

\Proposal Log No. (to be generated by ESMAP):

Please check whether this is supplemental request of an on-going or completed project: No

I. Basic Information

Region:	South Asia	Country:	Bangladesh
Theme:	<input type="checkbox"/> Sector reform and restructuring	<input checked="" type="checkbox"/> Renewable energy	<input checked="" type="checkbox"/> Energy and the environment
<input checked="" type="checkbox"/> Access:	rural and periurban energy	<input checked="" type="checkbox"/> Energy efficiency	<input type="checkbox"/> International energy trade
Title of Proposed Activity:	Bangladesh: Towards Formulating a Rural Energy Strategy		
Proposed Project Manager:	Douglas F. Barnes	Organizational Unit:	SASEG

II. Background & Introduction

Introduction - Traditional fuels account for 99% of the energy consumed in rural Bangladeshi households. About 15% - 16% of the population have now access to electricity, and this is projected to increase to 22% by the year 2010 in a business as usual scenario. Some 23,000 villages out of a total of 86,000 are connected to the electricity network. A total of about 13 million rural households are still using 19th century fuels at the dawn of the 21st century. Some households have started to use their own resources to improve the situation: according to a recent market survey for solar home systems (SHS) estimated that 3% of the rural households (650,000) are likely to use car batteries for running their televisions, radios, and some lights. They regularly have to bring these batteries to town for charging. This lack of better access to modern energy comes at a very high cost -- in human terms, traditional fuel collection and use falls mostly to women, depriving them of development opportunities and exposing them and their families to unhealthy indoor environments -- in economic terms, modern energy is a key ingredient for rural development -- and in environmental terms, unsustainable use of traditional fuels increases the pressure on already stressed forest resources which, in Bangladesh, are dwindling at an alarming rate.

Approximately 300,000 rural households were electrified in 1998. At this rate, electrification will not keep up even with population growth. At double this rate, it would take 20-25 years to achieve 50% electrification. Even then, it should be noted that electrified households still use traditional fuels for cooking, so rural electrification alone will not completely address pressing rural energy issues. There are other rural energy issues and options which have not been adequately considered for Bangladesh. These include off-grid electrification options, LPG for cooking, and increased stove efficiency. While some donors have supported initiatives in these areas, these have been implemented in the absence of an overall strategy, muting their long-term effectiveness. Moreover, there are several studies with conflicting figures and methodologies on rural energy, resulting in lack of clarity in the rural energy picture. Therefore, there is a strong need for a coherent, coordinated, and analytically sound GOB rural energy strategy.

Objective of ESMAP Activity - The specific objective of the proposed activity is to assist GOB in formulating a rural energy strategy aiming at increasing accessibility to affordable modern energy for its rural population.

Beneficiaries - This project will ultimately benefit most rural Bangladeshi households and industries that currently lack access to modern energy.

Background - Consistent with the *1998 Country Assistance Strategy for Bangladesh*, an important objective of the GOB is to devise strategies to expand the use of commercial and renewable energy in rural areas. In addition, it complements the work anticipated under the Power Sector APL (rural electrification component).

The challenge of providing basic necessities in a densely populated poor country (GNP per capita US \$260) like Bangladesh is complicated by the reality of its large population base. The pressing needs for the majority of 127 million Bangladeshis include: food, shelter, clothing, and health services. These needs are most severe in rural areas where 93% of the very poor live (WB 1998 a). According to the draft *Renewable Energy Policy* (Power Cell, March 1999), the rural areas are characterized by, "an abundance of open and disguised unemployment, high man-land ratio, alarmingly large numbers of landless farmers, extremely inadequate economic and social facilities, low standards of living and a general environment of poverty and deprivation". Use of energy sources in rural areas are central to providing for basic needs. The 1998 Bangladesh Bureau of Statistics publication states that the percentage of monthly expenditure in fuel & lighting is 14% for the rural poorest in Bangladesh, whereas rural Bangladeshis with higher incomes spend 5% (a more reasonable figure in developing countries) of their monthly spending on fuel & lighting.

Therefore, the lowest income group consumes a larger share of their income on energy sacrificing other necessities.

According to a 1990 study, of the total energy consumption by end-use in rural Bangladesh, 66% of energy use was in cooking, 1% energy use was in lighting, 17% was in industry, 2% was in irrigation, and 14% was in chemical fertilizer (Islam 1993). Unfortunately, most of the available information on the overall rural energy situation in Bangladesh is somewhat backdated and dispersed. A previous ESMAP Energy Assessment of Bangladesh (Oct 1982) stated that, “there are at least 10 studies available from which sharply conflicting figures on rural energy can be derived.” However, previous works like the 1982 World Bank Study by Fernando R. Manibog, 1984 Case Study by Faber and Stolwijk, and the 1993 Bangladesh study on Rural Energy Systems by M. Nurul Islam provide a good starting point. FAO’s Regional Wood Energy Development Programme in Asia has more recent data on wood energy. A market study for solar PV applications was carried out in 1998 by the Bank, and two new studies are underway, one on delivery mechanisms for rural electrification (with emphases on solar electricity), and another on women and energy. These three studies will provide an input into the rural energy strategy.

In terms of electricity access, under the present circumstances electrification is provided through grid-supported conventional methods. The GOB does not have the resources to provide access to modern energy for a large segment of its population in the immediate future. The previously mentioned Solar Household System (SHS) surveys show that up to 5 million rural households could pay for solar PV market at current prices without subsidy. However, even if the existing market was supplied with SHS, it leaves 8 million households mostly dependent on traditional energy and kerosene for lighting. Private providers of electricity, using small diesel generators and ultra low-cost distribution grids supply electricity to many shops around market places, in both unelectrified and poorly served electrified rural areas.

Traditional energy sources consisting of fuelwood, agricultural residues, and dung dominate the primary energy production and supply in Bangladesh. Regarding the **supply** side: agricultural residues contributed to 76% of the total traditional energy production in 1992, a slight decrease from 78% in 1982 (FAO 1997). It is thought that the introduction of high yielding variety (HYV) types of crops with less residues restricted its growth. On the other hand, the share of fuelwood increased from 11% in 1982 to 15% in 1992, with far reaching consequences: studies using the latest remote sensing techniques have revealed that the ever green forest cover in Bangladesh decreased from 7% to 3% between 1985-86 and 1992-93 (FAO 1997). This finding supports an earlier projection (1984 case study by Faber and Stolwijk) that suggests that perhaps “the country’s biomass resources are being utilized to an extreme and possibly dangerous level.” However, such techniques do not detect trees along roadsides and fields, and these trees may supply a substantial part of the fuelwood supply.

Traditional energy also dominates the final energy **demand** in Bangladesh. Most of the traditional energy comes from “agricultural residues” which is considered to be at the lowest level of energy ladder. Within rural Bangladesh, the household sector consumed 84% of the total energy consumption in 1992. A staggering 99% of that energy came from traditional sources (74% agricultural residue, 18% dung & 8% firewood) (Islam 1993).

In terms of energy usage, the rural industry sector is an important but often overlooked sector. Like other developing countries, the industrial strategy in Bangladesh in its early years followed the path of promoting large scale industries. In the successive industrial policies, promotion of small and cottage industries has been given priority. It is estimated that the small and cottage industries contributed 4.5% of the national GDP, and accounted for 78% of the total industrial labor force (Planning Commission, 1990). However, no separate data on the use of fuels by rural small and cottage industries is available. Earlier studies claim that within the rural industries sector, the consumption of fuel wood for brick manufacturing and tobacco curing add to the accelerated use of tree resources.

In the rural household sector, cooking and lighting needs are the two largest end-uses of energy. Traditionally women’s role in energy has been examined from the time spent in collecting fuel wood for cooking, but a greater time consuming activity for women is the process of cooking itself. According to the *1996 Rural Household Energy Survey* in India, cooking related activities can take up as much as seven hours per day for an average rural Indian woman. The situation in Bangladesh is probably not much different. When modern fuels are unavailable to the consumers (in this case mostly women), energy efficiency can become vital in providing the necessary fuel resources to them. Previous studies have

shown that, single and multiple stoves can be modified to achieve fuel savings to the extent of 50-80% as compared to unmodified ones. Notwithstanding previous efforts in research on improved stoves, adequate follow up of such research and diffusion efforts is necessary. Another cooking alternative is biogas, albeit one that needs to be evaluated very carefully because of the high capital requirements. In a recent National NGO Workshop in India, the speakers reiterated the role of low cost smokeless chulhas and biogas in removing the drudgery of women, and improving their health. However, the proposal for utilizing biogas technology goes beyond gender issues, since biogas is a renewable energy option and has environmental benefits as well. In the Village Power Conference 1998, the Grameen Shakti representative indicated that brick bio-digesters are being developed to produce cooking fuel (biogas) and organic fertilizer. In contrast, previous studies in Africa indicate that the investment costs of a biogas plant is sufficient to buy 10 years worth of LPG and an LPG stove. It is important to evaluate the potential contribution of biogas to the national economy for Bangladesh.

In most of unelectrified rural Bangladesh, lighting needs are met by the use of kerosene. Previous ESMAP reports in urban Hyderabad, India shows that “the policy to make kerosene affordable has actually resulted in the poor paying slightly higher prices for kerosene than more wealthy families” (UNDP/ESMAP 1997). Information on availability of subsidies for kerosene, and their effects on Bangladeshi rural poor could be very helpful to determine alternative pricing schemes for conventional fuels. It would be also helpful to conduct a cost comparison study of using kerosene versus solar PV sources versus electricity to meet the lighting needs of rural Bangladeshis. Considering the very high rate of illiteracy (61.9% for population in the age group of 15 and up, whereas the illiteracy rate of all of South Asia in the same age group is 50%), meeting the lighting needs whether by conventional or alternative, is of high priority for the development of Bangladesh.

Relationship to ESMAP Priority Areas, and Comparative Advantage - This activity addresses the ESMAP priority areas of: energy access to the un- or under-served, especially in rural areas, and environmentally sustainable energy practices. The comparative advantage the Bank brings to this project is: i) an open relationship with the GOB, local stakeholders, and potential donors; and ii) an unbiased approach based on iii) broad international experience.

III. Scope of Work

Existing information and experience will be used to the maximum extent possible in preparation of the strategy. However, significant information gaps exist which must be filled to ensure a solid underpinning. Therefore, the work will proceed as follows:

Task 1: Compilation of Existing Rural Energy Data in Bangladesh - This task will compile and review all available studies/surveys done in rural energy related areas, analyze the data and information, and summarize the findings so that they will provide a benchmark for the other tasks to follow. The focus will be on the use of traditional fuels and petroleum fuels, and will complement information from the PV market survey and the delivery mechanism study. The output will be summarized in a report.

Task 2: Rural Household Energy Survey – Household surveys and focus groups will be conducted for this task. Collection of statistics will emphasize household energy demand and usage patterns, fuel source for various end uses, availability of the source (for example, availability or scarcity of wood fuels and residues from village forests, availability of agricultural crop residue, cow dung; use of batteries and recharging distance), payment for fuels and opportunity costs, extent of informal fuel trade, fuel pricing systems (including any subsidies/taxes). The collected data will be analyzed and summarized. The output of the task is a report based on the findings and analyses.

Task 3: Rural Industry Energy Survey – Rural industry surveys will be performed by geographical locations. Data collection will emphasize energy usage patterns and supply sources (including the percentage of traditional versus conventional energy sources, and the pricing of the sources) in rural industries sector (which will include small and cottage industries). Analyses of the data will look into linkages among land ownership, access to energy, and energy use type. The collected data and results of the analyses will then be summarized in a report.

Task 4: Assessment of Rural Energy Delivery Mechanisms – This task will research into the existing rural energy delivery mechanisms, identify the various short-comings and distortions in the present systems, as well as the

barriers/opportunities for expansion of modern energy sources. The task will also briefly evaluate and compare experiences and findings in rural energy delivery in other countries. In addition to the focus on the delivery systems, this task will also examine policy and regulatory issues related to rural energy delivery. The concluding part of the assessment will summarize the findings and past experiences, and will provide policy recommendations on rural energy policy, delivery, and regulation mechanisms. The output of the task will be a report based on the assessment.

Task 5: Cooking and Lighting Alternatives Study (Including Biomass Issues) – This task focuses on the potential alternatives to two major rural household energy end uses in Bangladesh: cooking (alternatives include traditional fuels, improved stoves, biogas chulha, LPG) and lighting (alternatives include solar PV, electricity, kerosene). It will utilize data from tasks 2 & 3 as well as evaluate feasibility of alternatives in terms of costs, supply, technical performance, socio-cultural constraints, policy/regulatory issues, gender issues (especially in terms of health, loss of income and educational opportunities), and environmental concerns (with regards to unsustainable extraction of biomass resources as well as pollution resulting from continued usage of fossil fuels.) This task will therefore analyze the knowledge gathered on the two end uses, and combined with complete evaluation of alternatives, will: provide strategy recommendations. The output of the task will be in the form of a report.

Task 6: Prepare Draft Rural Energy Strategy – The draft rural energy strategy will be prepared on the basis of the foregoing tasks by a senior consultant. To ensure GOB ownership, the senior consultant will work closely the GOB, as well as the Bank in formulating the strategy. The output of the task, therefore, will be the draft rural energy strategy.

Task 7: Rural Energy Strategy Workshop – The workshop will center on the draft rural energy strategy (task 6). The Ministry of Energy and Mineral Resources (MEMR) from GOB will coordinate the workshop. The workshop will be conducted to ensure broad stakeholder review of the draft strategy. Peer reviewers will be selected beforehand to present: i)GOB, ii)Bank, iii) local NGO/ private sector, and iv) international NGO views on the draft which will be made available to all the participants prior to the workshop. The resulting recommendations will be incorporated in the final document.

Task 8: Final Rural Energy Strategy - The final strategy will be prepared based on input and comments from the workshop and peer reviews. The senior consultant and the task manager will work in active collaboration with the GOB, and other stakeholders to finalize the rural energy strategy for Bangladesh.

Task 9: Strategy Dissemination – The finalized rural energy strategy will be publicized by the local media, and other stakeholders, and will be made available to all relevant local organizations (e.g. BBS, BRAC, REB, LGED, BCSIR, BUET, BCAS, Grameen Shakti etc)

IV. Sustainability & Risks

Risk	Risk Minimization Measure
Information collected and available is not sufficient to formulate the energy strategy.	Proper design of surveys and TORs for studies based on Bank experience elsewhere
Number of entities involved is unmanageable	Primarily an issue in a workshop setting, this will be mitigated through judicious choice of workshop participants
GOB loses commitment to implementing a rural energy strategy	Maintain concentrated GOB involvement throughout strategy development
MEMR, other govt agencies, NGOs, donors lose commitment	Maintain intense MEMR and other stakeholder involvement throughout strategy development

Sustainability
Sustainability of the project will be measured in terms of implementation of the strategy. The project seeks to ensure sustainability by maximizing GOB involvement throughout strategy development, thereby establishing ownership. The Bank can cement this ownership through support of investment operations recommended by the strategy, perhaps through the Power Development Project APL currently under preparation. There is also a possibility that following the findings of this study, a new project would be initiated to oversee implementation of the strategy. The final outcome of

the study is expected to contribute to the Bangladesh Rural Development Strategy, an ongoing project of the World Bank.

See Project Design Summary for monitoring and evaluation measures.

V. Implementation Arrangement and Schedule

The task manager will be responsible for overall project coordination and for ensuring that the final report is complete, represents a consensus view, and is properly disseminated. He also will be responsible for coordination with GOB and other stakeholders, preparation of TORs, oversight of contractors, and coordinating Bank inputs to the strategy. MEMR will actively participate in preparation of TORs and coordinate GOB review of all draft reports. They will also coordinate the workshop (Task 7). Local and international consultants will be retained to undertake surveys and studies. A senior consultant will be retained to prepare the strategy in collaboration with the GOB, the Bank, and other stakeholders.

The proposed activity will take about 20 months for completion. The surveys will be carried out during the first eight months beginning in September 1999. The overall activity including the strategy report should be completed by March 2001. The project timetable including the agencies and institutions likely to be involved in implementing the activity are listed below.

<u>Activity Timetable</u>				
<u>Task Name (&Agencies Involved)</u>	<u>Duration</u>	<u>Begin</u>	<u>End</u>	
Task 1: Compilation of Existing Rural Energy Data	1 month			
Task 2: Rural Household Energy Survey	8 months			
Task 3: Rural Industry Energy Survey	8 months			
Task 4: Assessment of Rural Energy Delivery Mechanisms	3 months			
Task 5: Cooking and Lighting Alternatives Study	4 months			
Task 6: Prepare Draft Rural Energy Strategy	4 months			
Task 7: Rural Energy Strategy Workshop	3 days			
Task 8: Final Rural Energy Strategy	2 months			
Task 9: Strategy Dissemination	1 month			

VI. Team Composition

Project Manager, Survey Expert – Doug Barnes (EMTEG)
 Local Consultants (to be determined)
 Peer Reviewers- 1 Bank Rural/Renewable Thematic Group Staff: Enno Heijndermans
 1 GOB:
 1 Local Bangladeshi NGO/ Private Sector (Hasna Kahn, PSL)
 1 International NGO (e.g. NRECA, April Alderdice, NREL??)
 International Consultants

Project Design Summary

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation
ESMAP Strategy-related Goal: Increased access to affordable modern energy for rural Bangladeshis.	•Increase in percentage of population with access to modern energy.	•Continuing Bank energy sector dialog, statistical data of REB, LGED, BCSIR,
Project Development Objective Implementation of rural energy strategy	•strategy endorsed by the GOB and supported by Govt agencies, NGOs, donors	•1 year after submission, GOB endorses strategy
Expected Outputs: •1. Rural energy strategy for Bangladesh (report). •2. Dissemination program implemented	•availability of the report at BBS, research organizations, institutions of higher learning by end of project •report is complete & of good quality	•successful workshop •peer review

<p>Project Tasks/ Components:</p> <p>Task 1: Compilation of Existing Rural Energy Data</p> <p>Task 2: Rural Household Energy Survey</p> <p>Task 3: Rural Industry Energy Survey</p> <p>Task 4: Assessment of Rural Energy Delivery Mechanisms</p> <p>Task 5: Cooking and Lighting Alternatives Study</p> <p>Task 6: Prepare Draft Rural Energy Strategy</p> <p>Task 7: Rural Energy Strategy Workshop</p> <p>Task 8: Final Rural Energy Strategy</p> <p>Task 9: Strategy Dissemination (see text for details)</p>	<p>•survey & study results complete according to schedule</p> <p>Inputs (budget for each component):</p> <ul style="list-style-type: none"> • See Budget for details 	<ul style="list-style-type: none"> • monitoring and evaluation of tasks will be on the basis of progress with respect to schedule, and completion with respect to contract requirements.
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