired**	**Rice husk fired**
A.1	Project Cost (Rs mill/MW)	42.00	36.00
A.2	Debt Servicing - Rs/kWh sold (70% of Project Cost - Interest + Depreciation over 10 yrs)	0.88	0.75
A.3	Equity servicing - Rs/kWh sold (30%-Proj cost @14% div & 35.6% tax rate)	0.46	0.39
B.0	**Operating Norms**		
B.1.1	Plant Heat rate (Kcal/kWh-gen)	4000	3700
B.1.2	Plant load factor (PLF) %	77.00%	77.00%
B.1.3	Auxiliary consumption % to Generation	11.00%	10.00%
B.1.4	Biomass Calorific value (Kcal/Kg)	3000	3000
B.1.5	Unit Fuel cost (Rs/MT)	1200	1200
B.1.6	Fuel Cost (Rs/kWh sold)	1.80	1.64
B.2.1	O&M Staff strength	60	60
B.2.2	O&M Staff Cost (Rs mill/year) @ Rs 100000/person per year	6.00	6.00
B.2.3	O&M Direct costs (Rs in mill/year) @Rs 0.29/kWh sold	7.83	14.08
B.2.4	Total O&M Costs (Rs in mill/year)	13.83	20.08
B.2.5	Electricity Sales (kWh in mill/year)	27.0145	48.5654
B.2.6	Specific O&M Cost (Rs/kWh sold)	0.51	0.41
C.0	**Total Costs**		
C.1	Capital servicing cost (Rs/kWh sold)	1.34	1.13
C.2	Fuel Cost (Rs/kWh sold)	1.80	1.64
C.3	O&M Cost (Rs/kWh sold)	0.51	0.41
C.4	Total cost	3.65	3.19

Annex 4

BASELINE INFORMATION

Power station	Owner	Fuel	Generation GWh	Emission Factor IPCC	CO_2 Emission Reductions (tCO_2eq)
			2001	tCO_2/GWh	2001
Karnataka					
Raichur	KPCL	Coal 3E	8904	1080	9612032
Bellary	Pvt	Diesel	13	638	8299
Torangallu IMP	Jindal	Gas	1170	1080	1263037
Yelahanka	VVNL	Diesel	658	638	420062
Karnataka Hydro	KPCL	Hydro	10892	0	0
Kaiga	NPC	Nuclear	1886	0	0
Andhra Pradesh					
K_Gudam	APGENCO	Coal 3E	7639	1327	10140404
Vijayawada	APGENCO	Coal 3E	10199	1044	10643008
Ramagundam	APGENCO	Coal 3E	443	1281	567391
Nellore	APGENCO	Coal 3E	171	1487	254312
Rayal Seema	APGENCO	Coal 3E	3476	1053	3658940
Vijeshwaran	APGPC	Gas	1978	484	956432
Jegurupadu GT	GVK	Gas	1658	484	801701
Kondapalli	Kondapalli Th	Gas	679	484	328320
Godavari GT	Spectrum	Gas	1567	484	757699
R'gundam STPS	NTPC	Coal	16422	1053	17292513
AP Hydro		Hydro	7729	0	0
Kerala					
Brahamapuram DG	KSEB	Diesel	319	638	203647
Kozikode DG	KSEB	Diesel	460	638	293661
Cochin CCGT	REL	NG	154	484	74464
Kayamkulam	NTPC	NG	1945	484	940475
Kerala Hydro	KSEB	Hydro	6221	0	0
TamilNadu					
Ennore	TNEB	Coal 3E	753	1694	1275333
Tutikorin	TNEB	Coal 9T	7931	1063	8431260
Mettur	TNEB	Coal 9T	6423	1063	6828141
North Chennai	TNEB	Coal 3E	4358	1053	4589082
Basin Bridge	TNEB	NG	165	484	79783

Nariman GT	TNEB	NG	16	484	7737
Kovilakalappal	TNEB	NG	36	484	17407
Samalpatti DG	Samalpatti	Diesel	91	638	58094
Basin Bridge DG	Vasavi	Diesel	1281	638	817781
Neyveli STI	NLC Th	Lignite	4158	1225	5095535
Neyveli STII	NLC Th	Lignite	10519	1225	12890796
TN Hydro		Hydro	5441	0	0
MAPP	NPC	Nuclear	2513	0	0
Pondicherry					
Karaikal GT	PPCL	Gas	233	484	112664
Total			128501		98420009.28

Source: Ministry of Non-conventional Energy Sources, India (Annexure II C: Baseline Estimation Details southern region).

Summary (2001 Generation Mix)

Fuel	Generation in GWh	Emissions in tCO_2eq
Thermal	93819	98420009.3
Hydro	30283	0
Nuclear	4399	0
Total	128501	98420009.3

Baseline Emission Factor for year 2001 of Southern Region

= 98420009.3 / 128501

= 765.9 tCO_2eq/GWh

Annex 5

Fuel Consumption, Procurement & Leakage – Past 3 Years

MONTH	GENERATION (kWh lakhs)	FUEL PROCUREMENT (MT)					
		Cane Trash	Coconut Fronds	Rice Husk	Groundnut Husk	Toppings of Plantation Wood	TOTAL
JANUARY	25.5	1,113	1,435	436	-	995	3,979
FEBRUARY	16.56	689	1,266	284	-	556	2,795
MARCH	24.47	723	2,310	182	-	829	4,044
APRIL	24.57	558	1,890	334	-	1,492	4,274
MAY	19.61	423	1,393	100	5	1,198	3,119
JUNE	23.32	297	1,745	286	32	1,274	3,634
JULY	27.04	185	1,969	438	12	1,655	4,259
AUGUST	23.83	270	1,802	357	72	1,397	3,898
SEPTEMBER	15.07	431	1,180	167	7	911	2,696
OCTOBER	19.14	322	1,808	46	120	1,223	3,519
NOVEMBER	15.68	471	1,332	98	3	803	2,707
DECEMBER	21.59	852	1,405	260	-	894	3,411
TOTAL	**256.38**	**6,334**	**19,535**	**2,988**	**251**	**13,227**	**42,335**

Computation of carbon emissions resulting from Diesel consumption for transporting the Biomass fuels	Average distance (km)	15.00	90.00	2.00	75.00	15.00	
	Mode of transport	Tractor	Truck	Tractor	Truck	Tractor	
	Average load (MT-biomass)	2.00	5.50	5.00	10.00	5.00	
	Diesel consumption (km/litre)	8.00	4.00	8.00	4.00	8.00	
	Diesel consumption (kL/yr)	11.88	159.83	0.30	0.94	9.92	
	Total diesel cons (kL/yr)						**182.87**
	Carbon emission factor (2.815 t per kL of diesel)						
	Total carbon emission (MT)						**514.77**

Note: Some supplies of cane trash/Coconut fronds/toppings of plantation wood are also received in bullock carts, but to be conservative, this has not been accounted for.

Annex 5 ***contd.***

Fuel Consumption, Procurement & Leakage - Current

MONTH	GENERATION (kWh lacs)	FUEL PROCUREMENT (MT)					
		Cane Trash	Coconut Fronds	Rice Husk	Groundnut Husk	Toppings of Plantation Wood	TOTAL
JANUARY	29.5	2,800	-	1,500	-	-	4,300
FEBRUARY	26.1	2,500	-	1,350	-	-	3,850
MARCH	29.5	1,700	1,700	900	-	-	4,300
APRIL	28.3	1,650	1,650	850	-	-	4,150
MAY	29.5	-	2,300	900	-	1,100	4,300
JUNE	25.3	-	2,250	850	-	800	3,900
JULY	25.8	500	2,300	1,200	-	-	4,000
AUGUST	25.8	500	2,300	1,200	-	-	4,000
SEPTEMBER	13.5	-	-	1,000	-	1,000	2,000
OCTOBER	13.5	-	-	1,000	-	1,000	2,000
NOVEMBER	25.3	1,550	-	850	600	900	3,900
DECEMBER	29.5	2,800	-	900	600	-	4,300
TOTAL	**301.6**	**14,000**	**12,500**	**12,500**	**1,200**	**4,800**	**45,000**

Computation of carbon emissions resulting from Diesel consumption for transporting the Biomass fuels	Average distance-km	15.00	90.00	2.00	75.00	15.00	
	Mode of transport	Tractor	Truck	Tractor	Truck	Tractor	
	Average load (MT-biomass)	2.00	5.50	5.00	10.00	5.00	
	Diesel consumption-km/litre	8.00	4.00	8.00	4.00	8.00	
	Diesel consumption-kL/year	26.25	102.27	1.25	4.50	3.60	
	Total diesel cons-kL/year						**137.87**
	Carbon emission factor (2.815 t per kL of diesel)						
	Total carbon emission-MT						**388.11**

Note: Some supplies of cane trash/Coconut fronds/toppings of plantation wood are also received in bullock carts, but to be conservative, this has not been accounted for.

Annex 5 ***contd.*** **- Biomass Collection Area**