Mid-term Evaluation
of the UNDP-GEF-ICEF project
"Bio Energy for Rural India"
(IND/99/G32/A/IG/99)

An evaluation carried out on behalf of the
United Nations Development Programme (UNDP)
and the
India Canada Environment Facility (ICEF)

by
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This evaluation of the UNDP-GEF-ICEF project "Biomass Energy for Rural India (BERI)" (Project number IND/99/G32/A/IG/99) was carried out between 21 July and 15 September 2005.

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Introduction

This evaluation report contains a mid-term evaluation of the UNDP-GEF-ICEF Full scale project "Biomass Energy for Rural India", project number IND/99/G32/A/IG. In addition to GEF funding, the project is supported by ICEF, MNES and Government of Karnataka (GoK).

The evaluation team included one international and one national reviewer. A visit was made to India by the international consultant from 20 to 30 July 2005 and interviews with all relevant project stakeholders, including governmental representatives, municipal representatives, individual project beneficiaries, implementing agency, project executing agency, project staff and others were made.

The approach used for the evaluation was based on the results-oriented 'outcome evaluation' approach within the framework of Results Based Management. This approach generally covers a set of related projects, programmes and strategies intended to bring about outcomes[1]. In this case, the focus of the review was a single project. The evaluation thus focuses more on the UNDP and ICEF contribution to the outcome through the project outputs, and possible improvements that could be made to increase the performance of delivery of outputs and ultimately the desired outcomes.

Details of the people interviewed and the documents reviewed are given in the lists in annex 2 and 3. The UNDP and ICEF staff, the project co-ordinator, and staff of the project management unit gave excellent support during the evaluation and helped us feel very much at home.

[1] An outcome evaluation focuses on the 'developmental changes between the completion of outputs and the achievement of impact' (the outcomes), and encompasses efforts of partners working on the same issues. The evaluation assesses how and why outcomes are or are not achieved within a given context, and the role that UNDP has played in bringing these about. Outcome evaluations also help to clarify underlying factors affecting the situation, highlight unintended consequences, recommend actions to improve performance in future programming, and generate lessons learned.

Executive Summary

The UNDP-GEF-ICEF Biomass Energy for Rural India project (BERI) was originally conceived and developed by ASTRA (now called Centre for Sustainable Technologies), part of the Indian Institute of Science. The project preparation funding (PDF-B) from the Global Environment Facility (GEF) was approved in December 1999. The full-scale project started in April 2001 with the signing of the Project Document, with an expected end scheduled for March 2006. The project aims at developing and implementing bio-energy technology packages to reduce Greenhouse Gas (GHG) emissions and to promote a sustainable and participatory approach to meeting rural energy needs. The 5-year project is being implemented in 24 villages of Tumkur District in Karnataka State, with replication nationally. The project has two main objectives:

- To develop a decentralized bioenergy technology package for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply, and milling, and
- To remove barriers to large-scale adoption and commercialisation of the bioenergy technology packages.

This mid-term evaluation aims to contribute to effective project implementation and ensuring proper documentation of lessons learned by assessing the relevance of the project, project performance (progress in terms of effectiveness, efficiency and timeliness), management arrangements focused on project implementation, and overall success of the project with regard to impact, sustainability, and contribution to capacity development. The evaluation assessed project synergies with other similar projects, evaluated the efficiency, relevance and sustainability of the financial instrument set up within the project, including its potential impact on leveraging co-financing, and makes recommendations for further development of the project.

Project relevance and design
In the period between design of the project (1999-2000) and this mid-term evaluation, the relevance of the project appears to have increased. The design and project strategy is generally consistent with the needs of all stakeholders, and implementation experience since the project started has largely demonstrated that the basic premises upon which the project was built are still valid, and that the project design is appropriate for tackling the identified barriers. Design shortcomings in both implementation structure and tools for results based management have caused difficulties for project execution Attempts to produce a working project planning matrix in the beginning of 2003 were ineffective.

Performance and result
The project has achieved significant and sustainable results in the project area in terms of community mobilization, capacity building, strengthening of economic prospects for farmers and households (which should improve the ability for communities to pay for energy services in the medium to long term), and created impressive community-owned initiatives in afforestation (far exceeding the original project targets). This has already brought significant benefits to the communities involved. However, from a GEF point of view crucial project activities remain almost untouched, and fundamental changes in project strategy have meant that even with additional efforts on project activities which to date have been delayed, the market transformation impact of the project will have been reduced. The project appears to make significant contributions to local sustainable development and livelihoods and the replication prospects are uncertain and the market transformation effect of the project extremely limited to date.

Management arrangements
The current approach to project management (Planning, Scheduling, Control, Reporting) is based on the project co-ordinator and his Project Management Unit team on a somewhat ad-hoc basis. Perspective plans prepared by the PMU do not take into account the needs of the entire project. From the interviews held it is also understood that annual planning based on an overall master schedule was never adopted for planning or monitoring. Quarterly, Monthly, and potentially Weekly schedules should also have been evolved from the Master Schedule. This would help to ensure all Activity Components receive appropriate and timely

attention. The absence of a Master Schedule and the lack of Steering Committee and PMU attention on such a document has been one of the most important missing links of project management. Reporting formats and frequency should be reviewed, with quarterly workplan updates prepared and communicated with UNDP and ICEF.

Progress on the tasks undertaken, however, as has been noted before are highly effective due to the vision and capabilities of the PC and the knowledge and commitment of the PMU team.

To date (end June 2005), total project expenditure has been Rs. 64,563,560, with an additional Rs. 14,343,230 already committed, making a total of Rs 78,906,791 (approx. 1.7 million USD) since the project start. With a total project budget of 8.6 million USD, currently about 20% of the funds have been used, while 80% of the project period (4 out of 5 years) have passed. In order to reach financial targets a significant increase in the rate of expenditure will be required. This may not be possible within the remaining period available. The lack of output level tracking of expenditure means that feedback to management on how the project is progressing and the cost effectiveness of activities is virtually non-existent.

Project partnership strategy
Community mobilization has been one of the major successes of the project so far. The approaches used to community mobilization by the PMU staff and the cluster NGOs deserves to be documented and best practice distilled so that it can be passed on to other projects.

The excellent co-operation with the local Forestry Department was notable, and together with highly effective efforts from the PMU staff and the cluster NGOs shows the benefits of co-operation between extension officers from different disciplines and public private partnerships. This has been highly commendable.

Main recommendations

- The project workplan for the remaining time with budget, annual and quarterly workplans updates and timelines are required for effective project management. This would help to ensure all Activity Components receive appropriate and timely attention.
- Changes should be made to the current implementation structure, in particular there is a need to establish a Tumkur Project Office for local activities, with the Project Management Unit in Bangalore giving more attention to national issues and replication
- The planned leaf litter biogas systems, which are clearly still in an R&D stage, should either be abandoned within the project or removed from the direct focus of the Project Management Unit at this stage through a direct contract from ICEF or UNDP.
- The afforestation activities have been highly successful. The PMU should now plan to remove entirely the capital subsidies provided by the project, aiming to find other supporters or put afforestation on a full cost-recovery basis. There can be no further justification of project subsidies on afforestation activities. The PMU should also make efforts to remove the capital subsidy on the biogas plants, identifying other funding sources, and give loans rather than capital grants.
- For forestry and biogas activities the PMU should limit expenses to that originally budgeted, and preferably make remaining funding available through a revolving fund mechanism ensuring cost recovery.
- A national level subcontractor should be taken on by the PMU to take on national level activity components together with the PMU, in particular focusing on activity components on financing, enabling market, and information dissemination. This contract could be directly executed by UNDP or ICEF in consultation with PMU.

- Urgent attention should be given to the structure for the investment risk or revolving fund as soon as possible so that costs can be recovered from the investment in gasifiers, biogas digesters and afforestation.

I. The Development Context

Background

1. The UNDP-GEF-ICEF Biomass Energy for Rural India project (BERI) was originally conceived and developed by ASTRA (now called Centre for Sustainable Technologies), part of the Indian Institute of Science. The project preparation funding (PDF-B) from the Global Environment Facility (GEF) was approved in December 1999. The full-scale project started in April 2001 with the signing of the Project Document, with an expected end scheduled for March 2006.

2. The project aims at developing and implementing bio-energy technology packages to reduce Greenhouse Gas (GHG) emissions and to promote a sustainable and participatory approach to meeting rural energy needs. The project was to be implemented mainly in an area covering about 24 villages of Tumkur District in Karnataka State, Southern India.

3. According to the project design it is intended that the project goals will be achieved through:
   a) Demonstrating the technical feasibility and financial viability of bio-energy technologies on a significant scale;
   b) Building capacity and developing appropriate mechanisms for implementation, management and monitoring of package;
   c) Developing financial, institutional and market strategies to overcome the identified barriers for large scale replication of the bio-energy packages for decentralized applications; and,
   d) Disseminating the bio-energy technology and information package on a large scale.
   e) Evolving a financial and management system for the post-project period management of the packages implemented.

Project outcomes and objectives

4. The overall development goal of the project (the project outcome for GEF) is "reduce CO_2 emissions through the promotion of bioenergy as a viable and sustainable option to meet the rural energy service needs in India and thereby leading to sustainable development". The project contributes to the UNDP MYFF (Multi-Year Funding Framework (MYFF) for 2004-07) goal 3 "Energy and Environment for sustainable development" and service line 3.1 "Frameworks and strategies for sustainable development". This goal has a programme outcome of "National capacity built to contribute to global environmental agenda setting, and global environmental concerns mainstreamed in national development planning.". The outputs from the BERI project are explicitly described in the UNDP MYFF as key outputs, covering technical feasibility and financial viability, development of financial, institutional and market strategies to overcome barriers for large-scale replication, and large-scale dissemination of technology and information packages.

5. This is to be achieved by addressing institutional, information, financial, technical and market barriers for bioenergy technologies, thus contributing to the creation of a sustainable market for village based bio-energy systems in India. According to the project document, investments in bioenergy directly related to the project could reduce carbon emissions by at least 54 000 tonnes of carbon over a period of 25 years. The mitigation potential for the 18 000 extremely remote villages in India is estimated to be 40 million tonnes of carbon over a 25 year period.

6. The problems being addressed by this project include overcoming or reducing a range of barriers to biomass energy, specifically:
   - *Technical barriers:* principally limited track record of the gasifier technology and lack of experience on a large scale in rural areas, meaning high (perceived) risks for manufacturers, entrepreneurs and end users. The project document also highlights a lack of standardization, which "has led to poor reliability of these bioenergy packages". Supply limitations of sustainable biomass as fuel was also highlighted as a technical barrier.

- *Institutional barriers:* principally low capacity of the village-level institutions for implementation of bioenergy services package in rural areas. Institutional-related financing barriers (lack of micro-credit access) were also highlighted in the project document.
- *Information barriers:* principally a lack of awareness of viable technological configurations and low level of access to information.
- *Financial barriers:* resulting from the high (perceived) technical and institutional risks, and lack of capital for investments.
- *Market barriers:* principally caused by subsidized electricity and fossil fuels and freely accessible fuelwood and biomass residues.

7. To overcome these barriers the UNDP-GEF-ICEF project has two main objectives:
   - To develop a decentralized bioenergy technology package for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply, and milling.
   - To remove barriers to large-scale adoption and commercialisation of the bioenergy technology packages.

8. From those objectives, there are several project elements, as described in the project document:
   (i) *Technology package selection:* this project element focused on the identification of key problems with village-scale rural bioenergy technologies. It was intended that this element would focus on the adaptation of gasoline engines to both biogas and producer gas, and the development of technology standards.
   (ii) *System demonstration and proof of concept:* using the draft standards developed above, both the technical and market approaches ("good quality energy services model" and "'fee for service' payment schedule") to village energy were to be demonstrated. Both technical feedback and market lessons were to be used for improvement of the approach for later replication, and therefore supports, reinforces and extends all other project elements. Investment costs were to be recovered and used to create an investment risk fund under (vi).
   (iii) *Capacity building:* focused on the removal of institutional barriers the 'business premise' in the form of a Rural Energy Service Company (RESCO) would be enhanced through capacity building focused on technical operation of the bioenergy systems, and business skills (marketing, finance, accounting, billing, and project development). The organisations identified and trained would operate the demonstration systems under (ii).
   (iv) *Enabling activities:* this project element focused on the policy framework for the fee-for-service approach, and awareness raising based on project experiences under (ii) in the fee-for-service approach.
   (v) *Information dissemination:* information packaged according to the needs of users, service providers, manufacturers, etc. would be developed and disseminated to ensure "the maximum possible replication of the project's experiences" based on successful installations under (ii).
   (vi) *Removal of financial barriers and creation of investment risk fund:* a funding mechanisms was to be created during the first year of the project which would fund the demonstration projects under (ii), and be recovered for future dissemination of the concepts throughout India. The expectation was that by the end of the project all costs for bioenergy systems would be recoverable. The project document proposes two models for the post project period – either a commercial-entrepreneurial approach or a public-private partnership arrangement.
   (vii) *Monitoring and evaluation:* this element focused on project management issues, and ongoing monitoring of project progress of all project elements.

Key stakeholders and beneficiaries

9. Key stakeholders for both the UNDP and the GEF *outcomes* include:
   - Local authorities – in particular Panchayats (local government), and Zilla Parishads (District Administrations)
   - State level administration, including departments of Rural Development, Department of Forest and Panchayat Raj at the state level

- Government ministries, in particular
  - Ministry of Non-Conventional Energy Sources (MNES), Govt. of India which is responsible for the promotion of renewables, and the India Renewable Energy Development Agency (IREDA), which is the financial arm of MNES
  - Ministry of Environment and Forests, Govt. of India
  - Department of Economic Affairs, Govt. of India
  - Ministry of Agriculture, Govt. of India
- Producers of village-scale energy technologies, equipment suppliers, services providers
- Financing and micro-credit funding institutions
- Civil society and NGOs
- Power and heat consumers

10. The stakeholders directly involved in this project include
    - Department of Rural Development and Panchayat Raj of the government of Karnataka – executing agency
    - Karnataka State Council for Science and Technology (intended as local Implementing Agency)
    - Tumkur Zilla Parishad, and District level administration (eg. District Level Forest Division)
    - Panchayats
    - Village community institutions – Village Forest Committees, Self-help Groups, – in 25 target communities
    - Equipment suppliers

    - Technology developers (Indian Institute of Science {ASTRA and CGPL}, TIDE)
    - Consultants
    - NGOs – working in 5 'clusters' of 5 villages
    - Funders: UNDP, ICEF, Karnataka State Government, MNES

11. The most important direct beneficiaries of the project will be households, farmers, and village communities. Households benefit from the provision of biogas for cooking, electricity for piped water supply and home lighting, farmers benefits from more reliable electricity for irrigation, bio-fertilizer and incomes from farm forestry, and village communities benefit from community institution development and capacity building among women, common property resources (degraded lands, soil and water) conservation and development diversified employment opportunities. Entrepreneurs working at the local, state, and country levels would benefit from increased business opportunities including service activities such as installation, operation, maintenance, servicing, and training. Manufacturers benefit through the markets and demand for bioenergy systems, created under the project, and from field data leading to technological improvements.

II. Findings and Conclusions

12. The discussion that follows covers the current status of the project outcomes, and reviews key factors which affect the achievement of the project outcomes. However, since this evaluation focuses on possible mid-term adjustments to the project outputs and implementation the main findings address the UNDP & ICEF project contributions to achieving the outcomes through outputs which are contained in section C below.

A. Relevance and status of the outcomes

13. The intended outcomes on which this project focuses are not clearly defined in the project document. The overall rationale for the project support from GEF is the reduction of "CO_2 emissions through the promotion of bioenergy as a viable and sustainable option to meet the rural energy service needs in India". The project document continues "it would provide decentralized bioenergy technology packages for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply, and milling; and help in removing barriers to large-scale adoption and commercialisation of bioenergy technology packages.". These two components are encapsulated in the project's immediate objectives, as follows:
    a) A decentralized bioenergy technology package developed for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply, and milling.
    b) Barriers to large-scale adoption and commercialisation of bioenergy technology packages removed.

14. India is the second most populous nation in the world and has extreme ecological diversity. 70% of the population in India, close to 700 million, still live in the rural areas. With an average growth rate in the gross domestic product of 5.8 per cent during the first decade of recent reforms (1992-2001), India is among the 10 fastest growing economies in the world. The poverty ratio declined from 36 per cent in 1993-94 to 26.1 per cent in 1999-2000. India's steady progress over the last decade towards meeting the goals of human development is reflected in the improvement of the country's Human Development Index (HDI) value from 0.406 in 1975 to 0.595 in 2002. However, as the absolute number of unemployed and underemployed further increases, the challenges remain formidable. Statistics on critical development indicators such as literacy, life expectancy at birth, and child mortality indicate that regional inequalities are increasing and there is growing public consensus on the need for proactive measures to tackle the situation of disadvantaged and vulnerable groups[2]. Most people in rural India are poor, living on less than Rs 100 per day. Meeting their energy requirements in a sustainable manner continues to be a major challenge for the country. One of the fundamental dilemmas of poverty and development is the need to provide electric power to those who can least afford it. So it is important to keep in mind that the benefits of electricity accrue not only to the individual consumer, but also to society as a whole to the entire economy.

15. Almost 75% of the total rural energy consumption is in domestic sector. For meeting their cooking energy requirements, villagers depend predominantly on biomass fuels like wood, animal dung and agricultural residues, often burnt in inefficient traditional cookstoves. The main fuels used for lighting in the rural households are kerosene and electricity. Irrigation is mainly through electrical and diesel pumpsets, while the rural industries and the transport sectors rely primarily on animal power and to some extent on commercial sources of energy like diesel and electricity.

16. Energy use patterns has serious implications both on the environment as a whole as well as on the users. Fuelwood requirements have contributed to the degradation of forests. This has led to villagers, especially women and children to travel longer distances and spending more time in collecting fuelwood, switching to inferior, fuels, and even altering food habits to reduce fuel consumption affecting the

[2] http://www.un.org.in/CCA2.htm#The state of human development
http://planningcommission.nic.in/appdraft.pdf

nutrition levels. Given the exploitation processes of natural resources, this situation is likely to worsen in the years to come. Rural energy systems are further strained by the inability of people to shift to commercial fuels like electricity, LPG and kerosene because of low purchasing powers and limited availability.

17. Subsidies on electricity for agriculture and kerosene have also been a cause of concern for energy planners. There are currently about 10 million electricity customers in Karnataka state. Approximately 30% of these are unmetered accounts: irrigation pump sets and bhagya jyothi (below poverty level household) installations. At present, only 75% of the rural population has access to electricity, while the figure is about 90% for the state as a whole. The Government of Karnataka is paying about Rs. 1,500 crore annually as power subsidy for agriculture, while outstanding payments to the power utility amount to approx. Rs. 3,500 crores. Rural customers in Karnataka typically receive electricity that is below the rated frequency and voltage. This poor quality power stresses to irrigation pump sets and other appliances. The timing of their power supply is also unreliable, especially when there is “unofficial” load shedding during peak hours in summer time. The reasons this service is so poor are well recognized: the ESCOMs have inherited aging distribution networks and obsolete technology, as well as poor capacity for customer service, and various internal management constraints.

18. To redress these problems, several efforts have been made both by governmental organizations and non-governmental organizations in the form of national programmes for rural electrification, and promoting renewable energy technologies like biogas, improved cookstoves and solar cookers. However, in spite of the existence of these programmes for nearly two decades, their impact on the rural energy scenario has been limited. Over the last few years, in line with economic liberalization, there have been efforts towards bringing about commercialisation and cost-recovery approaches.

19. The Ministry of Non-Conventional Energy Sources has recently formulated a concept of providing "energy security" in villages through biomass and other renewable energy sources. Twenty-four test projects on Village Energy Security have been sanctioned during 2005, with employment opportunities for about 25 persons per village expected. On the basis of the outcome of the test projects, a full-fledged programme covering remote villages/hamlets may be formulated. The concept is based on the recognition that the energy needs of rural villages, be it for cooking, motive power (operating pumps) or electrification, can be met through biomass conversion, and the experiences with gasifiers and biogas-fuelled engines throughout India. The village energy security programme targets the same technologies as considered in the BERI project, namely: biogas from cattle dung, leafy mass biogas plants, and biomass gasifiers.

20. Since the project started biomass gasifiers and pure gas engines of capacity of 100kW, and in the range of 200-250 kW are becoming standard. There are currently 16 gasifier suppliers in the Indian market, with approximately 1200 biomass gasifiers currently in use (mostly industrial).

B. Project contributions to the outcome through outputs

Project relevance and design

21. In the period between design of the project (1999-2000) and this mid-term evaluation, the relevance of the project appears to have increased as have been indicated above. From a design standpoint, the original design and project strategy is generally consistent with the needs of all stakeholders.

22. Implementation experience since the project started has largely demonstrated that the basic premises upon which the project was built are valid, and that the project design is appropriate for tackling these barriers.

23. The project document provides a lot of detail on deliverables, beneficiaries and project strategy. The Objectives and outputs and activities are well correlated to the Project Strategy through Activity Components although the design is very complex and not obvious at first reading.

24. The implementation arrangements for the project described in section B8 of the project document are excessively complex, and this appears to have led to difficulties during project execution. The main difficulties with the implementation structure are:
    a) Two project implementation structures – a Technical Support Unit (TSU) and a Project Management Unit (PMU) – both appear to function autonomously under the project director who will provide overall project co-ordination. The division of the tasks between these two units is sometimes problematic. Although not clearly defined, it appears that the TSU would run national level and technical activities, and the PMU would be an operational unit based in the field. Both these units would come under (within) KSCST.
    b) The project director would provide strategic and co-ordination support with both the TSU and the PMU operating under the director. However in reality the project director is of a senior level who does not have the time or responsibility to guide the project and take that level of responsibility for the project.
    c) There are numerous committees providing advice to the project – a project steering committee (chaired by the development commissioner), an executive committee (chaired by the project director), as well as a project advisory committee. In reality, only one committee, the project steering committee has been functioning

    Additional discussion of the management structure and implementation realities is given in the section "Management arrangements" on page 29 below.

25. There are a number of design inconsistencies and structural issues in the project document. From both the implementation perspective where UNDP favours Results Based Management (RBM) and the evaluation perspective this has led to a lack of clarity on the project strategy and designed outputs. In particular the Project Planning Matrix does not appear to have been written to facilitate project monitoring and evaluation. Objectively verifiable indicators are scattered throughout the project document, and in the Project Planning Matrix the indicators that are given are in most cases neither objective nor verifiable. This is a common design shortcoming in GEF projects of the late 1990s, and in the experience of the evaluators most projects from this era do not have designs that allow for effective results based management. By way of example, an indicator such as "% of households having access to bioenergy services", which does not specify quantity, quality and time factors (QQT) does not allow for management decisions to be made and adaptive management approaches to be implemented. A more effective indicator which can be used for monitoring and evaluation would be, for example, "80% of household in the project area will make use of biogas for cooking in the project area by end of year 5". It is also advisable to establish mid-term and end-term indicators along these lines.

26. There is also some inconsistency between the objectives, outputs and activities described in the body of the project document and those in the Project Planning Matrix. Activity component 4 in the project planning matrix has an extra output (output 4.6 – monitoring and evaluation of the proposed project approach and activities), and Activity component 5 in the body of the project document also has an extra output (output 5.4 – establishing communication network within the project area to enable proper communication among project sites, PMU, PSU and bioenergy services enterprises). Activity component 7 (Monitoring and Evaluation) is not included at all in the Project Planning Matrix.

27. The shortcomings of the original Project Planning Matrix and the need for training of the project implementation team in the use of Results Based Management appears to have been recognised during the first few years of project implementation, and UNDP and ICEF organised a Results Based Management workshop between 6 and 8 January 2003. About 25 persons from BERI project, BAIF, ASTRA and Forest Department participated in this workshop. One of the results as an updated Project Planning Matrix.

28. The updated Project Planning Matrix prepared in January 2003 contains a radically different project design at the outcome and output level. The overall project purpose given in the new plan is: "To improve income and quality of life of rural population through development and use of bioenergy

technology package for meeting rural energy needs and build institutions and capacity to operate and manage bioenergy systems". The outcomes and outputs in the new Logical Framework Matrix are listed below:

a) *Outcome 1:* Improved capacity of rural communities in target areas to sustain production use and benefits of bioenergy for their energy needs

   Output 1.1. Village community groups participating more effectively in planning and management of the bioenergy systems (including forestry)

   Output 1.2. Entrepreneurs utilize specialized skills to provide bioenergy plants and users with reliable support services (maintenance, repair, financial)

   Output 1.3. RESCOs (includes a range of enduse services) operate and maintain bioenergy plants and services using efficient operating and financially sustainable practices

   Output 1.4. Improved technical and managerial skills of women utilized for bioenergy system planning and implementation

b) *Outcome 2:* Sustained increased income for rural communities to pay for bioenergy and its technical and maintenance support costs

   Output 2.1. Farmers and village communities utilize skills for increasing productivity of forestry /agricultural/ agro-processing activities to enhance incomes

c) *Outcome 3:* Reduction in barriers that discourage wide spread adoption of bioenergy systems by rural communities.

   Output 3.1. Strengthen Research and Development Institutions applying standard and qualitative aspects in the development of bioenergy technologies and environmental impacts

   Output 3.2. Improved ability of entrepreneurs to adapt efficient and dependable technology packages for rural energy needs

   Output 3.3. Improved ability of agencies and individuals to disseminate bioenergy system information to target groups to increase the awareness and improve bioenergy awareness to help overcome the barriers

   Output 3.4. Entrepreneurs, NGOs, bioenergy system mangers, manufacturers applying improved business skills to market and expand bioenergy enterprises to rural communities

   Output 3.5. Bankers, nodal agencies and local government institutions, MNES provides improved collaboration and services to rural communities for financing and promoting of bioenergy systems

Outcome 1 in the new project matrix focuses on capacity building, and is thus best aligned with Activity Component 3 – Capacity Building from the original project document. It also includes the gasifier and biogas aspects of Activity Component 2 – System demonstration and proof of concept. Outcome 2 of the new logical framework matrix focuses on enhancing incomes of farmers and village communities, specifically on energy forestry and agro-processing making use of bioenergy. There is no clear link between this outcome and the original project design, although there are aspects of Activity Component 2 (forestry activities), and Activity Component 6 – Removal of financial barriers and creation of investment risk fund. The new outcome 3 appears to capture some activities under Activity Component 1 – technology package standardization, Activity Component 3 (training centre from output 3.4 and business skills from output 3.5).

The new Logical Framework Matrix does not contain any climate change or Greenhouse Gas indicators in the project purpose, outcomes, outputs and activities.

As is evident from the above review of the Project Planning Matrix prepared in January 2003 the new logical framework appears to be a rather different project from that originally envisioned. However it should be noted that no use appears to have been made of this new version in the implementation of the project.

29. In summary, the project design remains highly relevant in it's original concept. The design and project strategy is generally consistent with the needs of all stakeholders, and implementation experience since the project started has largely demonstrated that the basic premises upon which the project was built are still valid, and that the project design is appropriate for tackling these barriers. Design shortcomings in both implementation structure and tools for results based management have caused difficulties for project execution. Attempts to produce a working project planning matrix in the beginning of 2003 were ineffective.

Performance and results

30. The performance of the project – the progress that is being made by the project relative to the achievement of its immediate objectives, outputs and activities – has been assessed from the point of view of 'effectiveness' (extent to which the project achieves its immediate objectives and produces the desired outcomes; the cost effectiveness, and the success rate of transforming inputs into outputs), efficiency (the optimal transformation of inputs and outputs, including an assessment of the different implementation modalities), and timeliness of inputs and results. The project document has been used as the baseline and progress reports supported by interviews and field visits form the basis of this assessment.

31. A number of significant changes to project activities, outputs and strategy have been made during execution of the project. These include:

    a) *Villages and clusters:* The original plan in the project document was that the project would be implemented in 24 villages. The project is however currently working in 29 villages, which are clustered into five groups and one more isolated village. The clusters are: Madhugiri (5 villages), Koratagere (5 villages), Sira (6 villages), Tumkur (5 villages) and Gubbi (7 villages). So-called 'cluster NGOs' were appointed in the five clusters. This approach appears to have been highly successful, as discussed in paragraph 44 below).

    b) *Size of gasifier electricity generation:* A study by PRDC completed in November 2002 on the most cost effective options for the villages in the project area Tumkur concluded that gasifiers of 100 and 200 kWel would be preferred to those of 20 kWel. The key factors for this conclusion include:
        - The villages all have grid access, although it has low availability, does not extend to all farms, and can be considered as the "tail end of the grid"
        - Larger units obviously have higher system efficiencies
        - Gas engines for larger units are available
        - Distribution maps indicated villages could be grouped in 'clusters' which could potentially be disconnect from the grid and operated in an independent manner.A study (and comparison to data collected by the electricity utility) indicated a much higher load than was originally planned.

    The PMU has therefore hopes to install gasifiers totalling 2.92 MW not 1.2 MW as was originally planned in the project document.

c) *No gas engine development:* the project originally planned to address "the adaptation of gasoline powered engines to biogas and producer gas, thereby making these inexpensive engines suitable for use in rural renewable electrification programmes", and the project planning matrix makes clear that the focus would be on engines of 20kW capacity. Following a study by Power Research and Development Consultants (PRDC) on the most cost effective options for the 24 villages in the project area, which concluded that gasifiers of 100 and 200 kWel would be preferred (see commentary under output 2.1below), and some disagreements between the PMU and the CGPL over contracts and payments this aim was abandoned.

d) *No biogas electricity systems:* Following a review of availability of dung for biogas in the project area which showed that there is insufficient dung available to provide cooking gas for the needs of the population it was decided not to create any electricity from biogas, and to use biogas only for cooking gas.

e) *No leaf little biogas:* following failure of two trials on the leaf-litter biogas systems in which no commercial progress was made and it was concluded that further laboratory work was required, no progress has been made of this technology. It was intended that leaf-little biogas would be used to displace wood use for cooking in the project area. This is now provided through a number of smaller community biogas plants using cattle dung.

32. As described in the section above on 'project relevance and design' (on page 11), the project document does not have a consistent structure with clearly defined objectively verifiable indicators. The project is thus somewhat difficult to monitor and evaluate consistently. The evaluators have therefore assessed the project performance against the following:
    a) *'Objectives, outputs and activities' (section C) cross-referenced to the Project Planning Matrix given in the project document* – as has been explained above (paragraph 26), there are some inconsistencies between these two sections, and we have this included all items from both locations. The evaluation does not take into account the Project Planning Matrix developed in January 2003, since it does not appear to have been used in project execution.
    b) *The 'expected end of project situation' (section B5 of the project document)* – this section lists objectively verifiable indicators for a number of project outputs (although many of the indicators do not adequately convey quality, quantity or time factors and are thus not objectively verifiable).
    c) *The 'target beneficiaries' (section B6 of the project document)* – this section gives indications of the number and type of stakeholders that would be reached through the project.

    In the two tables below we review current status of these indicators as given in the project document (Table 1: Components, outputs and current status includes information from the outputs and activities section of the project document as well as the project planning matrix, and Table 2: Stakeholder indicators and current status assesses current status against the 'target beneficiaries' section of the project document).

33. Progress in project implementation against objectives, outputs, and activities is shown in the following table:

Table 1: Components, outputs and current status

Components and Outputs	Status
IMMEDIATE OBJECTIVE 1: The immediate objectives of the project are to develop a decentralized bioenergy technology package for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply, and milling.	
Activity Component 1 - Technology Package Standardization: The key problems encountered with small-scale rural bioenergy equipment in India will be identified and thrust will be given to develop engines to run on 100% gas to avoid diesel consumption. Standardized specifications will be evolved for development and application of bioenergy equipment and rest of the components of the package by wide range of interested participants.	
Output 1.1 Gas-engine development.	This output aimed to "focus on the adaptation of gasoline powered engines to biogas and producer gas, thereby making these inexpensive engines suitable for use in rural renewable electrification programmes", and the project planning matrix makes clear that the focus would be on engines of 20kW capacity. It was intended that this activity would be carried out by the CGPL of the IISc. Following a study by Power Research and Development Consultants (PRDC) on the most cost effective options for the 24 villages in the project area, which concluded that gasifiers of 100 and 200 kW_{el} would be preferred (see commentary under output 2.1below), the fact that gas engines at this scale are commercially available, and some disagreements between the PMU and the CGPL over contracts and payments this output was abandoned. No work has thus been done on this output.
Output 1.2: Development of detailed technical specifications for bioenergy technologies.	As part of the work preparing tenders for the 100 and 200 KW dual fuel (diesel and producer gas) and gas only systems for output 2.1, technical specifications have been produced. These are in the form of tender documents prepared by TCE Consulting Engineers Ltd. It is intended to generalise these tender specifications based on the project experiences in the five village clusters, and make these available nationally.

Components and Outputs	Status
	While these specifications and tender documents will be valuable, the technical specifications and computer software packages for more general cases, and including biogas systems, should not be overlooked. With a small amount of additional work, it appears that this output could be achieved before the end of the project.
Output 1.3: Development of draft standards bioenergy package.	The original project aim which describes 'technology packages' as being integrated biogas + gasifier + end-use options ("lighting, drinking water supply, cooking gas, irrigation water supply and milling"), and aims to develop standards, guidelines and methods under this output has not been pursued. Although the technical specifications and tender documents for 100 and 200 kW gasifier systems (output 1.2 above) will undoubtedly be a valuable output, no work on the original concept under output 1.3 has been carried out to date.
Activity Component 2 - System demonstration and proof of concept: The technical and economic viability of the biogas, producer-gas and energy plantation systems will be tested by adopting the standardized technology package developed, which will also provide know-how for replication. The end use systems and services provided by the installation of this package are drinking water supply, irrigation water supply, lighting, cooking gas supply to kitchens and milling using the concept of fee-for-service.	
Outputs 2.1. 1.2 MW woody biomass gasifier installation. (From the project planning matrix: "1.2 MW biomass gasifier (60 units of 20 kW capacity) based power plants with a generating potential of 4800 MWh of bioelectricity annually.") (From the 'expected end of project situation': "these systems will not be operated year round, for example, during peak rainy season")	A study by PRDC completed in November 2002 on the most cost effective options for the villages in the project area Tumkur concluded that gasifiers of 100 and 200 kW_{el} would be preferred to those of 20 kW_{el}. The conclusion therefore was to form five clusters of villages and to establish large centralized gasifiers (roughly 500 kW_{el}). A study (and comparison to data collected by the electricity utility) indicated a much higher load than was originally planned. The PMU has therefore planned to provide gasifiers totalling 2.92 MW.

Components and Outputs	Status
	To date construction has started in one of the five clusters (Koratagere) in two phases. In the first phases the company Energreen Power Limitedis providing a 100 kW gasifier system with a dual fuel engine and a 100 kW gasifier system with pure gas engine. This work should have been completed in April 2004 by at the time of the evaluation in July 2005 the systems had not yet been completed. In the second phase an order has been placed with Netpro Renewable Energy India Pvt. Ltd. for a 100 kW and a 200 kW unit (pure gas). This work is expected to be completed in the second half of 2005. A building for housing the gasifier system at the first cluster has also been completed, and the electrical distribution system is ready for commissioning. In addition to the main work on gasifiers described above, 1 10 kW gasifier system has been installed by Ankur Scientific Energy Technologies Pvt. Ltd., in Namadachilume Forest Information Centre, about 10 km from Tumkur. The electricity generated by the system is being used for irrigation of the nursery maintained by the Forest Department and will also be used for illumination and drinking water supply. Tendering is currently underway for the supply of 5 additional 10 kW gasifiers with pure gas engines for drinking water supply and lighting in locations within a radius of 150 km around Bangalore. It is unclear whether these activities funded by the project contribute to the overall project aims and outputs.
Output 2.2. 120 kW Community biogas cum biofertilizer systems for domestic electric loads to meet the year-round requirements. (From the project planning matrix: “120 kW (3-10 kW each) Community biogas cum bio-fertilizer systems generating 346 MWh for base loads.”)	According to the project document small community biogas plants running on dung were intended for electricity generation. Following a review of the availability of cattle in the project area in which it was clear that there was insufficient dung available to provide cooking gas for the needs of the population, and the difficulties with the leaf-litter biogas technology (see below), it was decided not to create any electricity from biogas, and to use biogas only for cooking gas.

Components and Outputs	Status
	This output was therefore abandoned.
Output 2.3. 45 Community biogas cum biofertilizers systems to meet the cooking gas requirements. (From the project planning matrix: "24 Biogas cum bio-fertilizer systems in 24 village settlements with a total capacity of 4000m^3/day (range 25 to 100m^3/day) for cooking gas and bio-fertilizer production"	In the project document it is envisioned to set up leaf-litter based community biogas plants. The NGO Tide which was licensed by the technology developer (IISc) to disseminate the leaf-litter biogas plants on a pilot scale, was contracted to provide systems for the BERI project. M/s. TIDE constructed 2 leaf litter plants (one of 6 and another of 8 m^3 capacity) in the first village cluster. Following technical difficulties resulting from problems in construction quality, difficulties in testing and operation outside the controlled conditions of the laboratory, insufficient gas generation, low pressure, and problems with the supply of leaf-litter (requiring high levels of effort which users appeared unwilling to provide), the two plants were abandoned. 51 community biogas plants for small groups of households (3 or 4 households sharing one biogas digester) operating on dung have been constructed with capacities between 6 and 20 m^3. Work has started on installation of 3 more community biogas plants of 6 m^3, and tenders invited for supply and installation of individual biogas plants and community biogas plants in the project villages. The PMU intends to install 100 community and 100 individual biogas plants by the end of the project. The evaluators visited some plants and scrutinized the operations thoroughly. The benefactors seemed extremely happy and satisfied with the systems. The clean gas stove has acquired a place in their heart and they wouldn't like to get back to firewood or kerosene.
Output 2.4. Establish short-rotation energy forest plantations, agroforestry systems, community forestry, horticultural orchards and also high input forestry plantations. (From the 'expected end of project situation': Establish around 400-500 ha of short rotation forest plantations; 300-400 ha of agro-forestry systems; 200-300 ha of community forestry; 400-500 ha of orchards; and 100-125 ha of high input forestry).	Given the greater total gasifier capacity envisioned in the project, the PMU is planning to exceed the targets given in the project document. The planned new targets are: 1100 ha. of short rotation forest plantations; 460 ha of agro-forestry systems; 810 ha of community forestry; 785 ha of orchards; and 240 ha of high input forestry.

Components and Outputs	Status

	The following has been achieved since the project started (up to end March 2005):
	• Short rotation forest plantations (energy plantations): 554 ha. (exceeding original target)
	• Agro forestry systems (Agro Forestry TBF system): 99 ha.
	• Community forestry (Assisted Natural Regeneration): 454 ha. (exceeding original target)
	• Orchards (Agro-Horti Forestry (TBF)): 221 ha.
	• High input forestry: total 84 ha. of which,
	  o Farm Forestry: 35 ha.
	  o Clonal plantations: 10 ha.
	  o Avenue plantations: 38 ha.
	
	Output 2.4 appears to be on track. Very good co-operation between the PMU and the local Forest Department was noted.

Output 2.5 Lessons in different modes of providing the rural energy service package to rural villages, including experience in gaining full cost recovery.	To date cost recovery has been limited, with community members paying 8 USD per 6 m^3 biogas plant, 11 USD per 8 m^3 and 17 USD for 10 and 20 m^3. Comparing to project costs for the 51 biogas digesters installed (1.75 million Rs, approx 40,000 USD), and community contributions (totalling 17,100 Rs, approx 390 USD), this represents a cost recovery of less than 1%. Users pay a monthly contribution to O&M charges of 0.50 USD per month, and provide the dung themselves. This, it is believed, covers 100% of O&M costs. However this contribution does not appear to cover the long-run marginal cost (175 members contribute 0.50 USD per month, so approximately 1,000 USD is collected for all 51 biogas plants, so recovering the 40,000 USD capital investment would take a period of 40 years assuming there are not maintenance or operation costs). Only one delivery model has so far been tried. Since the gasifiers are not yet operational, no progress has been made on delivery models for this technology.

Components and Outputs	Status
IMMEDIATE OBJECTIVE 2: To remove barriers to large-scale adoption and commercialisation of bioenergy technology packages.	
Activity Component 3 - Capacity building: Personnel will be trained in the technical, financial, marketing and project development skills to be able to operate through institutional mode such as the rural energy service companies either as entrepreneurs, NGOs or businesses. The aim is to sustain the activity beyond the project duration in the given area and to replicate in wide areas.	
Output 3.1. Bioenergy packages for service enterprises for replication in other parts of rural India	No activities have been carried out under this output do date.
Output 3.2. Approach and methodology for monitoring carbon flows in bioenergy project	No work has yet been carried out on this issue, although a contractor (EMPRI, Bangalore) has been found to carry out a study on this issue, and started work on carbon sequestration issues in July 2005. This output appears to overlap with that of output 7.3.
Output 3.3. Training and involvement of women in planning and management of the bioenergy systems	Five cluster NGOs were appointed to facilitate all work in the five village clusters, including capacity building aimed at increasing the involvement of women in planning and management of bioenergy. Community organisations that have been mobilized are: • Biomass User Groups (BUG) – 1 per biogas plant – 51 groups, 175 households are members. • Self-Help Groups (SHG) – 72 women's SHGs have been created, with 1134 members (14 men's SHGs were created during the same period) Of the extensive number of capacity building programmes (with over 230 courses, and 10,000 participants) approximately 58 % of the participants have been women.
Output 3.4. Training Centre for training entrepreneurs, NGOs and managers on implementation of technology and institutional package. (from the 'expected end of project	A training centre has not been established, although each of the 5 village cluster NGOs have arrangements for conducting training activities. Capacity building on technical

Components and Outputs	Status
situation': "Trained entrepreneurs, NGOs and managers operating and managing the project")	issues, focused on the needs of the communities. 81 capacity building programmes have been run since the start of the project with 2322 participants. One training centre in Kabbigere is envisioned, and village community halls are planned for 20 locations before the end of the project.
Output 3.5. Training for entrepreneurs, NGOs, technicians and managers in the business skills (from the 'expected end of project situation': "Trained entrepreneurs, NGOs, managers, manufacturers for replication projects in other parts of Karnataka and India")	Extensive capacity building has been carried out within the project, including training in management skills (76 courses, 1957 participants). This has also focused at a grass roots community level. Community capacity building has also included exposure trips (73 programmes and 1963 participants), and promotional activities (68 and 9642 participants).
Output 3.6. Infrastructure development for manufacturing, spare parts supply and servicing of bioenergy systems	No activities have taken place under this output.
Activity Component 4 - Enabling activities: The main objective is to strengthen the new concept of rural energy service company by developing a policy framework to support fee-for-service model that will allow entrepreneurs to charge a fee for services delivered from bioenergy package. The experience will be analyzed through documentation of field monitoring experiences, case studies, policy-analysis, - documents and -workshops for level playing the field for bioenergy service establishment and replication.	
Output 4.1. 'Fee for service' framework	No activities have yet been carried out under this output.
Output 4.2 Policy papers to make impact on policy makers.	No policy papers have yet been prepared. There are plans to prepare reports on the project experiences including technology performance, institutional development and economic viability.
Output 4.3. Case studies on bioenergy technologies and field implementation.	No case studies have yet been prepared. About 10 are envisioned before the end of the project, including "Decentralised Nurseries", "Community Biogas Plants", Community Micro-irrigation under gravity", "Affforestation", "Vermi-compost and vermin-wash", "Fee for

Components and Outputs	Status
	energy services concept", "Rain water harvesting", "Village Electricity Distribution franchise", "Setting up of biomass gasifier system", and "Renewable energy packages and integration". The company ITCOT was contracted to carry out a study on Biomass Gasifier based Power Generating Systems in Southern India and Sunderbunds. This review, combined with the direct project gasifier experiences, will be a good basis for one of the case studies.
Output 4.4. Workshops to involve stakeholders especially policy makers to exchange the experiences, study tours and policy research activities	A review and planning workshop on "Community Mobilisation experiences" was held in December 2004. No other dissemination / awareness raising workshops have yet been held.
Output 4.5 Documentation of lessons learnt and sharing of experiences	No targeted dissemination activities have yet been carried out, although the project has maintained a project website, published three newsletters providing an overview update of the project.
Activity Component 5 - Information dissemination: The information on successful implementation of bioenergy systems and services will be compiled as an information package, which will include proposed standards, technical designs, costs, benefits, sources of technology, sources of financing and software packages to meet the requirement of different categories of stakeholders. This information package, which will be the rationale for establishment of fee-for-services approach and levelized playing field, will be disseminated through mass media, workshops, techno-economic reports and field visits.	
Output 5.1. Information package made available for bioenergy technologies manufacturers, suppliers, financial mechanisms, performance guidelines, R & D facilities, technical expertise, etc.	No activities have been carried out under this output to date.
Output 5.2. Methodology and designs for project formulation, financial analysis, implementation, fee recovery for services and project-monitoring guidelines for potential replicability will be evolved.	No activities have been carried out under this output to date.

Components and Outputs	Status
Output 5.3. Development of promotional modules of bioenergy packages using audio-visual, print and other mass media for training and dissemination.	No activities have been carried out under this output to date.
Activity Component 6 - Removal of financial barriers and creation of investment risk fund: This envisages to remove critical investment risks and ensures to establish a risk mitigation revolving fund which will support to overcome risks from cost recovery for project duration and would be reinvested for promoting leverages in market resources and also make available for future dissemination.	
Output 6.1: Financing of enterprises (from the 'expected end of project situation': "Venture capital provided for 20 franchisers and franchisees")	No activities have been carried out under this output to date.
Output 6.2. Creation of Investment Risk fund or Revolving Fund	No activities have been carried out under this output to date. At a grassroots community level, a study on the "Identification of the Various Formal and informal Financial institutions Mechanisms/ Networks and their Dynamics in select Talukas of Tumkur District" was carried out by Indian Grameen Services (BASIX), Hyderbad
Output 6.3. Formulation of approach involving bidding for concessions to operate future bioenergy systems in areas targeted for replication	No activities have been carried out under this output to date.
Output 6.4. Demonstration of financial viability	No activities have been carried out under this output to date.
Output 6.5. Demonstration of willingness to pay	No activities have been carried out under this output to date.
Activity Component 7 - Monitoring and Evaluation: Goal is to periodically monitor and evaluate different components of the project to learn lesson for improving project performance and for replication.	
Output 7.1. Periodic monitoring of physical, financial and institutional aspects.	The PMU has prepared detailed updates on project status for the periodic steering committee meetings (7 since the project

Components and Outputs	Status
	started). A management audit report for the year 2004 was carried out for ICEF and UNDP by AF Ferguson Associates.
Output 7.2. Mid-project period and project-end evaluation.	The mid-term evaluation is the content of this report.
Output 7.3. Monitoring carbon flows.	This overlaps with output 3.2, and monitoring will take place under that output.
Output 7.4 Post-project evaluation	Future activity.

34. Assessment according to the indicators given in section B6 'target beneficiaries' of the project document are given below:

Table 2: Stakeholder indicators and current status

Stakeholder	Status
Households: Up to 2500 households benefit from provision of biogas for cooking, electricity for piped water supply and home lighting contributing significantly to the improvement of quality of life of women.	175 households are currently benefiting from biogas for cooking. 99 households have received pressure cookers, 131 household latrines have been installed with partial subsidy from the project.
Farmers: Up to 2500 farmers to be provided with reliable electricity for lifting water for irrigation, bio-fertilizer and farm forestry will contribute to increased incomes.	256 vermi-compost units have been installed. 304 farmers have been provided with community irrigation systems in two clusters. Approximately 900 farmers have participated in the afforestation activities, and 114 farmers have created farm ponds.
Village communities: Village communities will benefit from community institution development and capacity building among women, common property resources (degraded lands, soil and water) conservation and development diversified employment opportunities.	Significant work has been carried out to build community capacity and establish local institutional structures, these are: • Biogas User Groups (BUG) – 175 households • Water Users Associations (WUA) – 304 farmers • Village Biomass Energy Management Committees (VBEMC) – 2875 households, 95% of all households • Village Forestry Committees (VFC) –

Stakeholder	Status
	2996 households, 100% coverage • Self-help Groups, 2182 households, (73%)
Women's Enterprise: Increased agricultural production and reliable energy supply will provide opportunities for women enterprises in agro-processing leading to increased incomes.	Community organisations with high involvement of woment include: • Biomass User Groups (BUG) – 1 per biogas plant – 51 groups, 175 households are members. • Self-Help Groups (SHG) – 72 women's SHGs have been created, with 1134 members (14 men's SHGs were created during the same period) Of the extensive number of capacity building programmes (with over 230 courses, and 10,000 participants) approximately 58 % of the participants have been women.
Entrepreneurs: At least 60 entrepreneurs will be provided opportunities through bioenergy systems and service activities such as installation, operation, maintenance, servicing, and training. Fifteen entrepreneurs from each of the four southern states will be selected and trained.	Apart from the various community organisations described above, the project has not yet provided training and establishment of entrepreneurs.
Manufacturers: Manufacturers will benefit through the markets and demand for bioenergy systems, created under the project. Further, providing feedback through intensive monitoring of the projects in the field could lead to technological improvements and finally, by removing marketing barriers for generating large scale market demand for bioenergy systems. Initially, one manufacturer from each of the four southern states will be involved in the infrastructural and capacity building programmes.	Feedback to manufacturers is still limited since the gasifiers have not yet been installed and commissioned. Three gasifier manufacturers have so far been involved in the project as contractors.

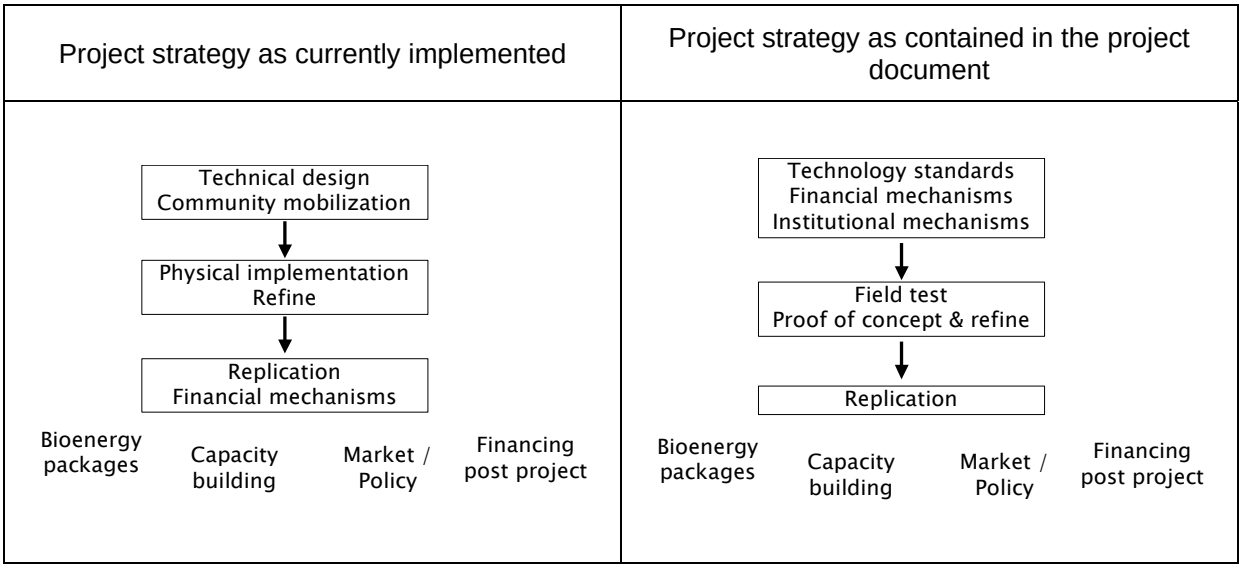
35. The project document contains a detailed 'input' budget (budget according to staffing, travel, and other inputs), but no output budget (budget according to the desired outputs). While the project brief on which the project document is based does contain a rough output budget, it does not seem as though this has been translated into an operational plan. This gap in long-term planning and monitoring is discussed further in the section "Management arrangements" below).

Figure 1: BIRD-K NGO project officer where training and meetings take place (see output 3.4)

36. As has been evident from the above review of project status in Table 1 and Table 2, the project has so far focused attention almost exclusively on a limited number of project activities, in particular those under output 2.1 (gasifiers), output 2.3 (biogas for cooking), output 2.4 (forestry), and output 3.3 and 3.4 (capacity building). Almost all other project components are currently largely untouched. While the project is undoubtedly contributing effectively to significant beneficial activities in the villages in the project area, the lack of action on many of the other outputs and project components means that the overall market transformation logic of the GEF project is currently not effectively being achieved. Significant attention will be required to address this gap.

37. The general difference between the project strategy as currently being implemented and that which appears to have been proposed in the project document is shown diagrammatically in Figure 2 below.

Figure 2: Project strategy as currently implemented and strategy proposed inthe project document compared



A key difference that may be clearly seen in the above figure is the role of the financial mechanism which are part of Activity Component 6 (removal of financial barriers and creation of investment risk fund). According to the project document and the workplan given in annex 3 of the project document activities to create the revolving or investment risk fund should have started at the beginning of the project (second half of year 1), and the fund should have been used to finance all the project investments on the basis of entrepreneurial / commercial risk. This approach is a key to the market transformation strategy as contained in the original project document.

38. With the decision to install larger 100 and 200 kW gasifier units the project risks are greater than in the original project design with 60 units of 20 kW (essentially more eggs are in one basket). These risks

include principally financial and time risks during commissioning, fuel supply during operation, and technical risk with fewer and larger units from both the gasifier and grid synchronization perspectives. These greater risks have been demonstrated in the over 1 year delay in commissioning the first gasifier which has resulted in delays throughout the project, and has jeopardized the achievement of the project aims within the time available.

39. The use of larger gasifiers have also meant that the original concept of 'integrated technology packages' given in the project document are somewhat difficult to conceive – essentially since the gasifiers are large scale so would require significant capital and commercial expertise to reproduce in other areas of the country, the biogas digesters are comparatively small, and the leaf-litter biogas digesters are not working in the field. The original project vision of "The project scenario proposes to meet rural energy needs through the following integrated technology package: i) energy forest-biomass gasifier for electricity to be used for irrigation water pumping and agro-processing; ii) cattle dung based biogas-electricity system for base load activities such as lighting and pumping drinking water; and iii) leaf biomass biogas-based gas system for cooking gas supply." (project document, page 60) is no longer possible. While the decision to implement larger grid-connected gasifers rather than small autonomous gasifiers no-doubt makes technical and financial sense, further investigation would be needed to confirm that the resulting technical package is reproducible throughout the country. It is notable that the Village Energy Security programme of the Government of India will probably focus on smaller 20 kW gasifier systems.

40. For a combination of reasons Energreen Power Ltd., Chennai delayed the supply of the gasifiers for over a year. The most important appear to be:
    a) The misunderstanding between the company and the PMU in connection with the way the Bank Guarantee will be released: The company felt that the BG will be released in proportion to the supply so that they can get the margin money locked with the bank released for working capital needs
    b) The party does not seem to be equipped to handle logistics in supply, installation and commissioning in remote location (misjudgement in capability assessment)
    c) A mistrust developed over a period of time

    The party's technical capability however appears to be satisfactory. They have agreed to PMU that they will complete the balance supply and commission the systems by August 2005. This appears to be possible if constant review and facilitation is carried out.

    After an independent assessment (SWOT analysis) of the party's capability and after satisfactory completion of order –in-hand, the company could be considered for further supplies.

41. With only about 6 months remaining before the official end of the project (March 2006), a number of activities only recently started or as yet entirely un-addressed, and a budget utilisation of less than 20%, decisions have to be made about the future of the project. From the point of view of maximizing project benefits and ensuring sustainability and replication, and the possible achievement of the wider GEF aims of market transformation and demonstration of cost-recovery approaches to rural energization, an extension of the project is highly recommended. Two scenarios for future developments of the project were considered:
        a. If the project ends as originally planned with a March 2006 end, it seems likely that biomass gasifier systems could be completed under a BOOT arrangement (Build, Own, Operate, and Transfer) in village clusters 1 and 2, and that preparatory work for the other clusters could be carried out. The project team would need to give immediate attention to the unaddressed project components, in particular those related to replication. Urgent arrangements for the use of the remaining project funds after the end of the project would also be needed, and for ongoing operation of the completed systems after the end of the project.
        b. If the project were to be extended for one extra year (until March 2007), in addition to the above, gasifiers in village clusters 3 and 4 could be completed, with these two potentially

implemented under a BTOO arrangement. Again, urgent attention must be given to sustainability of the installed systems, and activities focused on replication.

Under both scenarios, it seems unlikely that the gasifiers in village cluster 5 could be constructed in a sustainable way. This could possible be built after the end of the project by a Rural Energy Service Company as originally envisioned within the project document.

42. The project performance and results section of the evaluation can be summarized as follows: The project has achieved significant and sustainable results in the project area in terms of community mobilization, capacity building, strengthening of economic prospects for farmers and households (which should improve the ability for communities to pay for energy services in the medium to long term), and created impressive community-owned initiatives in afforestation (far exceeding the original project targets). This has already brought significant benefits to the communities involved. However, from a GEF point of view crucial project activities remain almost untouched, and fundamental changes in project strategy have meant that even with additional efforts on project activities which to date have been delayed, the market transformation impact of the project will have been reduced. The project appears to make significant contributions to local sustainable development and livelihoods the replication prospects are uncertain and the market transformation effect of the project extremely limited to date.

Management arrangements

Organisational structures

43. According to the organisation plan given in the project document, the tasks of the project are to be accomplished through contracts with 19 experts and 16 sub-contracts in addition to a small permanent staff consisting of one project coordinator, and four project staff. The project structure given in the project document and the practical realities at the time of the evaluation are reviewed below:

a) *Project director* (PD) is the Secretary to the Department of Rural Development and Panchayat Raj (RDPR) of GoK. The responsibilities of the project director as described in the project document are ones of coordination and strategy and the project director is the chairman of the project executive committee, and guide to the Technical Support Unit and Project Management Unit.

   While the steering committee meetings chaired by the DC had been reviewing the task and the activities, the progress and the plans ahead were not reviewed against objectives.

b) *Three advisory committees* were envisioned, namely the Project Steering Committee, the Project Executive Committee (as subset of the steering committee for quicker decision-making), and a project advisory committee at the district level in Tumkur.

   Only the project steering committee has been functional, with seven meetings being held since the project started. The project executive committee met only once.

   At the local project area level the project's partnership strategy included a Project Advisory Committee (PAC) "To be chaired by the CEO - Zilla Parishad (ZP) will be formed at the district level in Tumkur with the objective of ensuring the stake holders participation and consultations on project planning and implementation in the district"

   A senior official of the Forest Department (On deputation) function as the Local Project Coordinator assisted by another Forest dept official and operate out of the ZP office, without any infrastructure support.
   The local office is yet to be in a position to own responsibility and control local operations, so local control comes from the PMU in Bangalore. It seems apparent that infrastructure needs to be built up at Tumkur and clarity should be provided in terms of responsibility to be handled.

Except for few meetings by the PAC (five in total), no effective role is currently being played by the PAC.

c) *Local implementation agency:* The implementing agency was to be KSCST, and would receive funds from UNDP,ICEF ,State Government, and MNES, would manage funds thus received and report accounts to the agencies, would implement through technical institutions, consultants , NGOs, Panchayat, entrepreneurs, and would monitor progress and report the project achievements, problems and lessons to respective funding agencies.

For all practical purposes the KSCST has ceased to be involved in the project. During interview many operational reasons were given for KSCST's withdrawal and PMU's emergence to occupy partially the responsibility of KSCST, during the discussions with officials concerned. Some major ones appear to be:

- Delays in decision making by KSCST specially due to the organizational requirement of KSCST to get all operational decisions agreed by their governing council which meets only periodically (at best once in three months)
- Mismatch in speed of operation desired by the PMU and KSCST
- ASTRA's withdrawal from the project when an acceptable commercial agreement could not found.
- The original intention of PMU to be located at Tumkur was probably with the intention to ensure that the PMU focused on the operational issues to be guided by KSCST, which was expected to plan the tactical and strategic issues. However, with PMU being relocated in Bangalore, it occupied the responsibility space of KSCST but focused on operational issues as if they were in Tumkur.

d) *Technical Support Unit (TSU)* was to be formed at KSCST, would report to the project director, and work closely with the Project Coordinator based at the PMU. The TSU was to be responsible for recruiting and hiring of experts, consultants and institutions for conducting various technical activities. The tasks of TSU included preparation of the technology package, designs and plans, preparation of guidelines for implementation, management and monitoring, planning and organize capacity building and enabling activities, preparation of policy papers, manuals, guidelines, audio-visual aids, case studies, information and policy packages, organizing of workshops, training programmes, awareness campaigns, and business meetings.

The TSU was never established.

e) *Project Management Unit* (PMU) to be located in Tumkur, and headed by the project coordinator was to be headed by the Project Coordinator assisted by Project Officers (4 persons). The PMU is presently located in Bangalore. No records could be found on the decision to shift the location of the PMU. The project co-ordinator is in position. The project document describes:

i) Project officer 1: Project Administration at PMU
ii) Project officer 2: Finance Management at PMU
iii) Project officer 3: Manager at TSU
iv) Project officer 4: Outreach activities at TSU

The PMU has been located in Bangalore not in Tumkur and has to some extent taken over responsibility of the KSCST, the TSU and the strategic role of the Project Director. While four project officers are currently employed in the PMU their responsibilities are substantially different from what was envisaged in the project document. There is no project officer for project administration.

A comparison of the intended functions of KSCST, the TSU and PMU shows that most of the responsibilities to be done by KSCST and TSU are of strategic in nature, to address Activity Component 1, Activity Component 3, Activity Component 4, Activity Component 5 and Activity Component 7 and

the responsibilities of the PMU based on Tumkur are of a tactical and operational in nature to address Activity Component 2, Activity Component 6 and Activity Component 7.

Analysis of minutes of the project steering committee meetings, and other reporting reveals that the role of KSCST never came into play and has virtually became extinct over the years. ASTRA, which was presumably to probably play the role of TSU (especially technology package) never got into the chain of the process of project management. The PMU, which took up the tactical and operational functions, has carried out its responsibility extremely well as far as Activity Component 2 (System demonstration and proof of concept). The vacuum of KSCST was never filled nor the responsibilities formally assigned to PMU. Thus, attention on rest of the six Activity Components was very low. This is one of the main reasons for the skewed progress of the project. The delays however on Activity Component 2 are purely due to operational reasons which is dealt with separately.

44. The villages involved in the project area were divided into 5 clusters which are responsible for grassroots activities including community mobilization and capacity building. The appointed NGOs, which started their work for the BERI project in 2003 (with the exception of BIRD-K in Koratagere which started its work in 2002) are as follows (Table 3):

Table 3: Cluster NGOs

NGO	Cluster
BAIF Institute of Rural Development – Karnataka (BIRD-K)	Koratagere
BAIF Institute of Rural Development – Karnataka (BIRD-K)	Madhugiri
Self Reliant Initiatives through Joint Action (SRIJAN)	Sira
Institute for Youth & Development – Symbiotec Research Associates (IYD-SRA)	Tumkur
Multipurpose Organisation for Training, Health, Education and Rehabilitation (MOTHER)	Gubbi

Based on project reports and validated through field discussions with representatives from the NGOs and from other stakeholders, it has been observed that the cluster approach appears to be highly effective. The NGOs have been successful in mobilizing community interest and support. A high level of synergy and ownership from the NGOs and communities was seen during the field trips.

45. In the absence of an overall plan (discussed in paragraph 46 below) to address all the Activity Components, the deployment of manpower through appointment of experts and Sub contracts are far fewer from what was required, although it should be noted that to the extent of task taken up (principally activity component 2) the manpower utilisation at the PMU (Project Officers and other staff) and NGOs been excellent. The PMU team members led by the PC and staff of NGOs were all found to be extremely sincere, committed and hardworking.

The PMU organizational strength and Local Project office (Tumkur) strength are far less in number than required to manage a multi-dimensional project of this nature.

Management, monitoring and review processes

46. The workplan given in Annex 3 of the project document covers 5 years at a broad and indicative level. No records have been found where this Workplan has been converted to a Master Schedule (Using PERT/CPM like tools which is a pre-requisite for effective Project Management, either manual or software based) from which the Annual Plan should have been evolved and based on which quarterly progress reports and Annual Performance Reports should have been generated. On the contrary, the records indicate that annual action plans produced by the PMU, such as the "Action Plan 2002-2003" prepared are stand alone in nature without any relation to the overall plan or Master Schedule. This management tool was not identified by the Steering Committee, and the first few Steering Committee Meetings (Specifically First and Second) do not mention the availability or need of such a Master Schedule. From the interviews held it is also understood that annual planning based on an overall master schedule was never adopted for planning or monitoring. Quarterly, Monthly, and potentially Weekly

schedules should also have been evolved from the Master Schedule. This would help to ensure all Activity Components receive appropriate and timely attention.

The absence of a Master Schedule and the lack of Steering Committee and PMU attention on such a document has been one of the most important missing links of project management.

47. The Steering committee meeting takes place regularly. However, since the meeting is not making its reviews based on an overall project schedule, as indicated earlier, steering committee meetings do not focus on deviations from a strategic path and direct solutions but remains more of a transaction processing forum, very much at an operational level.

48. No records of any Project Advisory Committee meetings were available to the evaluators (although 5 appear to have been held), and only one Executive Committee Meetings was held since the project started. Except for the Project Steering Committee Meetings, which seems to be fairly regular (half yearly) and well documented the other meetings like Project Advisory Committee , Executive Committee etc are very infrequent and not well documented either.

49. The UNDP Annual Project Reports (APR) and Project Implementation Reports (PIR), while conveying project status, do not provide the tools to track project progress against aims. One reason for this is the lack of measurable indicators which set targets for Quality, Quantity and Time, as has already been described under paragraph 25 above.

50. A structured project management approach does not appear to be in place:
    - The quarterly reporting requirements, including quarterly workplans, in the UNDP format is not met.
    - The current approach to project management (Planning, Scheduling, Control, Reporting) is based on the PC and his PMU team, which is somewhat ad-hoc. Perspective plans prepared by the PMU do not take into account the needs of the entire project. Progress on the tasks undertaken, however, as has been noted before are highly effective due to the vision and capabilities of the PC and the knowledge and commitment of the PMU team.

51. No formal written documents (periodic reports) seems to exist between ZP office (or the Tumkur project office) and PMU at Bangalore.

Administration, contracting and procurement

52. IT Power was contracted during the beginning of the project to develop administrative procedures including procurement. Contrary to these guidelines however, the delegation of authority to the project co-ordinator is not fully utilised. Because of the nature of the Project Implementation Agencies (with a strong presence of the Karnataka Government) it seems to be important to have the delegation of power formally ratified to follow the World Bank procedures (value for money), which will make procurement more effective and efficient, and provide the necessary backup to the project co-ordinator.

53. The administration set up at PMU is well organized and set up. Contracting procedures are also well laid out and appear to be robust and fair.

54. It may be necessary to review the procedures concerning approval of allowances (Travel etc.) in the light of KSCST practically not being involved to any extent. Procedures could be simplified with PMU directly being responsible to RDPR.

55. Manpower at the senior level of the PMU is inadequate as there is no organizational structure drawn up and responsibility definitions have not been made. Many officials are drawn on deputation from Govt. service and the turnover, at the project officer level (due to promotion etc.) is quite high. This affects the project continuity

Financial overview

56. While it is not the responsibility of the evaluation to carry out a financial audit of the project, a review of the project expenditure to date according to intended outputs, as well as planned expenditure provides a useful indicator of project progress and status. We therefore include here financial data provided to the evaluators by the Project Management Unit. The evaluation team has not verified the expenditures given here.

57. To date (end June 2005), total project expenditure has been 64,563,560 Rs, with an additional 14,343,230 Rs already committed, making a total of 78,906,791 Rs (approx. 1.7 million USD) since the project start. With a total project budget of 8.6 million USD, currently about 20% of the funds have been used, while 80% of the project period (4 out of 5 years) have passed. In order to reach financial targets a significant increase in the rate of expenditure will be required. This may not be possible within the remaining period available. The expenditure according to co-funder is given in the table below (Table 4):

Table 4: Overview of budget and disbursement to 30 June 2005 by funding source

All amounts in USD	UNDP	ICEF	GoK	MNES	Others	Total
Budget allocation as per Proj Doc	4,017,000	2,495,000	1,481,000	391,000	239,000	8,623,000
Disbursment as on 30-06-2005	843,397	532,165	333,117	-	-	1,708,679
% disbursement	21%	21%	22%	0%	0%	20%
Available	**3,173,603**	**1,962,835**	**1,147,883**	**391,000**	**239,000**	**6,914,321**

58. The project expenditure and budgeting is tracked according to budget lines, and not according to project components or outputs (e.g. 'domestic travel' is budget line 015.01, and total expenditure under this budget line up until end of June 2005 has been 1,962,708 Rs.). The lack of output level tracking of expenditure means that feedback to management on how the project is progressing and the cost effectiveness of activities is virtually non-existent. This additional monitoring tool is required to allow the project management to assess the cost effectiveness of progress and where adaptive management is needed to improve effectiveness. It is thus strongly recommended that the project management start to track expenditure according to project output in addition to budget line tracking. Future planning should also reflect intended expenditure according to budget line.

59. The contribution from the MNES was intended to be comprised of subsidies under an existing government subsidy scheme for biomass gasifiers. Efforts are needed by the Project Management Unit to secure this funding from the government.

60. The funding under 'others' appears to relate to end-user funding. While there clearly have been own-contributions made by the communities involved in the project this contribution has not been systematically tracked. It is recommended that the PMU estimates the contribution made to date, and tracks this contribution for the rest of the project.

61. During evaluation meetings with the project co-ordinator and other staff, the following rough draft budget according to project components was developed (Table 5):

Table 5: Budget and expenditure by project component

Cost Components (million Rupees)	Project Document	Used
Activity 1: Technology package standardization	20	-
Activity 2: Technology demonstration	62	45
Activity 3: Capacity & institutional building	40	7
Activity 4: Enabling Activity	37	-
Activity 5: Information dissemination	57	-
Activity 6 : Financial Barriers / Risk Fund	170	-
Monitoring and evaluation	12	0
PMU	-	10
Total	397	62

Expenditure under activity 2 include the forestry-related activities. Expenditures given under "PMU" include some activities that were budgeted under 'monitoring and evaluation' and other activities budgeted under activity components 1 to 6. It is clear from Table 5 that there are significant deviations from what was initial envisioned, and that expenditure is well below what was expected in all activities.

62. UNDP budget lines are being used for all project expenditure, with the co-funders ICEF and the Government of Karnataka covering some of the budget lines. The Government of Karnataka, for example, co-finances five budget lines, namely Resource Assessment & Installations, Expendable Items, Non-Expendable Items, Others, and Forestry.

Overall success

63. The project has two main objectives:
    - To develop a decentralized bioenergy technology package for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply, and milling.
    - To remove barriers to large-scale adoption and commercialisation of the bioenergy technology packages.

    While neither of these two objective have been made, and progress towards them has been limited, the project has undoubtedly achieved significant positive impacts in the project area (Tunkur) in terms of community mobilization, capacity building, strengthening of economic prospects for farmers and households (which should improve the ability for communities to pay for energy services in the medium to long term).

    The project has to date also created an impressive community-owned momentum in afforestation, which far exceeding the original project targets. This has already brought significant benefits to the communities involved. The work on afforestation will have made a real impact on carbon sequestration in the project area, thus meeting the projects global goal. Once the gasifiers are commissioned, it is expected that emission reductions will also be achieved.

Figure 3: Rain water harvesting through trenches, demonstrating synergies between agriculture, forestry, and bioenergy

    On the other hand, from a GEF point of view crucial project activities remain almost untouched, and fundamental changes in project strategy have meant that even with additional efforts on project activities which to date have been delayed, the market transformation impact of the project may be limited.

64. From the point of view of static sustainability (which refers to the continuous flow of the same benefits to the same target groups), indications from the field visit to the project area showed significant local ownership of project results, and the evaluators are thus confident that the project is well on the way to providing ongoing benefits in the project area long after the end of the project. Indications for static sustainability to be achieved are thus high. The project has taken extensive and effective steps to mobilizing the communities, building capacity and empowering local people and this is evident in the field. The branding of 'Green Power' throughout the project area was notable, and communities and local NGOs are clearly highly motivated.

65. From the point of dynamic sustainability (referring to the use and/or adaptation of the projects' results by original target groups and/or other target groups), there is only limited evidence of replication. A positive indication is that the MNES appears to have considered the BERI project when designing their planned Village Energy Security programme. However since many of the activity components on barrier removal, policy development, and dissemination of project results are yet to be started, very little progress has been made on ensuring replication. This is evident even within the Tumkur district where policy-makers appear surprisingly unaware of the policy implications of project activities. The project exit strategy also urgently requires attention.

66. A significant success of the project has been in its local contribution to capacity development. Without doubt the project has empowered the target groups and build the capacities of local communities. There is very strong local ownership of the project at a field level. Capacity development at local, state and national government levels to ensure an uptake of the project lessons will be required to ensure ongoing success.

Partnership strategy

67. The Forest department officials at the local level (led by Mr. Santhappa, DFO) were found to be actively involved in the project and exhibiting sincere and committed interest.

68. A large number of local institutional structures have been made to ensure involvement of local stakeholders. These include

    The *Village Bio Energy Management Committees (VBEMC)*: The VBEMC "is a village level representative body to facilitate participation of village community in decision making process and management". Once VBEMC is established per village, operating with a 15 member committee. Thirty percent of committee members are women, and other members include: Grama Panchayat members of the respective villages, members of WUAs, BUGs and representatives from SHGs and landless group selected from Grama Sabhas for these committees. These committees are to act as an umbrella organization at village level to address all the bio-energy related policy issues and also to implement and manage bioenergy related programmes.

    It was reported that 97 % of households have been covered under this institution. Through discussions during the field visit the evaluators found the VBEMCs at Korottegare, Dasarhalli and Tumkur to be active and well enabled for the task in hand.

    Village Forest Committees (VFC): The VFCs aim "For sustainable biomass production, supply and management of forest resources". VFCs have the primary task of afforestation of village common land, raising of seedlings in Decentralised Nurseries (DCN) and implementation of Tree Based Forestry activities with peoples' active participation.

    It was reported that 26 VFCs have been formed for 28 project villages in addition to strengthening of 6 existing VFCs. It was also understood that 100% of households have been enrolled as members of VFCs in the project villages. Households are charged Rs.10.- as a monthly membership fee. The president is elected from the members of VFC. An Executive Committee is formed with about 12

members. Member secretary is from the forest department. Seedlings are raised by the VFC on hired land.

The formation/strengthening of VFCs appear to be progressing well.

Water Users Association (WUA): WUAs support the management of community irrigation systems. Twenty six groups have so far been formed.

Farmers in the project area mostly grow rain-fed crops like ragi, jowar, with some small pockets irrigated from bore wells. One of the activities of the project has been to facilitate establishment of community irrigation system as an income generation activity. Bore wells have been dug in the area, presently energized with grid power supply, which it is intended will ultimately will get power from the village biomass gasifiers. International Development Enterprises (India) Ltd., a reputed NGO has been working for designing appropriate micro-irrigation systems for each farmer and prepare relevant cropping and irrigation plan. Through this, cultivation has been ensured round the year. Saving in water use understood to be of the order of about 50%.Where,with rain fed one crop is to taken ,now 3 to 4 crops are being taken. On field enquiries, the evaluators understand that 40 households were addressed in the first phase and the enhancement in income generation was of the order of about Rs.20,000 per season.

WUA has been found to be functioning very effectively.

Biogas Users Groups (BUG): BUGs have been created for the management of community biogas plants.

The BUGs seem to be working very effectively on participatory mode.

Self Help Groups (SHG): SHGs of women members have been formed as one of the key strategies of the project for ensuring empowerment. The project seems to have helped to enhance the total number of SHGs from baseline figure of 68 SHGs (1048 members) to 144 (2182 members) with coverage of almost 73% households.

Figure 4: Women's Decentralized Nursery Self-Help Group

69. Overall, the Community Based Organisations established and strengthened have created a high level of awareness and active participation could be observed. SHGs were found to be extremely active in Decentralised Nursery activities. VBEMCs,VFCs,WUAs,BUGs were all found to be fully aware of their roles and responsibilities and seemed enthusiastic in discharging their duties. the cluster NGOs were found to be fully aware of the task they have in hand and seem to be discharging the those in a committed manner.

70. At the PMU level, there is a dedicated Project officer for Community Extention programmes who effectively coordinates the various Community Based Organisations indicated above directly and through the cluster NGOs.

71. No formal Management Information Systems Reports could be seen between the NGOs and the PMU but communication seems to be effective and total. The CBOs transact their business through periodic meetings as given below, facilitated by the identified NGOs:
    - SHG – Weekly meetings
    - WUA – Fortnightly meetings
    - BUG – Monthly meetings

- VFC – Monthly meetings
- VBEMC – Monthly meetings

72. From the discussions with the beneficiaries during the field visit it could be observed that the level of participation and ownership is very high among the stakeholders, namely residents of the project area, Forest officials, the CBO committee members, NGOs and Zilla Parishad officials.

73. Ownership and involvement by the cluster NGOs and Forest officials is highly commended.

74. Very little interaction was observed with policy and decision-markers at the MNES.

D. UNDP common rating system

75. The evaluators has attempted to make use of the UNDP common rating system. Evaluation of the status of objectives is based on subjective assessments, since quantifiable indicators were not given in the project document

76. Intermediate objective 1: To develop a decentralized bioenergy technology package for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply, and milling.

    ☐ Positive Change
    ☐ Negative Change
    ☑ Unchanged

    Explanatory notes: While progress is being made to commission biomass gasifiers in the field, and a number of biogas digesters are being used, technology packages for energy services have not been defined and approaches not standardized with a view to replication.

77. Outcome 2: To remove barriers to large-scale adoption and commercialisation of the bioenergy technology packages.

    ☐ Positive Change
    ☐ Negative Change
    ☑ Unchanged

    Explanatory notes: While significant activities of community mobilization, afforestation and capacity building are happening at a local level; barrier removal activities at a state or national level are yet to be implemented.

78. Rating sustainability: The rating system assesses the degree to which progress towards achieving the outcome appears to the evaluator to be sustainable, as follows:

    ☐ Sustainable (determined by evidence of local ownership of outcome and systems/institutions in place to carry forward progress in the outcome or cement gains)
    ☐ Unsustainable (determined by lack of ownership of outcome and systems/institutions in place to carry forward progress or cement gains)
    ☑ Too soon to tell or cannot be determined

    Explanatory notes: Local sustainability appears to be secured, but since the project aims at large-scale market transformation, sustainability at this level cannot yet be determined. The long-term national impact currently depends on whether financing models and commercial approaches for operating the gasifier systems depends on local successes in demonstrating these models and approaches.

79. Rating relevance: The rating system assesses the degree to which an outcome is relevant given a country's development situation and needs. Essentially, it tests the development hypothesis. The rating system is as follows:

    ☑ Yes (relevant)
    ☐ Somewhat (evidence is found that the outcome is somewhat relevant but perhaps not the best one for addressing the development situation per se)
    ☐ No (not relevant)

    Explanatory notes: Given the significant needs for energy services in rural areas of India, and a growing interest in sustainable energy service delivery models, the project is without doubt highly relevant.

80. Rating cost-effectiveness: The rating system assesses the degree to which the progress towards—or the achievement of—the outcome is cost-effective, given the financial resources and time invested in the outcome and the degree of change actually achieved, as follows:

    ☐ Yes (cost-effective)
    ☑ Somewhat (evidence is found that the outcome is somewhat cost-effective but could have been more so; evaluators should provide qualitative analysis of how)
    ☐ No (not cost-effective)

    Explanatory notes: While only a small portion of the budget has so far been used, there are already questions over whether the local ambitions for gasifiers and afforestation can be achieved. Market transformation activities have so far been largely overlooked, and financial resources will be required for those activities.

III. Recommendations

81. Workplan (baseline and rough plan) – perspective plan must be converted into a real workplan with budget, annual workplans and timelines. Quarterly, Monthly, and potentially Weekly schedules should also be evolved from an overall project schedule. This would help to ensure all Activity Components receive appropriate and timely attention. Project management tools and processes (possibly using Open Workbook (free) or Microsoft Project) could help facilitate this longer term planning and operational management. Project Steering Committee meetings should discuss the annual workplan within the context of the overall master project schedule. Reporting formats and frequency should be reviewed, with quarterly workplan updates prepared and communicated with UNDP and ICEF.

82. Changes should be made to the current implementation structure, and thought should be given in particular to the following issues:
    a) The PMU should be explicitly authorised to make budget decisions (reinforcing old decisions from the IT Power management guidelines)
    b) The project steering committee should become a real *steering* committee, and not attempt to micro-manage and carry out PMU functions
    c) The PMU should give more attention to strategic and national level issues
    d) A district level Project Unit (focusing on operational level issues) with a manager responsible for liaison with local government departments), an extension officer, agriculture / forestry, technical issues, and micro-credit / finance

    An alternative project implementation structure is shown in Figure 5 below:

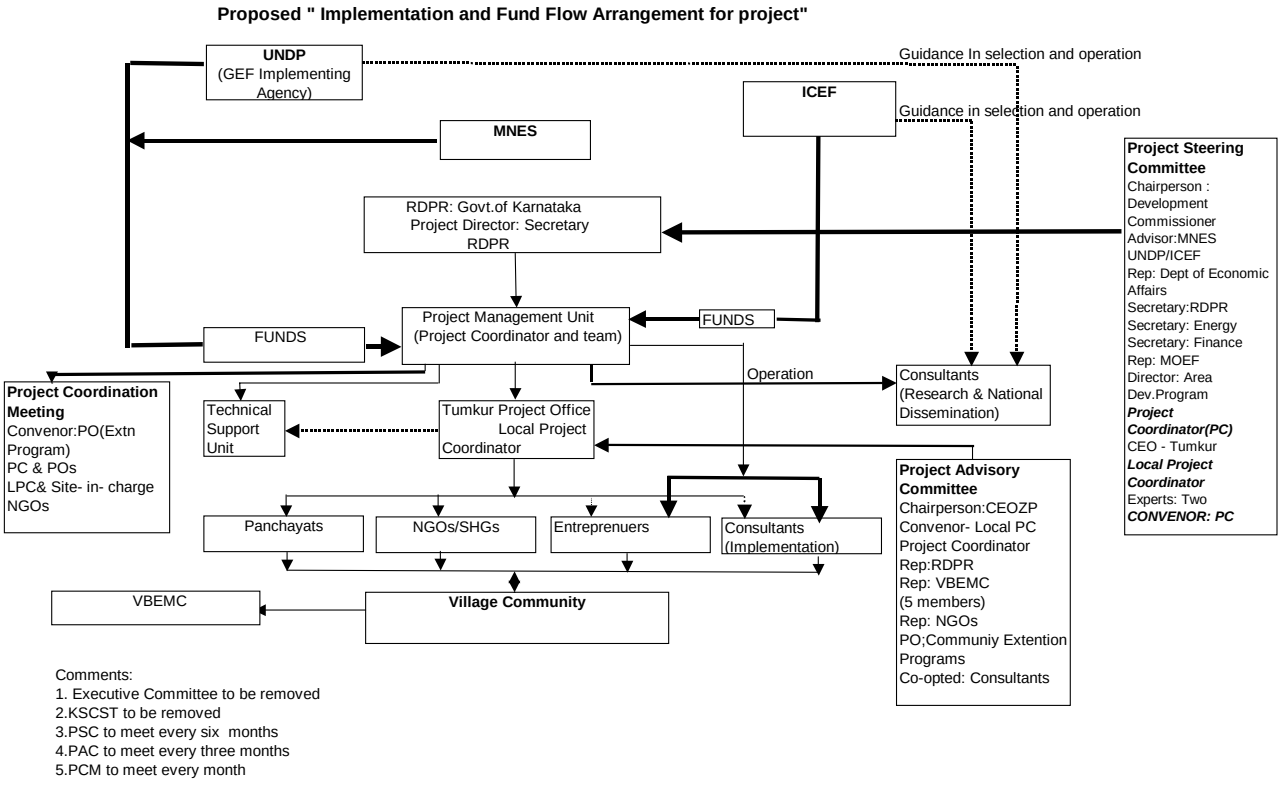


Figure 5: Alternative project implementation structure

Direct funding of some contractors by the UNDP or ICEF may facilitate quick turnaround. A Technical Support Unit may not be required.

83. The planned leaf litter biogas systems, which are clearly still in an R&D stage, should either be abandoned within the project or removed from the direct focus of the Project Management Unit at this stage. It would potentially be handled as an R&D project (by the new "TSU") or contracted, guided and monitored directly by UNDP/ICEF especially for future needs as lot of technical grounds seem to have been covered by TIDE.

84. The afforestation activities have been highly successful. The PMU should now plan to remove entirely the capital subsidies provided by the project, aiming to find other supporters or put afforestation on a full cost-recovery basis. There can be no further justification of project subsidies on afforestation activities.

85. The PMU should also make efforts to remove the capital subsidy on the biogas plants, identifying other funding sources, and give loans rather than capital grants.

86. For forestry and biogas activities the PMU should limit expenses to that originally budgeted, and preferably make remaining funding available through a revolving fund mechanism ensuring cost recovery.

87. Capacity building, enabling activity, information dissemination, financing happens at two levels: Tumkur demo and proof of concept and National Level. PMU needs a co-ordinator for the national level activities and should also appoint a contractor, which provides all these 4 at a national level. A national level subcontractor should be taken on by the PMU to take on national level activity components together with the PMU, in particular focusing on activity components on financing, enabling market, and information dissemination. This contract could be directly executed by UNDP or ICEF.

88. Information dissemination of reports should be made through the project website (an executive summary at least).

89. Efforts to secure the contribution from MNES: already biogas plants are no longer supported by MNES (subsidy has been removed). The MNES subsidy level is not clear year by year (currently 15 laks per $100kW_{el}$ gasifier).

90. Attention should be given to the structure for the investment risk or revolving fund as soon as possible so that costs can be recovered from the investment in gasifiers, biogas digesters and afforestry.

91. As has been discussed earlier, so as to maximize project benefits and achieve better chances of long-term local and national sustainability and replication, and the possible achievement of the wider GEF aims of market transformation and demonstration of cost-recovery approaches to rural energization, an extension of the project is highly recommended. From the evaluators' point of view the longer the project can be extended the better: there are clearly very important local benefits to the project, and the project is demonstrating a unique and highly effective approach which would have wide application in India and world wide, and it would be a pity to cut the project short before the financing models can be further tried and tested, and replication activities implemented. UNDP and ICEF should make every effort to extend the project for as long as they can. At the same time, the project team needs to make every effort to implement project components which have so far been postponed immediately and with urgency, in particular those relating to national replication and local sustainability / cost recovery.

    At the least, an extension for one extra year (until March 2007) is recommended.

IV. Lessons Learned

92. The project has demonstrated the significant benefits of pursuing an integrated approach to rural energy where bioenergy issues are brought together with community owned afforestation, income generation activities (in particular irrigation), agriculture development including vermin-composting, vermin-wash and biogas, and rain water harvesting. The synergies from effective co-operation on all these issues which is apparent at a grass roots level in the project area demonstrates how all these factors are intertwined and best tackled by stakeholders co-operating

93. In spite of the project area being within fairly easy reach of a major city and on good roads, both the gasifier technology supplier and the leaf litter biogas supplier reported difficulties in communication (mobile networks not working), accommodation, water and other rural challenges. The translation of technologies from an urban setting to a rural one should not be underestimated and infrastructure constraints should be included in planning.

94. Most GEF projects have both a local field component and a national ambition focused on market transformation. This causes tension between the need to show success on the ground and to act to remove barriers on a national level. When there are significant delays in delivery at a local level, then threatens the national barrier removal process. While all project risks clearly cannot be removed, a strategy that seeks to spread the risk and ensure quick delivery of local outputs is desirable. A project co-ordinator needs to juggle local and national priorities and ensure that both remain compatible.

95. Results Based Management needs clearly and well defined targets given in *indicators* that convey the Quality, Quantity and Time aspects. Without such indicators it is remarkably difficult to maintain perspective of how much progress is being made, and how much more is required. Both *output and input based budgets and budgeting* is required to allow strategic management decisions to be made based on the available funds and the desired outputs. Finally, overall planning which does not take into account a master workplan and budget, and does not then breaks this down into annual, quarterly, monthly and perhaps weekly workplans, results in a loss of the 'bigger picture' and strategic decision-making. While extensive efforts were being made to resolve the delay in the delivery of the first gasifiers, for example, it is possible that a review of the overall plan would have made it clear that this element was part of the critical path of the project, and that emergency measures were needed to solve this issue, or at least move ahead with other gasifiers and other suppliers. While it is admittedly easier to look back at the delays and state that this delay should have been overcome, it cannot be denied that if the PMU and steering committee had focused on the bigger picture, alternative measures would have been adopted earlier.

96. Community mobilization has been one of the major successes of the project so far. The approaches used to community mobilization by the PMU staff and the cluster NGOs deserves to be documented and best practice distilled so that it can be passed on to other projects.

97. The excellent co-operation with the local Forestry Department was notable, and together with highly effective efforts from the PMU staff and the cluster NGOs shows the benefits of co-operation between extension officers from different disciplines and public private partnerships. This has been highly commendable.

Appendix 1: Terms of Reference

Bio Energy for Rural India
BERI
TERMS OF REFERENCE
Mid-term evaluation

1. Introduction
The project is supported by GEF (through UNDP), ICEF, MNES and Government of Karnataka (GoK). The Department of Panchayati Raj and Rural Development, GoK is the executing agency, and the PMU, BERI in KSCST is implementing the project.

Project goal: The project goal is to develop, implement, demonstrate and disseminate a Bioenergy package to meet all the rural energy needs in a sustainable and participatory way to promote rural development.

Project purpose and objectives:

The project purpose is: "Field demonstration of Bioenergy system and development of financial and institutional arrangement for large-scale spread of Bioenergy concept". The objectives are:

i) To demonstrate the technical and financial feasibility of Bioenergy technology package on a significant scale
ii) To develop institutional mechanisms for facilitating implementation and management of the Bioenergy and end-use package on a sustainable way in the selected project cluster of villages
iii) To develop information packages on Bioenergy technologies, approach, methodology, for planning, implementation, operation, maintenance and management of the systems.
iv) To develop implementation mechanisms for facilitating large-scale replication of the 'Bioenergy systems' model,

The project aims at meeting the entire energy needs of 24 villages in the project area (Tumkur district, Karnataka state) in a sustainable and participatory way to improve the quality of life of the people in the project areas. Use of Bioenergy provides both local and global environmental benefits and the aim of the project is to assess the impact of large-scale adoption of Bioenergy systems in the country. The project also aims at conserving the biomass (fuel wood, crop residue and animal dung) currently burnt in a less efficient way in rural areas. The Bioenergy options will reduce the dependence of rural population on fossil fuels and fossil fuel electricity.

The project commenced in April 2001, and would end in March 2006.

The mid-term assessment is being planned to be carried out jointly by ICEF and UNDP. The assessment would have four components:

i) to evaluate results achieved till date;
ii) to provide changes in directions of the project, if required, and the justification for the same;
iii) to document lessons learned
iv) suggestions for the remaining project period

In accordance with UNDP/GEF and ICEF policies and procedures, all projects should undergo an interim assessment mid way during the course of the project. The assessment is intended to determine the relevance, performance and success of the project. The assessment looks at early signs of potential outcomes and sustainability of results, including the contribution to capacity development and the achievement of local and global environmental goals. The assessment is also expected to identify, document lessons learnt and make recommendations that might improve design and implementation of other ICEF and UNDP/GEF projects.

2. Objectives of the Evaluation

In accordance with the UNDP, ICEF and GEF M&E policies and requirements, the mid term evaluation of the project would be undertaken with the concurrence of the Government of India having the following objectives:

- To evaluate the overall relevance, performance and success of the project
- To assess impact of the project and draw lessons for future project and program formulations with the UNDP and GEF, as well as other internal and external partners.

In this section, the answers to the following questions must be clearly stated:

- Who initiated the evaluation?
- Why is the evaluation being undertaken?
- What will the evaluation try to accomplish?
- Who are the main stakeholders of the evaluation?
- What is the purpose of this evaluation?

3. Products expected from the Evaluation

The evaluation team would submit the following upon successful evaluation of the project:

1. The methodology for evaluation prior to commencement of the actual evaluation.
2. Draft Evaluation Report for review by partners, ICEF/UNDP and others as may be necessary
3. Presentation of the findings to the relevant authorities (MOEF)
4. Final Evaluation Report

4. Methodology or evaluation approach

The methodology that will be used by the evaluation team should be presented in detail in inception report. It may include information on:

- Documentation review (desk study); the list of documentation to be reviewed should be included as an Annex to the TORs
- Interviews
- Field visits
- Questionnaires
- Participatory techniques and other approaches for the gathering and analysis of data.

5. Evaluation Team

The assessment team would comprise two national experts who would have relevant background and experience in technical, financial and social aspects of renewable energy projects with special emphasis on gasifiers, community processes and off-grid electricity and energy supplies.

The team leader would be a person who has extensive background and experience in social and community processes, and has been extensively involved in working with communities to plan, design and implement renewable energy projects. The team leader would also have relevant experience and grasp and understanding of financial and economic aspects of renewable energy, and supply of energy.

The second person would have a strong grounding in technologies of renewable energy, and in particular biomass gasifiers or related technologies, and is very familiar with the issues relating to technology, and commercialization of technologies in the field of renewable energy.

Expected qualifications: Post graduate degree in a relevant field, and over 10 years of relevant work experience at national and international levels in project planning, design, implementation, reviews and assessment relating to renewable energy projects.

6. Implementation arrangements

ICEF/UNDP will be the main operational point for the evaluation and will be responsible for liaising with the project team to set up the stakeholder interviews, arrange the field visits, co-ordinate with the central and state government agencies and other institutions with who the consultants are expected to meet during the course of the assessment.

ICEF/UNDP and GoI will receive a draft of the assessment report and provide comments on the same prior to its finalization.

Each consultant is expected to allocate about 20 working days, which would include:

- Desk review – 3 days
- Briefings for evaluators – 1 day
- Visits to the field, interviews, questionnaires – 5 days
- Debriefings – 1 day
- Validation of preliminary findings with stakeholders through circulation of initial reports for comments, meetings, and other types of feedback mechanisms – 5 working days
- Preparation of final evaluation report as per the suggested outline - 5 days

7. Scope of the Evaluation

In the context of the BERI project, the evaluation team would:

1. Assess the project planning activities, and documentation-this will entail the details to which planning was undertaken, and institutions identified for the project.
2. Assess project implementation strategy for activities undertaken. This will entail an assessment of the networks established at local level and other stakeholders; an assessment of level of participation of and exchange of information between stakeholders concerned and the operational partners and an assessment of the level of capacity built in each activity towards project implementation.
3. Review processes undertaken to achieve the outputs, including procedures to be followed for administration, contracting, procurement etc. and also workshops conducted for training and the peer review of the various types of activities undertaken.
4. Review project outputs achieved as of the assessment, such as assets established, and their use, information packages, including communication, brochures, web site and data center and their level of dissemination.
5. Assess the utilization of resources (including human and financial) towards producing the targeted outputs such as inventory development, reducing uncertainties in inventory and vulnerability assessment.
6. Assess the gaps and additional resources required to improve outputs generated.
7. Review the factors that could affect sustainability of the energy supply systems, based on steps taken.
8. Assess the contributions of the project towards the relevant outcomes of the Strategic Results Framework/goals of Government of India, ICEF, the Global Environmental Facility and the United Nations Development Programme.
9. Assess the effectiveness of the assistance provided, in achieving the stated objectives an document the impacts of the process at large;
10. Recommend actions required, if any, for the design, implementation, for a better realization of project objectives.

Appendix 2: List of interviews

Name	**Dr. G. Sridhar.**
Designation	Fellow, ABETS
Company Name	Combustion, Gasification & Propulsion Laboratory Department of Aerospace Engineering, INDIAN INSTITUTE OF SCIENCE.
City	Bangalore.

Name	**Vishwanath Rao.**
Designation	Team Leader
Company Name	Srijan
City	Bangalore.

Name	**G. K. Darsharathi.**
Designation	Area Manager
Company Name	International Development Enterprises (India)
City	Tumkur.

Name	**C. S. Ramachandra (B.E.)**
Designation	Associate Project Officer (Energy)
Company Name	Biomass Energy for Rural India Project
City	Bangalore.

Name	**Ramachandra Rao K.**
Designation	Project Officer (Extension & Organisation)
Company Name	Biomass Energy for Rural India Project
City	Bangalore.

Name	**Dr. Arun Kumar.**
Designation	President-Business Initiatives
Company Name	Development Alternatives
City	New Delhi.

Name	**Dr. M. K. Surappa (Ph.D. (IISc)).**
Designation	Professor
Company Name	DEPARTMENT OF METALLURGY INDIAN INSTITUTE OF SCIENCE
City	Bangalore.

Name	**V. P. Baligar (IAS).**
Designation	Secretary to Government
Company Name	Rural Development & Panchayat Raj Department
City	Bangalore.

Name	**Vijayakumar Gogi (I.F.S.).**
Designation	Project Officer (Forestry)
Company Name	Biomass Energy for Rural India Project
City	Bangalore.

Name	**Subhash C. Khuntia (I.A.S.)**
Designation	Project Co-ordinator
Company Name	Biomass Energy for Rural India Project
City	Bangalore.

Name	**H. V. Sridhar.**
Designation	Fellow, ABETS
Company Name	Combustion Gasification & Propulsion Laboratory INDIAN INSTITUTE OF SCIENCE
City	Bangalore.

Name	**V. T. Sunil.**
Designation	Chief Operating Manager
Company Name	International Development Enterprises (India)
City	Bangalore.

Name	**T. S. Sivaswamy**
Designation	Managing Director
Company Name	Energreen Power Limited
City	Chennai.

Name	**K. Ramachandra**
Designation	Chief Engineer
Company Name	Netpro Renewable Energy (India) Pvt. Ltd.
City	Bangalore.

Name	**Aklavya Sharan.**
Designation	Chief Operating Officer
Company Name	Netpro Renewable Energy (India) Pvt. Ltd.
City	Bangalore

Name	**Dr. P. J. Paul.**
Designation	Professor
Company Name	Combustion, Gasification & Propulsion Laboratory Department of Aerospace Engineering INDIAN INSTITUTE OF SCIENCE
City	Bangalore.

Name	**K. S. Ningappa (K.A.S).**
Designation	Chief Executive Officer
Company Name	Zilla Panchayat
City	Tumkur.

Name	**H. R. Venkatesh.**
Designation	Sr. Engineer Power System Group
Company Name	Power Research & Development Consultant Private Limited
City	Bangalore.

Name	**A. E. Rajkumar**
Designation	Vice President
Company Name	ITCOT Consultancy and Services Ltd.
City	Chennai.

Name	**Dr. S. Dasappa**
Designation	
Company Name	Centre for Sustainable Technologies INDIAN INSTITUTE OF SCIENCE
City	Bangalore.

Appendix 3: List of Main Documentation Reviewed

UNDP-GEF-ICEF (March 2001) *Project Document: India – Biomass Energy for Rural India*, New Delhi, India

AF Ferguson Associates (June 2005) *Draft management audit report for the year 2004: Under the project titled India: Biomass Energy for Rural India, project number 13002*, New Delhi, India

AF Ferguson Associates (June 2005) *Draft management audit report for the financial years 2003-4 and 2004-5: Under the project titled India: Biomass Energy for Rural India (ICEF component), project number 13002*, New Delhi, India

Usha Rao & Sunil Arora (April 2005) *Biomass Energy for Rural India (IND/99/G32)*, in Susainable Environment and Energy Division publication of UNDP

Expressions of Interest from companies (May 2005) for *Carbon Monitoring in the BERI project villages in Tumkur district*

Power Research and Development Consultants Pvt. Ltd. (November 2002) *Report on Study and Determination of plant capacity, plant location, plant distribution mapping for proposed Biomass energy system of Kabbigere, Chikkannana halli and Chikkarasana halli villages*, Karnataka, India

UNIDO / IISc (December 2003) *Roundtable Meet on Biomass Gasification Technologies*, Bangalore, India (held 11-13 December 2003)

Steering committee meeting notes and minutes (numbers 2 to 7).

PMU (2005) *Write-up on the activities of the biomass energy for Rural India Project*

Symbiotec Research Associates (December 2004) *Review and planning workshop on Community mobilisation experiences for bioenergy systems and end-use management: Documentation of proceedings*

TCE Consulting Engineers Limited (March 2004) *Biomass based integrated gasification power plant at Kabbigere Village, Tovinakere Gram Panchayat, Tumkur District, Karnataka: Detailed project report*, Bangalore, India

PMU (June 2005) *BERI project Perspective Plan*

PRDC (May 2005) *Study and determination of plant capacity & location, developing efficient distribution network for proposed biomass energy system for cluster of 3 villages in Rangapura village panchayath & cluster of 2 villages in Kavandala village panchayath in Madhugiri taluk of Tumkur district*, Bangalore

Chanakya HN, Svati Bhogle, Arun RS (June 2005) Field experience with leaf little-based biogas plants, in *Energy for Sustainable Development*, volume IX, No 2., International Energy Initiative, India