

## FACSIMILE TRANSMISSION

**United Nations Development Programme**  
GLOBAL ENVIRONMENT FACILITY**To:** Mr Dilip Ahuja,  
GEF Secretariat**Date:** 1 December, 1995**Fax:** 202-522-3240**Pages:** 13**From:** John O'Brien,  
LINDR-GEF **Subject:** SuTra PDF-B Proposal

I understand you had trouble downloading the email version. Please find attached a copy of the revised PDF-B prepared by Dick Hosier. Please call Dick once you have had a chance to read and review. Many thanks.

**UNITED NATIONS DEVELOPMENT PROGRAMME  
GLOBAL ENVIRONMENTAL FACILITY  
PROJECT DOCUMENT FOR PDF FUNDING  
(BLOCK B)**

**Country:** India

**Project:** Biomass Energy for Rural India (SuTRA)

**Total Cost:** To be determined

**GEF Cost:** To be determined

**Co-Funding:** US\$2.35 million possible from the Government of India  
Additional co-funding TBD

**Requesting Agency:** UNDP

**Executing Agency:** UNOPS

**PDF Funding Requested:** US\$ 196,000

**Block A Grant Awarded:** Yes \_\_\_ No x

**SUMMARY PROJECT OBJECTIVES AND DESCRIPTION**

1. The overall objective of this project is to establish the viability of a bio-energy package for widespread adoption at the village level in India. This will not only further the development goals of rural India but also actively promote a low CO<sub>2</sub> path for development. This strategic approach will maximize the effectiveness of this project in assisting the government of India to fulfill its obligations under the United Nations Framework Convention on Climate Change. This project would form the basis for a bio-energy approach to rural energy development for Karnataka State initially, and eventually, elsewhere in India and other developing countries. After initial work on technology package development and barrier removal, it is expected that this will provide a replicable and sustainable model for CO<sub>2</sub> neutral, decentralized, rural electrification. It will thus fit into GEF Climate Change Operational Programme 2: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs. ✓

2. The long-term goal of the project is to assist The Centre for Application of Science and Technology to Rural Areas (ASTRA) to develop a technology package and approach to biomass-based rural electrification, so that this approach can be replicated throughout the state of Karnataka and elsewhere in India. However, there are a large number of barriers to the widespread replication of this approach. This PDF proposal is designed to define the barriers, identify which ones can be effectively overcome through a project, and then to prepare a project for GEF support which will address the most important of these barriers. Given the large number of barriers identified, it is likely that their complete elimination will require more than one project. The PDF activities will identify the best logical path to pursue to eventually overcome these barriers. ✓

3. Over the last 2 decades, ASTRA has acquired extensive experience and insights in undertaking R&D

and pilot dissemination on developing renewable energy technologies for rural areas. These results provide this project with a solid foundation for success. These results dictate that an **integrated rural energy approach** to development be chosen because past experience in India has concluded that this approach is essential to meeting the complex, system-wide energy needs of rural areas (Subramanian and Reddy, 1979; Planning Commission 1992). Earlier field programmes undertaken by ASTRA were isolated projects, largely to study the performance of a particular technology and to examine its acceptance among villagers. Work in recent years has led ASTRA to identify individual components which will work to meet the rural energy needs. However, the village-level implementation of this integrated package has not yet been undertaken, nor has its commercial viability been established. ASTRA has not yet attempted to optimize the size or scale of power generation systems and support services.

4. The selected bioenergy package consists of the installation of small-scale dispersed power generation through biomass gasifiers, agro-residue based biogas plants (augmenting dung shortage) to supply cooking gas, and the establishment of sustainable mixed tree cover to meet partial requirements for bioenergy and to sequester carbon.

5. The project is intended to assist ASTRA in establishing and demonstrating the commercial viability of bioenergy packages in the semi-arid south of Karnataka State. The proposed technology package and ASTRA's experience in demonstrating the package is elaborated upon in Annex 1.

#### DESCRIPTION OF PROPOSED PDF ACTIVITIES

6. The project falls directly within **Operational Programme #2** of the GEF Climate Change Operational strategy. It is intended to identify the hurdles to the widespread dissemination of the decentralized biomass-based electrification packages discussed and then to systematically undertake projects to remove them. In the process, the project(s) designed as part of this PDF will serve as a "proof of concept" for the selected package that will allow for its widespread adoption. Specifically, the PDF activity will:

- identify the barriers to the cost-effective implementation of bioenergy projects in Karnataka state and throughout India;
- estimate the scope for win/win bioenergy projects in India that are not being implemented due to the existence of barriers;
- estimate the potential contribution of these bioenergy projects to the mitigation of greenhouse gases;
- analyse specific measures to reduce these barriers;
- estimate the transactions costs of such removal;
- identify a project or set of projects which will lead to the permanent removal of these barriers and the ability of the approach to disseminate itself;
- demonstrate the sustainability of win/win bioenergy projects after GEF support has ended (following both barrier and cost reduction), including demonstrations of cost recovery;
- estimate the overall financial requirements and time horizon; and

- show how the programmatic benefits will be monitored and the subprogram evaluated.

7. Preliminary work on this project has led to the identification of the following list of barriers to the successful replication of the bioenergy packages. This preliminary list is contained in the following box. Given the large number of these barriers, it is unlikely that any single project will lead to the removal of all of them. Therefore, it is likely that a programme which leads systematically through the gradual elimination of the barriers finally identified will come out of this PDF activity.

**Preliminary List of Barriers:**

- bioenergy technology packages are not currently commercially produced;
- limited manufacturing base for bioenergy packages given limited effective demand;
- lack of significant field demonstration of integrated biomass-based rural energy systems;
- limited ability of the village community to manage the biomass energy programmes;
- limited ability to pay for the energy services for commercial viability;
- limited financing avenues to support widespread dissemination of rural energy systems;
- limited involvement of entrepreneurs in producing bioenergy systems for rural applications;
- financial viability not yet established on a significant scale;
- absence of strong political support on behalf of government bodies; and
- trained manpower to plan, implement and monitor bioenergy packages do not exist.

8. The PDF-B will assess the magnitude and prioritize the role of each of these barriers in preventing the spread of bioenergy in Karnataka State. This assessment will form part of the strategy for financial sustainability. On a preliminary basis, the approaches included in the following box appear to be potential ways to overcome some of these barriers. The purpose of the PDF activity will be evaluate the feasibility of these and other initiatives to overcome the identified barriers through a project or projects. It is unlikely that all barriers can be overcome through a project and even if all barriers can be addressed through project activities, it is likely that a series of projects will be necessary to overcome all hurdles.

**Preliminary List of Measures to Overcome The Identified Barriers:**

- the involvement of engineers, firms, and community members in design of CO<sub>2</sub>-neutral bioenergy packages for rural areas;
- the piloting and demonstration of bioenergy packages;
- the field demonstration of integrated biomass energy systems to convince manufacturers that the proposed systems can work in a fiscally sustainable manner;
- the establishment of village institutions with the capacity to manage and maintain the biomass energy systems (through Village Development Institutions (VDI's));
- the strengthening of financial agencies to not only demonstrate importance of rural energy but also to develop financial tools to enable them to finance rural energy initiatives;
- the provision of lines of credit and financial capabilities for either village institutions or manufacturers;
- the education of policy makers and entrepreneurs on the technical and financial viability of the integrated biomass approach; and
- the development of a viable and visible field demonstration of integrated biomass energy systems to form the basis for an integrated biomass energy package that can be replicated throughout India and provide lessons for GEF bioenergy projects.

9. The assessment of how to best overcome these barriers will be developed into a strategy to ensure financial sustainability of the project beyond its lifetime. The analysis will include an assessment of consumer acceptance of the proposed package.

10. Although the project has elements appearing to be consistent with **Operational Programme #3 - Low GHG-Emitting Technologies**, it has been decided that it fits more closely under **Operational Programme #2: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs**. Although some limited cost reduction will be achieved, most of the efforts will focus on removing transactions barriers to the widespread adoption of the package.

11. Project preparation to date has been funded by ASTRA using its own resources. The project concept was identified at the GEF Programming Workshop (New Delhi, April 1994) as potentially a strong candidate for GEF support. The project concept was then circulated widely among experts in the field of biomass technologies and discussed with representatives of the Government Ministries (NABARD, MNES, UNDP technical advisors, GEF Secretariat, and STAP) and on this basis a draft project brief was prepared (attached). The proposed PDF grant for this project will allow ASTRA to (i) complete project preparation (including draft methodological outline) for IA approval (ii) secure appropriate buy-in from industry, policy-makers and other co-financiers, and (iii) prepare a project document to carry out the proposed project.

12. The specific activities to be funded under the PDF grant are as follows:

• **Linkages with Private Sector, Policy Analysis, and Strategy for Financial Sustainability:** This activity will involve the assembly of a Project Design Steering Committee with representativeness of ASTRA, village representatives, the interested business community, the financial community, the Ministry of Non-Conventional Energy Resources; Karnataka State Electric Utility; and over interested stakeholders. Linkages with the government, entrepreneurs, and the banking sector would be strengthened. This activity would also involve examining the policy, administrative, and legal hurdles in Karnataka State to the commercialization of a low CO2 path (as proposed by this project) and identifying possible solutions. The main outputs of this activity will be the development of a strategy to ensure the financial sustainability which will include a full consumer acceptance assessment of the proposed integrated package.

• **Establishment of criteria for selection and number of participating villages:** This activity will involve reaching agreement with the Karnataka State Authorities and MNES on the suitable candidate villages for the demonstration identified on the basis of criteria for selection determined by ASTRA, in close consultation with the village community. The activity will also involve determining the most appropriate number of villages for the project for GEF incremental funding. The number of villages will be determined on the basis of (i) most appropriate number to meet GEF objectives of reducing barriers and reducing technology costs (ii) capacity of ASTRA (iii) cost-effectiveness. The exact number of villages for the project will be selected only after the financial sustainability and consumer acceptance surveys have been fully completed.

*Pre-machine ?*

• **Establishment of Village Development Committee's (VDI) in Selected Villages:** This activity will involve developing methodology and criteria and then selecting Village Development Committee's (VDI's) to oversee and manage the system in each village. While in some cases suitable local agencies may exist in other cases they do not. Where they do not exist they will be established as part of this activity. The principle goal of this exercise is to develop a replicable methodology for establishing local village units that are able to manage the systems both technically and financially.

• **Village Surveys** This activity will involve developing a methodology for village needs assessment and documenting for each of the villages the typical load profile and generation requirements. Other issues to be considered include the following: locations for generation units, site suitability surveys, locations and arrangements for woodlots, including how the land will be obtained, locations and capacities for the biogas digesters for each village, and the real cost for each of the needed installations. The purpose of these surveys will be to lay the foundation for project implementation.

• **Equipment Package Design:** This activity will undertake pre-liminary work with manufacturers and the VDI of the various types of equipment to be utilized and to fine-tune the technology packages to be utilized to meet the specific requirements of the participating villages. The potential for future technology cost reductions will be estimated as part of this activity as well as the sustainability of win/win bioenergy projects of this type after GEF support has ended. A number of packages for supplying power to meet the required village loads will be designed as part of this activity.

• **Workshop Presenting Project Ideas :** This final activity to be carried out by ASTRA as part of the PDF activity will involve presenting at a regional workshop the project idea to policy-makers, financiers, village communities and the private sector with the aim of increasing and securing widespread interest and support for the adopted approach. The workshop will also involve consultations, agreement and the submission of a full scale project brief to UNDP/GEF for submission

to GEFOP. This will involve the estimation of incremental costs in an acceptable manner, consistent with the guidelines for the designated operational programme. A draft project document will also be prepared as part of this activity.

•**International Review Missions:** Due to the highly visible nature of this project, the PDF workplan and final project proposal will be evaluated by a team of international experts in the areas of biomass energy, GHG emission reduction, and rural energy. This will ensure that the recommendations of the project team are subject to rigorous peer review and are therefore deemed to be appropriate.

## **ELIGIBILITY**

13. The project eligible for funding under the proposed **Operational Programme #2 of the GEF Climate Change Operational Strategy** related to removing barriers to renewable energy, in this case, biomass. The bioenergy package that this project will demonstrate is fully consistent with IPCC findings related to the cost-effective options for mitigation of GHG emissions. The IPCC Second Assessment Report indicates that biomass power will have to be relied upon heavily in any scenario which successfully stabilizes GHG emissions. The IPCC scenarios include dramatically increased uses of biomass energy through both centralized and decentralized generation of power.

## **NATIONAL LEVEL SUPPORT**

14. Consultations between ASTRA and the Ministry of Non-Conventional Energy Sources (MNES) has resulted in an indication that significant baseline funding may be available for this project (up to US\$2.35 million). Additional baseline funding as appropriate will be identified as part of the PDF activity in conjunction with the determination of incremental costs.

15. This proposal is fully consistent with the 1993 National Environmental Action Plan of the Government of India which states that "It is imperative that importance is given to develop non-conventional or renewable sources of energy for sustaining the development process." A major thrust of this goal is therefore the promotion and dissemination of viable technologies throughout India. The proposal is also consistent with UNDP's concept of sustainable human development in that it will meet rural energy needs in a sustainable way for a selected cluster of villages.

## **JUSTIFICATION FOR PDF GRANT**

16. A PDF grant is necessary to undertake activities related to ensure that (an) strong GEF proposal is prepared which is fully consistent with the GEF operational strategy for climate change. PDF money is necessary to identify fully the barriers; analyse how they can best be removed; undertake surveys; obtain the involvement of the private sector and government; and determine financial sustainability and consumer acceptance. It will also ensure that a large number of stakeholders are consulted and included in the project and that their feedback is incorporated into the project's design. The institutional arrangements for the larger project will need to be clarified through the PDF work. In other words, the development of the full project will be guided and determined by the outcome of these activities.

17. Given its promotion of what are potentially self-sustaining practices this project has the potential to significantly assist the Government of India in fulfilling its obligations under Article 4 of the Framework Convention on Climate Change of stabilizing GHG emissions. The proposed project concept based upon biomass energy has been recognised as an attractive climate change mitigation option by several studies,

including the IPCC report which identifies biomass as having a large impact to mitigate greenhouse gas emissions. As has already been indicated, the extensive work already undertaken by ASTRA points to this approach as having the greatest potential to meet growing rural energy needs through a low carbon path.

18. Unless the suggested package is demonstrated to be commercially viable it is clear that the Government of India could not reasonably be expected to undertake any of the activities outlined in this proposal of its own accord. In other words, without GEF support none of the activities outline in this PDF Block B grant would take place. However, over the longer term once the suggested packages is shown to be financially viable then commercial banks can be expected to be involved in providing loans and financing expansion of existing programmes. In this way the proposal can be seen as laying the foundation for setting in motion a self-sustaining process with much greater global and national benefits than those that would arise from just the project itself.

#### **Special Features:**

18. The most innovative part of the proposal is its attempt to find capital resources to propagate the low CO<sub>2</sub> path by the very process of propagation itself. The project aims at developing the capital surplus from the very same areas by providing a package of technologies which can increase the productivity of their land, and manpower and increase collection of solar energy by photosynthesis and fix carbon for mitigating the global warming problem. The package is undoubtedly unique and is first of its kind opening up a promise that the stress of global warming could be mitigated using available local resources in countries like India.



**BUDGET**

19. The total proposed budget for the PDF activity is US\$196,000. It is broken down in the following table.

Category:	Total Cost:
1. Local Experts	40,000
2. International Travel	43,200
3. Domestic Travel	3,000
4. International Experts, International Activities	45,300
5. Financial Sustainability Strategy Report	5,000
6. Seminars and Project Workshop	30,000
7. Project Brief and Project Document Preparation	15,000
Sub-Total:	181,500
8. Project Support Services (Including Executing Agency Support Costs) (8%)	14,500
Total PDF-B Request:	196,000
ASTRA Contribution	50,000
Total Cost:	\$246,000

*Too much*

**PDF OUTPUTS**

20. **PDF Outputs** will be as follows: (a) establishment of criteria and methodology for selecting villages and constructing VDIs (b) strategy to ensure financial sustainability and develop private sector linkages including full assessment of consumer acceptance at the village level (c) selection of exact number of villages (d) development of methodology village for surveys and pre-liminary surveys for the participating villages, (e) Finalized Project Brief including full incremental cost analysis, (e) completed equipment package design, (f) establishment of Project Design Steering Committee, and (g) completion of draft UNDP project document

**EXPECTED DATE OF PREPARATION COMPLETION**

21. August 1996.

## ANNEX 1 - EXPERIENCE OF ASTRA IN DISSEMINATING RENEWABLE ENERGY TECHNOLOGIES IN RURAL INDIA

This project will draw upon the vast field experience gained over 20 years in disseminating rural energy technologies in Karnataka State:

- \* Continuous field testing of biomass energy technologies, backed by in-house R&D, has systematically improved the quality and durability of component devices and steadily made them increasingly user friendly. Successful demonstration in villages of the target area has built up confidence among potential users and created a demand.
- \* From the past experience it is clear that setting up a village level body, VDI before all physical activities and involving it at all stages, weaving an "all-win or all lose" situation, enhances participation, local control and commitment to success and overcomes social hurdles.
- \* Energy utilities, domestic water and lighting, capture womens' support providing a vital entry point which ensures stability, sustainability and commitment amongst other direct benefits to users. The REWSUs at Pura and other villages have worked continuously for eight years.
- \* Assured energy for agriculture overcomes vagaries of monsoons, reduces farm risks and enhances employment, income and mens' participation, provides high stake against project failure, justifies peoples efforts, etc.
- \* Empowering the local community through the VDI reduces inequitable use, ensures local control, better revenue and system management, provides pride and status indices and ensures a high degree of sustainability.

These five elements, appropriately strung together, has been the formula for past success in this area which will be incorporated into this proposal on a local, regional, national and global perspective. The area taken up for investigation arose from extensive discussions with a small number of villages around the ASTRA's extension centre. In this region the biomass gasification work was initiated to provide minimal power for agricultural water pumping in case of an energy crisis (villages of Pallerayanahalli and Hosahalli). Biogas technologies were initially deployed to provide basic services like domestic lighting and drinking water supply (five villages). A village development institution (VDI, one per village comprising of village people, >30% women) handles the day to day management. All these projects have been set up, operated and managed with inputs from individual users as well as the village development societies. The continued satisfactory functioning of such village level bodies, in various villages, for over 8 years bears adequate testimony to success of these projects and people's participation at all stages of such projects.

The experiences of ASTRA have been shared and discussed with a number of NGOs, policy makers, administrators and UN agencies. A large number of articles have been published in technical and semi-technical literature and two books discuss in detail the approaches and technologies of ASTRA. The centre has organized numerous seminars, workshops and training programs. It has hosted a UNCHS discussion meeting on Biomass Energy for Sustainable Development. Its accomplishments have resulted in attracting the "Bio-resources-94" - an international conference to Bangalore in October 94 (attended by about 100 delegates from outside India). Thus NGOs and local communities have been extensively

consulted and substantively involved in project identification, design and development of approaches.

The power supply to rural areas is characterized by a high cost of transmission, high transmission and distribution losses due to low loads, poor and unreliable supply, and erratic voltages. Studies on rural energy in India have all strongly advocated promoting and developing decentralized energy systems due to low and fluctuating loads and dispersed locations.

**PROPOSED TECHNOLOGY PACKAGE** Wood gasification work began at ASTRA in the 1980s with the intention of fueling existing diesel engine pupsets in the field used for water lifting. The objective arose from the 1970s oil crisis. After 5 years of R&D a gasifier design evolved which was completely different from the conventional design of a wood gasifier. The design consisted of an open top with an air nozzle which provided for a better environment for the gases to pass and thus crack the tar. Initial funding for this work was provided for by the Karnataka State Council for Science and Technology. Subsequently, MNES funded the testing of approximately 500 of these gasifiers in the field with a subsidy which was progressively reduced (from 100 percent to 90 percent to 80 percent) During this period, technological improvements were carried out on the systems related to reliability and user friendliness and bugs in the system.

## **ANNEX 2 - ALTERNATIVES CONSIDERED BY ASTRA TO THE BIOMASS ROUTE**

Many alternatives were considered in the first decade of ASTRA (wind, solar, pedal and animal power, engines with alcohol and vegetable oils as alternatives to provide shaft power: pozzalona making, processing of sisal leaves and oil seeds, building improved wood stoves etc. as a low carbon path options integrated to employment generation: forestry, farm ponds, water lifting as resource generation activities). This is not an assured wind resource region and wind power harvest clashes with tree biomass cover - detrimental to this project. Solar photovoltaics are not economic as of now (\$1 compared to 0.084 /kWh for bioenergy). Thus these have been set aside in favour of the proposed focus in this project for several other reasons also.

- biomass resources are already being generated with available skills, manpower and resources making low CO<sub>2</sub> biomass energy options most apt for this region,
- biomass based power integrates well with existing land use pattern, people's occupations, local values and traditions, etc.,
- village level management and sustainability and outputs from such energy systems in the form of local and global benefits are highest from a biomass based option.

### **ANNEX 3 - REVISIONS TO EARLIER VERION OF PDF**

The revised proposal clear places the project under both Operational Programme #2 and Operational Programme #3 of the revised GEF operational strategy and makes it clear that the proposal is aimed at both "reducing barriers" and "reducing technology costs." It also:

- provides significant additional information on the barriers that the project will aim to reduce and how it will aim to reduce.
- explains that part of the PDF activity will be to determine the most appropriate number of villages for support (and does not pre-suppose 15 villages as was earlier the case). The final number of villages will only be determined following the completion of the strategy for (i) financial sustainability and (ii) consumer acceptance.
- provides more information of the proposed technology package that the project will adopt (annex 1)
- includes much more emphasis on the development of a strategy for (i) financial sustainability and (ii) consumer acceptance as part of the PDF activity. This strategy will now be moved forward to take place at the start of the PDF and will be used as a basis for selecting the most appropriate number of villages.
- makes it absolutely clear that GEF funding will be for "incremental" and not "baseline costs" and that the full project will only be prepared with the appropriate amount of baseline funding.f