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A report for the

*Office of Energy,
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Technology*

Improved Performance
of the Energy Sector
Rural Electrification:

Bangladesh
Program Assessment

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and Technology
Center for Environment
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Field Support and Research
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IMPROVED PERFORMANCE OF THE ENERGY SECTOR RURAL ELECTRIFICATION

Bangladesh

Program Assessment

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Gordon Weynand, Deputy Director, USAID's Office of Energy, Environment, and Technology and Michael Ellis, Managing Consultant, of PA Government Services are the primary authors of this report. A summary draft of this report was presented to the USAID Mission to Bangladesh and the authors appreciate the contributions of Mr. Gordon West (Mission Director), Ms. Mary Ott (Deputy Mission Director), Mr. Bruce McMullen (Senior Energy Advisor), Mr. Charles Uphaus (Director, Office of Economic Growth, Food & Environment), and Mr. Md. Kamaruzzaman (Engineer),

This final report reflects the comments and suggestions made during Mission debriefings and follow-up discussions with Mission and host country counterpart staff.

Executive Summary

The energy assistance program in Bangladesh has been a major success for USAID and the Government implementing agencies. It has brought electricity, jobs, economic growth, social well being, and increased agriculture production to a significant portion of the population. The program has leveraged over \$1 Billion in foreign aid and established a sound framework of rural electrification that will form the basis of national electrification for the foreseeable future. USAID and its associates should take great pride and satisfaction in knowing that this worthwhile program has truly benefited the lives of millions of people: today and in the future.

At this point, in the development of the rural electrification sector of Bangladesh, it is also important to assess the past program strengths and accomplishments; and formulate an ongoing program of technical assistance which will provide maximum benefits to the rural population of Bangladesh. At the request of the USAID Mission in Bangladesh, the Office of Energy, Environment & Technology in the Environment Center (G/ENV/EET) fielded a two-person energy team to Dhaka from June 3 through June 15, 2001. Per Mission guidance, USAID's assistance to the rural electrification (RE) program of Bangladesh was to be examined from at least three points of view:

- 1) How have the assistance needs of the RE program changed, and what is the natural evolution of the USAID assistance program in meeting these needs?
- 2) What is the uniqueness of USAID's program vis-à-vis the contributions of the programs of the other bilateral and multilateral donors? Is USAID's involvement still seen as "catalytic" in attracting support from other donors?
- 3) What are the logical connections between the support USAID provides to the RE program and USAID's energy sector reform assistance program within Bangladesh?

To carry out the analysis, the team reviewed available reports and held discussions with key stakeholders and donors within Bangladesh. The team also held discussions with USAID mission, its contractors, and US Embassy officials. This report is a compilation of those findings and presents an analysis of key issues and needs affecting the power sector. The report then makes recommendations for a program of future technical assistance that builds upon the success of the past program, while addressing the future needs of rural electrification in Bangladesh.

USAID's Rural Electrification Program in Bangladesh

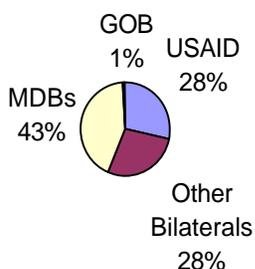
The results of USAID's past and current rural electrification program in Bangladesh are well documented and the Team will not duplicate it here. However, a few facts are worth noting to set the stage for the subsequent analysis:

- USAID's commitment has been continuous over the past 22 years; with approximately \$211 Million in grant and loan funds allocated
- The primary implementation contractor has been the National Rural Electric Cooperative Association (NRECA), who successfully patterned the structure of the Bangladesh RE sector on the U.S. model
- Seventy PBSs (cooperatives) have been conceptualized under the ACRE (area coverage) system, with 67 formed and 64 actively operating
- The Rural Electrification Board (governing entity) has been established and is functioning well as a supervisory, technical support, and on-lending agency
- 16 million additional people now have electricity and 5 million new jobs have been created through 163,000 small rural businesses and 62,500 irrigation connections
- The RE program is credited as being the single most important factor in achieving self-sufficiency in rice and other staple food production

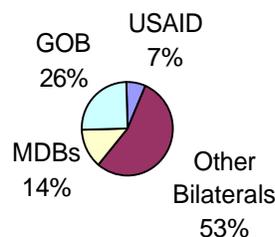
Most notable, the electrification coverage has been extended from approximately 3% (pre-1977) of the rural population, to approximately 24% today; an outstanding achievement in a country of 130 million people generally regarded as one of the poorest in Southwest Asia.

The USAID program has also provided significant leverage of GOB, MDB and other donor country funds, which have increased in relative terms post-1997, as illustrated below:

Donor Contributions 1977-1997



Donor Contributions Post 1997



Strengths

The energy team identified the following strengths of the current program, which are detailed in Section 3:

- ❑ *Program Design and USAID Commitment* – The rural electrification program addressed an urgent need with the right mix of resources, institutional implementation arrangements, and a qualified contractor.
- ❑ *Government of Bangladesh Support and other Donor/MDB Support* – The GOB has provided commitment and consistent support, as have other donors/MDB’s through complimentary and supportive programs.
- ❑ *Organization of REB and PBSs* – From the outset, the RE program was founded on sound commercial investment decision making processes and eventual full cost recovery.
- ❑ *Creation of Ancillary Service Industries* – REB and the PBSs has made good use of domestic suppliers, contractors, and other service providers; including contract staff.
- ❑ *Sustainability* – The USAID program has laid the groundwork for a sustainable rural electrification sector in Bangladesh.
- ❑ *Positive Social and Economic Indicators* – It is generally recognized that the USAID RE program has had a positive impact on the social and economic well being of a significant portion of the population.
- ❑ *Capacity to Handle Infusion of Capital* - Over the 22 years of the RE program, the GOB, REB, and PBSs have developed and demonstrated an admirable capacity to manage the large influxes of capital provided by the international donors.

Enhancements

As the RE program has progressed over time and as changes in the nation’s energy sector and economy have occurred, the REB and the PBSs now face new challenges, thus areas of “enhancements” must be addressed.

- ❑ *Some Original Program Design Elements Were Not Fully Implemented* - REB management has, for the most part, resisted allowing PBSs to exercise more decision-making autonomy. In addition, it appears that the Bangladeshis have grown over-dependent on NRECA and may be avoiding taking full responsibility for certain management tasks. Compounding this attitude on the Bangladesh side may be reluctance on the part of NRECA staff to forego their earlier role of project implementers in favor of the role of advisors and mentors.
- ❑ *Lack of a Transition Plan for the Next Major Phase of the RE Program* - To better target its available resources, the REB should characterize the existing

PBSs into different economic and social categories, including analyzing the characteristics and business potential of their service territories.

- ❑ *Over-emphasis on System Expansion and Intensification versus Maintenance* - The management of the REB and the PBSs must now begin to develop preventative maintenance procedures and training staff to implement the maintenance programs.
- ❑ *Training Response to the Transition* - The transition facing the RE system raises concerns that the training facilities, curricula, and staff may be inadequate to meet the future needs of the REB and PBSs, and significant enhancements will be needed to train staff to meet future challenges.
- ❑ *Tariff Structure and Subsidies Require Revision* - As the national power sector regulatory regime develops, the REB and the PBSs will need to more explicitly define their methodology for calculating tariffs and to more clearly define those tariffs set by economic calculations versus social considerations.

Key RE Sector Issues and Needs

The assessment team has investigated the key issues and perceived needs which affect rural electrification in Bangladesh. The results are summarized in the following paragraphs as: RE core items, ancillary items, and REB requested assistance items.

RE Core Issues

- ❑ *Expansion and Intensification* – The REB and PBSs are under intense pressure to expand and intensify their service areas and to cover the country as a whole, and as a result have neglected other critical areas such as maintenance, master planning, system planning, tariff rationalization, and safety
- ❑ *REB/PBS Strengthening* – REB and the PBSs will need to strengthen their internal organizations and establish their role within the broader context of energy sector restructuring in Bangladesh in order to remain an effective organization
- ❑ *Role of the Private Sector* - As the RE program moves into the intensification and maintenance phase, the GOB should continue to encourage the development of Bangladeshi private sector to provide the needed services to the RE program.
- ❑ *Future Donor Country and MDB Funding* - Large infusions of capital from bilateral and multilateral donors, especially the multilateral development banks, will still be required. Once the 5th phase of grid expansion is completed, it is unclear how much bilateral assistance will be available for the follow-on intensification and maintenance program.
- ❑ *Transition to Operations and Maintenance* - The RE program will need to transition from expansion and intensification to operating and maintaining the system as a whole. Thus, the organizations managing the system must re-

evaluate their investment strategy to put in place the resources and personnel to maintain the system.

- ❑ *Renewables, Isolated Generation, and Mini-grids* - Providing electricity service to rural populations that are unlikely to be connected by conventional grid extension will be a challenge for Bangladesh. To assist policymakers in making decisions regarding the value of investing in such approaches an integrated analysis of the different options on a common basis would be useful. It is especially important to examine the opportunity costs associated with taking funds away from the grid extension program and investing in these alternative approaches.

Energy Sector Ancillary Issues

- ❑ *Gas Development Program* - The expansion of the gas grid throughout the country will expand power supply options for the rural electrification grid by providing clean fuel for either large generation facilities or for small distributed units such as the 10 MW ones being deployed under the Rural Small Power Program.
- ❑ *Power Supply and Transmission Capacity* - The need for continuing and expanding the Small Power Program is unclear, and as the RE network grows the expansion needs of the transmission system must be identified.
- ❑ *Wheeling and Regional Interconnections* - If power import, export, and wheeling arrangements are worked out with India, Nepal, Bhutan, etc., the REB could potentially import power as needed from these countries and/or export power from its own generation facilities.
- ❑ *Power Sector Restructuring* - The restructuring of the power sector to improve management and increase the economic viability of the sector has been slow, and without proper rationalization of the generation, transmission, and distribution sectors, the financial viability of the sector will never be attained
- ❑ *Regulatory Reform* - One critical reform needed in the power sector of Bangladesh is the creation of an effective independent regulatory body. The decisions of the regulatory body will have a major impact on the performance of the RE program, and the REB and PBSs should participate actively in the creation and development of that body to protect the RE program.
- ❑ *Power Tariff Rationalization* - A major part of the power sector reform process will be the adjustment of tariffs to affect the true cost of generation, transmission, and distribution services to all categories of consumers

REB Requested Assistance Items

The REB, with support from NRECA, has provided the energy team with a concept paper of proposed assistance activities, which are summarized here:

- ❑ Enhanced Distribution System Reliability

- Continued Enhancement of REB's Training Function and Development of the RE Academy
- Enhanced Information Technology and Overall Management Development
- Exploration and Utilization of Off-Grid and Renewable Energy Systems

The REB requested areas of assistance are generally consistent with the energy team's recommendations. However, the REB request relies heavily on donor assistance with actual implementation activities. The recommendations in this report follow more of a phase out of donor assistance for implementation, and instead relies on institutional strengthening of existing entities (i.e. REB/PBSs) for implementation support.

Proposed Future USAID RE Assistance Program in Bangladesh

The energy team assessed the future role of RE assistance in Bangladesh by considering the strengths and enhancements to the current program, the key issues and needs of the RE sector, and USAID program design considerations. The results are summarized here in terms of the role of USAID, other donors and MDBs, proposed program elements, and implementation arrangements.

Role of USAID

Since the Rural Electrification Program started in 1978, 15 donor organizations have provided grant and loan assistance to the program. USAID, however, has played a unique leadership role to date. The original 1976 NRECA Commonwealth study (which recommended that Bangladesh draw heavily on the American rural electrification experience), was funded by USAID. The Agency also provided the first \$79.20 million for the construction of the distribution system infrastructure and the formation of the first PBSs. While virtually all of the other donors have provided funds for construction and intensification of the RE network, only USAID has provided technical assistance since the inception of the program to build the necessary capacity within the REB and the PBSs to effectively carry out the RE program.

In 1997, USAID shifted its RE assistance program from the provision of technical assistance and commodities/construction support to the provision of technical assistance. The Rural Power for Poverty Reduction (RPPR) Program (1997-2002) focuses principally on strengthening selected administrative and management skills pivotal to the sustainability of the overall RE program. As a consequence of USAID's seminal role in the creation of the RE program and in creating the institutions that carry it out, the other international donors appear to have tacitly delegated to USAID the ongoing role of providing technical assistance to the REB/PBSs to ensure the continued success of the RE program.

In the future USAID should assume the following role in supporting the Bangladesh RE program :

- ❑ Continue its policy of letting other donors provide funds for construction and intensification while USAID provides funds for technical assistance,
- ❑ Continue narrowing the focus of its TA to concentrate on overcoming those institutional management challenges faced by the REB and the PBSs that will undermine the sustainability of the RE program in coming years; and
- ❑ Resist assuming the responsibility for providing technical assistance to the REB to provide oversight of how well REB manages the resources provided by other donors, especially committing to funding the involvement of NRECA beyond the point where their technical value is at an end solely to provide a “comfort factor” for other donors

The Role of Other Donors and the MDBs

A number of bilateral donors and multilateral development banks (MDBs) have expressed continued support for the RE program in Bangladesh, including:

- ❑ The Netherlands - Capital assistance to the GOB on intensification of the PBSs and in providing support, both TA and commodities, for providing electricity services to off-grid areas utilizing renewable energy technologies
- ❑ Germany - Through GTZ, are interested in providing \$4 million to the GOB to support renewables in rural areas
- ❑ The World Bank - A large capital loan, with associated TA, to support both the intensification of the PBSs, the Rural Power Program, and the use of renewables and other mini-grid approaches to providing electricity to rural populations
- ❑ The Asian Development Bank (ADB) - Focusing capital assistance to the GOB on supporting those PBSs taking over service areas from PDB/DESA, large power generation projects, and the improvement of the transmission system.

It appears that there is substantial donor support for both commodities for intensifying the distribution grid in rural areas and for supporting the use of renewable energy sources in off-grid areas.

Proposed Program Elements

To address the evolving RE program enhancements, issues, and needs discussed above, the following two-part transition program is recommended:

Strengthening Business Operations - The goal of this assistance is to increase the resources available to the REB and the PBSs and to strengthen their operations in order to achieve their mandate of providing reliable electricity to the maximum number of consumers in an economically sound fashion.

- ❑ Characterizing the service territory to identify the existing and potential customer mix
- ❑ Characterize the PBS itself in terms of performance
- ❑ Developing an electrification approach that strategically improves areas of non-performance
- ❑ Developing a business outreach program to encourage new industrial and commercial customers
- ❑ Reviewing the costs of providing service and recommend suitable tariff structures within the guidelines provided by REB.
- ❑ Strengthening the financial forecasting capabilities of the PBS.
- ❑ Improving the collection of socio-economic information
- ❑ Supporting the design and implementation of effective maintenance programs that meet international standards.
- ❑ Supporting the design and implementation of effective safety programs that meet international standards.
- ❑ Working with the REB to develop suitable business planning modules
- ❑ Supporting the automation of the collections and billing functions and the financial systems of the PBS.
- ❑ Implementing Geographic Information Systems (GIS)

After piloting these programs at selected PBSs, a model “PBS Business Strengthening Package” would be rolled out to remaining PBSs with the support and promotion of REB.

Strengthening Sector Management

The goal of this assistance is to support the REB and PBSs through the transition of the RE sector from one based on expansion to one based on intensification, sustainable operation, and maintenance of a nation-wide distribution network.

- ❑ Strengthen the training program, procedures, and firmly establish the staff and curricula at a well-managed and designed and equipped facility
- ❑ Develop preventative and ongoing maintenance programs
- ❑ Establish suitable maintenance equipment and supply systems
- ❑ Establish effective safety programs, reporting, promotion, and accident prevention programs for the PBSs
- ❑ Update the master plan for electrifying the rural areas of the country with the aim of identifying those areas that would be most difficult to reach through grid extension
- ❑ Establish a power generation unit and finish building up the capacity of REB to continue the Small Rural Power Program into the future
- ❑ Classify the PBSs into separate categories based on potential financial viability and begin a graduated system of human and financial support that will focus more resources on the weaker PBSs while allowing the successful ones greater autonomy and reduced access to subsidized resources, especially loans.

- Analyze the tariff-setting methodologies to explicitly define the costs-of-service for each customer category, the degree and level of cross-subsidies, the level of subsidy received from the GOB for selected customer classes, and the costs of power supply and transmission wheeling.

To complement these two areas of assistance to the RE program, the Mission must also address the following elements in its ongoing energy sector reform program. The RE program is an integral part of overall power sector reform and coordination is necessary to protect RE from being negatively impacted by the sector reform process:

- Power Sector Reform Strategy
 - Regulatory Reform
- Small Power Development and Distributed Generation
- Tariff Reform and Rationalization
- Renewables and Off-Grid Alternatives

Proposed Implementation Arrangements

In terms of implementing the above program, the energy team has the following recommendations:

- USAID should provide assistance to the RE program for only 5 more years with the objective of transition, and then phase out all support. This approach recognizes that the USAID/NRECA partnership has created sound institutions that can carry out their mission effectively without further support.
- USAID should diversify the source of assistance to the RE program. NRECA should be kept on board, but they should be focused on technical and operational activities being dealt with by the REB and the PBSs. A second assistance provider or providers should be brought in to provide support to the REB and PBSs in strengthening their business planning and management functions while still striving to meet their social mandate.
- Obviously, the two will need to coordinate their activities since the REB generally develops guidelines for programs implemented by the PBSs. There will also be issues where the two providers will have to work closely together – tariff structure, system planning, computerization/GIS, business training modules, and changes in REB loan conditions to the PBSs among others.
- Both assistance providers to the RE program should be engaged through contractual mechanisms that will provide the Mission with the necessary level of program management authority. In the case of NRECA, a sole-source contracting procedure is justified for program continuity. For the second provider, a competitive process should be followed.
- Given the specialized nature of the expertise required, and the potential impact on the RE program, it is recommended that the Mission look beyond their current assistance providers and seek out the best available talent

- USAID should also seriously consider eliminating expatriate long term advisors and concentrate on focused short term technical assistance.
- To better define the program activities described above and to provide resource estimates that can be turned into contractible scopes of work and government budget estimates, it is recommended that the Mission bring in a project design team.
- In terms of the use of the Mission's local currency resources, the team feels that one high-priority use would be to set up a small revolving loan fund in the REB to support the computerization of the PBSs, especially in support of the collections and billing and financial management systems, as well as the GIS systems.

A representative program design and implementation schedule is presented in the body of the report.

1.0 Introduction

At the request of the USAID Mission in Bangladesh, the Office of Energy, Environment & Technology in the Environment Center (G/ENV/EET) fielded a two-person team to Dhaka from June 3 through June 15, 2001. The team consisted of Gordon Weynand, Deputy Office Director, and Michael Ellis, Managing Consultant with PA Government Services.

The purpose of the visit was to assist the Mission in analyzing the rural electrification (RE) program in Bangladesh to determine assistance needs and to recommend appropriate activities to be included in the next phase of USAID's RE support program. Per Mission guidance, USAID's assistance to the rural electrification (RE) program of Bangladesh was to be examined from at least three points of view:

1. How have the assistance needs of the RE program changed, and what is the natural evolution of the USAID assistance program in meeting these needs?
2. What is the uniqueness of USAID's program vis-à-vis the contributions of the programs of the other bilateral and multilateral donors? Is USAID's involvement still seen as "catalytic" in attracting support from other donors?
3. What are the logical connections between the support USAID provides to the RE program and USAID's energy sector reform assistance program within Bangladesh?

The Mission was also seeking advice on what assistance providers and what procurement vehicle(s) to utilize in the future if the RE support program is continued.

To carry out the analysis, the team reviewed available reports and held discussions with key stakeholders and donors within Bangladesh including: the chairman and members of Rural Electrification Board (REB), selected rural co-op (PBS) managers, field staff from the National Rural Electric Cooperative Association (NRECA), World Bank and Asian Development Bank staff, and managers from the Power Grid Company of Bangladesh. The team also held discussions with USAID mission and US Embassy officials. The team wishes to thank the Mission for its clear guidance and tremendous technical and logistical support, and to thank those involved in the discussions for their willingness to participate and for their forthrightness in sharing their points of view.

2.0 Rural Electrification (RE) Program

2.1 Description

Bangladesh is a Southwest Asian country with a population of 130 million people and a land area of 144,555 square kilometers, resulting in one of the highest population densities in the world (900/sq. km). The average per capita energy consumption in 2000 was ~1% of that of the average US citizen. The per capita GDP is around \$350.

In the 1970s, with less than 3% of the population having access to electricity, the Government of Bangladesh decided to accelerate the provision of electricity to rural populations to stimulate economic and social development. A 1976 analysis prepared by the National Rural Electric Cooperative Association (NRECA) and Commonwealth Associates recommended that: (1) Bangladesh begin a phased Area Coverage Rural Electrification (ACRE) Program to establish the foundation of a rural electrification network throughout the country; (2) Each project area should form a consumer-owned cooperative (Palli Bidyut Samity or PBS), modeled on the successful US rural electrification program, to ensure maximum possible participation of the beneficiaries; and (3) A central agency should be established under the government to organize, finance, administer, and monitor the activities of the PBSs. Under the ACRE concept, electricity is brought to the rural areas through a backbone grid followed by the realization of local distribution and consumer connections. This approach optimizes the overall development of a large area rather than the piecemeal network extension programs followed by most national utilities. The Government of Bangladesh accepted the recommendations and established the Rural Electrification Board (REB) in 1977. The first PBS was formed north of Dhaka and energized in 1980.

2.2 Accomplishments

Since its establishment, the REB has implemented four phases of development and should complete the last phase by 2005, establishing the skeleton of an electric distribution network over virtually the entire country. Over \$1 billion has been invested in the establishment of all of the originally-planned 67 PBSs, 66 of which are operational (3 more may be added later in the Chittagong Hills). The REB has constructed 195 substations and 120,445 km of distribution lines. The RE program has connected more than 2.8 million consumers in over 36,650 villages throughout Bangladesh, bringing electricity coverage in the rural areas to over 20% and in the nation up to about 15% of the population. These numbers include areas transferred to REB in recent years from the distribution areas managed by the Power Development Board (PDB) and the Dhaka Electric Supply Authority (DESA). In the 1999-2000 reporting period alone, over 11,000 km of lines and over 512,000 service connections were made, bringing service to over 3,400 new villages and allowing over 674,000 hectares of land to be irrigated. Rural consumers used over 2.4 million megawatt-hours (MWH) of electricity in the same reporting period, for an average of 850 kWh per connection. The breakdown by connection and average use by category are

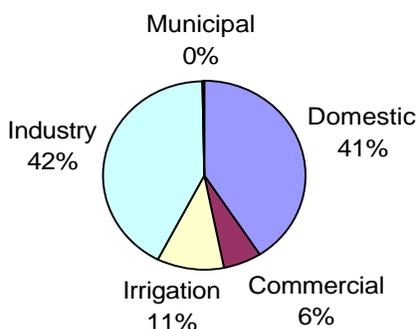
shown in Table 1. Over 50% of the power demand in the PBSs is for productive uses (42% for industry and 11% for irrigation), thus contributing substantially to the economic development of the rural areas.

Since the REB and the PBSs are operated along strict commercial lines, the REB and the PBSs taken as a whole are financially viable. However, individually, only about 25% of the PBSs have a positive margin, and some are struggling to attain that goal. For the 1999-2000 reporting year, the average bill collection for the PBSs is almost 97%, and the average system loss is only 16%. Both of these figures are far better than the distribution zones administered by the PDB and DESA.

Table 1 – Breakdown by Category of Connections and Power Use
(1999-2000 Reporting Period)

Category	Number	Power Consumption (MWH) [kWh/connection]
Domestic	2,355,091 (81%)	1,005,193 [427]
Small Commercial	340,954 (12%)	149,454 [438]
Irrigation Pumps	82,253 (3%)	262,158 [3,187]
Industries	58,219 (2%)	1,034,560 [17,770]
Street Lights/Other Municipal	55,130 (2%)	8,180 [148]
TOTAL=	2,891,647 (100%)	2,459,545 [850]

Power Consumption 1999-2000



In addition to developing the rural distribution system above, the REB has also found itself forced to enter the generation sector because of the power supply shortages faced by the country. The Rural Power Company (RPC), an REB/PBS joint company, has built and operates the 70 MW Mymensingh gas-fired power facility, which can be expanded up to 210 MW. In addition, three 10 MW natural gas engines to generate electricity were installed by private Bangladeshi companies in 2001 under a build-own-operate (BOO) arrangement. Eight more are planned in the near future. These supply efforts have been successful at

obtaining additional power at costs comparable to the price of bulk power purchased from the Power Development Board.

2.3 Socioeconomic Impact

Because each electricity connection in a rural area provides benefits to an estimated 8 people and over two households, the socioeconomic impact of electrification is actually greater than the numbers presented above. While the REB is currently working to strengthen its socioeconomic data tracking capability with assistance from USAID/NRECA, a 1996 socioeconomic study¹ of the rural electrification program in Bangladesh identified the following impacts:

- ❑ Irrigation pumps (over 82,000) powered by the RE program have extended irrigation benefits to over 674,000 hectares of land, assisting farmers to grow high-yield varieties of rice and creating about 2,000,000 seasonal jobs for landless farmers. Crop yields are also higher in electrified villages. The country's self-sufficiency in food production probably owes a great deal to the RE program².
- ❑ The more than 55,000 small and medium size industries that have been set up in the project areas have created about 750,000 new job opportunities, many of these occupied by women. Off-farm employment has increased greatly in electrified villages³.
- ❑ The RE program itself employs directly more than 6,000 people at the REB and PBSs, and has created a service industry of electrical consultants, contractors, manufacturers, suppliers, and retailers that employ 22,000 others.
- ❑ The average income in electrified households is higher than for non-electrified households. The poverty rate is significantly lower in electrified villages than in non-electrified villages.
- ❑ Electrified businesses stay open longer and do a third more business in a day. Electrified commercial units hire more employees at higher salaries.
- ❑ The presence of lights and power in the home has accelerated the process of learning and exposure to new ideas and information, especially the use of TV for educating people on matters regarding health, agriculture, voting, etc. Women are now better informed of matters outside the home, and there has been a positive impact on the education of children.

¹ A Socioeconomic Impact Evaluation of the Rural Electric Program in Bangladesh.

² Rural Electrification Board Annual Report 1999-2000.

³ Ibid.

These results are consistent with information received from the management of Dhaka PBS-1, the oldest PBS in the country. They are also generally consistent with observations and limited analyses made by various donors. Excerpts from the various donor reports are summarized the Appendix to this report.

3.0 Analysis of the Current RE Program

An analysis of the past and current USAID rural electrification program demonstrates considerable strengths and some areas in need of improvement, which are presented in this section. It should be noted that this evaluation was done in the context of the current conditions in Bangladesh with the purpose of assessing the structure and implementation arrangements of subsequent RE programs. All of the areas identified as needing improvement are simply topics that have evolved into needing attention, and should not be construed as deficiencies of the current program.

3.1 Strengths

The most predominant strength of the current program lies in the fact that it has fulfilled its intended purpose to create a sound and sustainable rural electrification framework in Bangladesh. It is definitely the right program, in the right place, and at the right time. The statistics are no less than outstanding⁴: 16 million additional people now have electricity and 5 million new jobs have been created through 163,000 small rural businesses and 62,500 irrigation connections. The RE program is credited as being the single most important factor in achieving self-sufficiency in rice and other staple food production. The electrification coverage has been extended from approximately 3% (pre-1977) of the rural population, to approximately 24% today; an outstanding achievement in a country of 130 million people generally regarded as one of the poorest in Southwest Asia.

The assessment team has identified the following factors of the current program that can be credited to the success of the program:

- Program Design and USAID Commitment – *The rural electrification program addressed an urgent need with the right mix of resources, institutional implementation arrangements, and a qualified contractor. For more than 20 years USAID has been fully committed to the RE program in Bangladesh and has made significant investment in funding, program management, and building institutional capacity. This consistent and solid base of support has enabled the USAID contractors and host country counterparts to fully implement program elements and make improvements in the implementation arrangements over time. USAID has kept the same contractor in place for the duration of the program. This has enabled the contractor to build a solid base of internal experienced staff, establish a sound mutual relationship with USAID and host country counterparts, and leverage its experience to efficiently implement the RE program in Bangladesh.*

⁴ USAID 1999 Congressional Presentation

- Government of Bangladesh Support and other Donor/MDB Support – *The GOB has provided commitment and consistent support, as have other donors/MDB's through complimentary and supportive programs.* The GOB has been particularly diligent in following through with support and vested authority of REB and PBSs.
- Organization of REB and PBSs – *From the outset, the RE program was founded on sound commercial investment decision making processes and eventual full cost recovery.* This has enabled the REB and PBSs to make investment decisions, procure equipment, contract for installation and construction services, and establish tariffs on a sound economic foundation. The REB continues to evaluate PBSs on this basis and recommend remedial action for those PBSs who do not meet certain conditions of financial performance. The goal of every PBS is not only reliable electric coverage, but to achieve sound commercial operations as well.
- Creation of Ancillary Service Industries – *REB and the PBSs has made good use of domestic suppliers, contractors, and other service providers; including contract staff.* This use of outside firms has helped establish the RE service industry in Bangladesh and created thousands of well paying jobs. The PBSs are fully committed to this concept and regularly make use of outside contractors when it makes financial and operational sense.
- Sustainability – *The USAID program has laid the groundwork for a sustainable rural electrification sector in Bangladesh.* Most of the key elements are in place, including: funding mechanisms, financial performance standards, technical standards, operational procedures, management procedures, audits, billing/collection, reporting, and development planning.
- Positive Social and Economic Indicators – *It is generally recognized that the USAID RE program has had a positive impact on the social and economic well being of a significant portion of the population.* This impact ranges from the direct effects of electrification on education, health, status of women, environment, and poverty alleviation; to the ancillary economic effects of job creation, productivity, and income generation.
- Capacity to Handle Infusion of Capital - *Over the 22 years of the RE program, the GOB, REB, and PBSs have developed and demonstrated an admirable capacity to manage the large influxes of capital provided by the international donors. These institutions have carefully invested these resources and put in place effective monitoring and reporting systems, while avoiding the creation of a huge bureaucracy. This track record bodes well for the efficient use of future investment resources provided by the donors to the RE program.*

It is also important to note that the strengths of the current RE program are complimentary and mutually supportive so that the entire program functions cohesively without any significant gaps or deficiencies.

3.2 Enhancements

As the RE program has progressed over time and as changes in the nation's energy sector and economy have occurred, the REB and the PBSs now face new challenges which could not be envisioned when the program was started. To meet these challenges, vulnerabilities or areas of "Enhancements" must be addressed.

□ Some Original Program Design Elements Were Not Fully Implemented

During the formative years of the RE program, the original program plan called for REB to closely control the PBSs and to develop administrative, financial and technical standards and procedures that would apply uniformly to each PBS. Over time, the REB was to relax this "top-down" management approach to allow the PBSs to exercise more autonomy. Now that the program has reached its 22nd year, a differentiation among the PBSs has become evident. The older and commercially-viable PBSs have developed a level of managerial skill and expertise that should allow them to successfully manage with greater autonomy from the REB. Unfortunately, REB management has, for the most part, resisted allowing these PBSs to exercise more decision-making autonomy. Instead, all PBSs must submit most routine and low-level decisions to the REB for approval, even when it involves spending their own revenues on activities such as system maintenance or increasing the pace of intensification to add new customers.

This observation is supported by the fact that the REB has not instituted a "graduation" policy whereby well performing PBSs would be placed on more of a commercial basis (e.g. fewer subsidies like access to low interest loans), and given greater autonomy and accountability.

USAID has funded NRECA since the beginning of the RE program with the idea that NRECA would first be heavily involved in program implementation and capacity building, but then would later assume the more hands-off role of advisors. NRECA has skillfully brought to bear its unique expertise and experience from the American rural electrification program, and has developed solid working relationships with the management and staff of the REB and the PBSs. However, at times it appears that the Bangladeshis have grown over-dependent on NRECA – the REB may be avoiding taking full responsibility for certain management tasks, but may be leaving these to be undertaken by NRECA staff. In addition, REB seems reluctant to accept the services of any advisors other than NRECA, even when such services might provide a fresh point of view on the issue under discussion. Compounding this attitude on the Bangladesh side may be reluctance on the part of NRECA staff to forego their earlier role of project implementors in favor of the role of advisors and mentors. Such a situation puts off the time when the management and staff of the REB

and PBSs will have the capacity and confidence to function on their own without donor assistance.

□ Lack of a Transition Plan for the Next Major Phase of the RE Program

The RE program is rapidly approaching a major milestone – the completion of the five-phase program to lay down the skeleton of the distribution network over most of the nation’s land area. All of the original 67 PBSs in the plan have been formed, with some over 20 years old while others are only 1 year old. Many of the older ones are commercially sound, while many others are still struggling towards that goal. To better target its available resources, the REB should characterize the existing PBSs into different economic and social categories, including analyzing the characteristics and business potential of their service territories. This information could be used to classify the PBSs into distinct groups (possibly 3) based on their level of current and potential viability. The REB could then tailor its management, technical and financial support programs to each of the different groups. For example, the most well-off PBSs could be allowed to obtain loans from REB at terms closer to those of commercial banks, while those PBSs just starting up would receive loans on much more favorable conditions.

□ Over-emphasis on System Expansion and Intensification versus Maintenance

In the first two decades of the RE program, the emphasis was correctly on constructing the basic network and adding new customers to the newly-constructed system (“intensification”). However, now that some of the PBS networks are 15 to 20 years old, proper attention must be given to ongoing system maintenance to protect the country’s massive investment in RE infrastructure. Thus, the organizations managing the system must re-evaluate their investment strategy to put in place the resources and personnel to maintain the system, while adding customers in ways that will improve the financial viability of the system. The management of the REB and the PBSs must now begin to develop preventative maintenance procedures, including setting aside sufficient funds for materials stockpiling, developing the appropriate private sector service firms, and training staff to implement the maintenance programs.

□ Training Response to the Transition

Over the past two decades, the REB has developed a substantial training capacity and curriculum, and has also trained a significant number of PBS and REB staff. In the 1999-2000 reporting period, 3,401 training hours were provided to 5,606 trainees, for a total of 52,050 trainee days. The major training effort regularly carried out by REB has enabled new technical staff to be made available indicating the surprising depth of human potential available in Bangladesh to staff the private service industry and the REB/PBS system. However, the transition facing the RE system raises concerns that the training facilities, curricula, and staff may be inadequate to meet the future needs of the REB and PBSs. Significant enhancements will be needed train staff to meet three challenges: (1) absorbing the different varieties of PDB/DESA equipment

as well as mastering new automated electrical gear; (2) improving the business management of the PBSs; and (3) effectively automating current operations through increased use of computers and other information technologies. The ADB has made available \$6.3 million in loan funds to the REB to develop an enhanced Technical and Management Development Institute, but the REB and ADB have been unable to work effectively together to utilize these funds.

□ Tariff Structure and Subsidies Require Revision

The PBSs have the authority to set their own distribution tariffs within ranges set by the REB with the exception of the agricultural tariff, which is set by the government. Each PBS sets the tariff by category, with affordability by domestic and other consumers as one of the major criteria, but balanced always against the need for complete cost-recovery over time. The industrial and commercial tariffs are used to cross-subsidize the domestic and agricultural consumers. In addition, domestic consumers have a lifeline rate that extends up to 300 kWh, which is well beyond the average power used by lower economic classes. As the national power sector regulatory regime develops, the REB and the PBSs will need to more explicitly define their methodology for calculating tariffs and to more clearly define those tariffs set by economic calculations versus social considerations. The level of subsidization must be clearly delineated, and where GOB policy is to specifically subsidize a sector such as agriculture, then means must be identified for the GOB to directly compensate the PBSs for these subsidies. In addition, REB should use its consumer use statistics to suggest a more realistic lifeline rate that will clearly target domestic consumers in the lower economic group. The cost of the power supplied by generators to the RE network must also be clearly specified, as power sector reforms in the future may cause these prices to rise.

4.0 Discussion of Key Issues and Needs Affecting Rural Electrification

The assessment team has investigated the key issues and perceived needs which affect rural electrification in Bangladesh. The team met with host country sector entities (participants), donor agencies, and multi-lateral development banks in order to profile these areas. The assessment was performed within the context of identifying and prioritizing these issues and needs, while identifying the impact on the energy sector as a whole. The results are presented in the following sections as: RE core items, ancillary items, and REB requested assistance items.

4.1 RE Core Issues

- Expansion and Intensification – The REB and PBSs are under intense pressure to expand and intensify their service areas, and the country as a whole. The GOB has set an ambitious target of full electrification by the year 2020. Given the extent of remaining electrification (approximately 24% of the rural sector is electrified today) and the limitations of funding, implementation, and PBS institutional capacity; this goal appears unrealistic. Nevertheless, the PBSs operate under this pressure and as a result have neglected other critical areas such as maintenance, master planning, system planning, tariff rationalization, and safety. It will be necessary for the PBSs to take a more rational approach of addressing these other issues, while maintaining acceptable levels of expansion and intensification. The sector will continue to need infusions of MDB capital for funding infrastructure, and donor country funding for technical assistance.
- REB/PBS Strengthening – REB and the PBSs are operating quite effectively as a whole, although the majority of PBSs have not achieved financial viability as yet. However, REB and the PBSs will need to strengthen their internal organizations and establish their role within the broader context of energy sector restructuring in Bangladesh in order to remain an effective organization. REB will need technical assistance with master planning, system planning, PBS graduation, training, tariff rationalization, and general aspects of RE sector oversight. The PBSs will need more direct technical assistance with establishing preventive and predictive maintenance programs, safety programs, computerization, and system planning.
- Role of the Private Sector - Over the last two decades, the GOB has made significant progress in expanding the role of the private sector in meeting the energy needs of the country. In addition to attracting international private investment in developing gas supplies and in building and operating power generation facilities, the GOB has also managed to develop the capacity of the Bangladeshi private sector in the provisions of consulting and construction services and the building and operation of small power facilities under the RE program. As the RE program moves into the intensification and maintenance

phase, the GOB should continue to encourage the development of Bangladeshi private sector to provide the needed services to the RE program.

- Future Donor Country and MDB Funding - While the GOB contribution to the RE program has grown significantly over the last few years, large infusions of capital from bilateral and multilateral donors, especially the multilateral development banks, will still be required. Once the 5th phase of grid expansion is completed, it is unclear how much bilateral assistance will be available for the follow-on intensification and maintenance program. On the positive side, the potential commercial viability of the REB and the PBSs seems to be attracting loans from both the ADB and World Bank groups and both are in the process of preparing new loan packages.
- Transition to Operations and Maintenance - With the successful completion of the 5th phase of the grid expansion plan, the RE program will need to transition from expansion and intensification to operating and maintaining the system as a whole. Thus, the organizations managing the system must re-evaluate their investment strategy to put in place the resources and personnel to maintain the system, while adding customers in ways that will improve the financial viability of the system.
- Renewables, Isolated Generation, and Mini-grids - Providing electricity service to rural populations that are unlikely to be connected by conventional grid extension will be a challenge for Bangladesh. These areas are often remote islands, mountainous regions, and sparsely populated areas with limited ability to pay for electricity. Several alternative approaches have been put forward, including renewable energy systems (solar, wind, mini-hydro, etc.), hybrid systems (e.g., wind-diesel), and isolated generation combined with mini-grids to provide services. Other concepts such as single-wire-earth-return (SWER) and shield-wire extension (SWER) have not been tried as yet. To assist policymakers in making decisions regarding the value of investing in such approaches in addition to or in place of the grid extension program, an integrated analysis of the different options on a common basis would be useful. It is especially important to examine the opportunity costs associated with taking funds away from the grid extension program and investing in these alternative approaches. Similarly, an effective domestic proponent must be found. Alternate/renewable energy systems are outside of the REB/PBS core business and are unlikely to receive adequate promotion and support from these organizations.

4.2 Ancillary Issues

- Gas Development Program - The recent assessment by the US Geological Survey and Petrobangla has estimated the natural gas potential of Bangladesh is 32 .1 trillion cubic feet, which means that the country has world-class resources of this clean fuel. The GOB has been successful in attracting private sector investment to the development of the gas resources, and has constructed an extensive gas transmission system over the eastern half of the country. With the completion of the Jamuna River bridge, the GOB is poised to extend the grid to the western half of the country. The expansion of the gas grid throughout the country will expand power supply options for the rural electrification grid by providing clean fuel for either large generation facilities or for small distributed units such as the 10 MW ones being deployed under the Rural Small Power Program.

- Power Supply and Transmission Capacity - While the power generation from independent private power producers has increased in the last few years, a national power supply deficit still exists and load-shedding is common. The Rural Small Power Program of the REB has been successful in bringing online 30 MW of power dedicated to the RE program (with another 80 MW planned), and the Rural Power Company has brought on an additional 70 MW. These supplies have buffered the RE network consumers somewhat from the load-shedding, but the situation in the future is still clouded, and the need for continuing and expanding the Small Power Program is unclear. Part of the difficulty is the uncertainty surrounding the GOB's ability, through the Power Development Board, to negotiate agreements with IPPs to expand the existing power generation capacity, and, more critically, to pay for these new facilities. Discussions with the Power Grid Company of Bangladesh have revealed that the REB's push to extend the distribution network to far-flung rural areas of the country may be surpassing the ability of the national transmission grid to carry the necessary power to these networks. As the RE network grows, the expansion needs of the transmission system must be identified and the sufficient investments made to support the RE network as it expands and its load increases.

- Wheeling and Regional Interconnections - Recent changes in Bangladeshi law allow power generators to sell directly to end users instead of having to sell only to the Power Development Board as is presently the case. This change creates three opportunities for the RE program. (1) The REB could now potentially buy power directly from the new IPPs without having to go through the PDB, which could firm up supplies for the RE network. (2) The Rural Power Company and the Small Power Program producers could sell some of their excess capacity during certain parts of the day to industrial customers, thus increasing load and reducing costs. (3) The REB could arrange to buy surplus power from captive power producers, thus increasing the availability of power to rural consumers. In all of these cases, a wheeling

fee will need to be paid to the Power Grid Company of Bangladesh. In addition, USAID's South Asia Regional Initiative in Energy (SARI/E) seeks to increase trade in energy between the countries in the region. If successful, this program could create several potential benefits for the RE program in Bangladesh. First, the arrangement of natural gas exports to India would accelerate the expansion of the transmission grid to the western half of Bangladesh, expanding both power supply options and economic growth opportunities that could reinforce the RE program. Second, if power facilities are built in western Bangladesh to export power to India, the surplus capacity could provide power to the RE networks in the western part of the country. These facilities would also accelerate the expansion of the country's natural gas transmission system. Finally, if power import, export, and wheeling arrangements are worked out with India, Nepal, Bhutan, etc., the REB could potentially import power as needed from these countries and/or export power from its own generation facilities.

- Power Sector Restructuring - Despite the efforts of reformers within Bangladesh and support from the donor community over the last decade, the restructuring of the power sector to improve management and increase the economic viability of the sector has been slow. The piece-meal nature of the reforms to date has failed to improve services provided by the sector, and the inter-locking nature of the board members has provided numerous opportunities for opponents of reform to block progress. However, without proper rationalization of the generation, transmission, and distribution sectors, the financial viability of the sector will never be attained, power supplies and private investment will stagnate, the burden on the GOB budget will increase, and the RE program and the economy of Bangladesh will be undermined.
- Regulatory Reform - One critical reform needed in the power sector of Bangladesh is the creation of an effective independent regulatory body. Such a body would issue operating licenses, adopt market rules, and set/approve generation, transmission, and distribution tariffs for electricity. The body would probably oversee the natural gas transmission and distribution network as well. The decisions of the regulatory body will have a major impact on the performance of the RE program, and the REB and PBSs should participate actively in the creation and development of that body to protect the RE program.
- Power Tariff Rationalization - A major part of the power sector reform process will be the adjustment of tariffs to affect the true cost of generation, transmission, and distribution services to all categories of consumers. While the REB and PBSs currently set tariffs within ranges that cover costs of service, they employ cross-subsidies to provide affordable electricity to domestic and agricultural consumers. The new independent regulator might curtail the authority of the REB and PBSs to set rates and to employ such cross-subsidies. In addition, the Power Grid Company of Bangladesh will be

seeking to increase its tariffs to cover the costs of wheeling power to all consumers, including the REB. The ADB estimates that, despite the introduction of lower-priced power from IPPs, electricity tariffs will still need to increase to cover the costs of generating power. [Currently, PDB sells power to the REB at a subsidized rate of 1.81 taka/kWh, the lowest rate for any of its commercial customers.] All of these increased costs will ultimately need to be passed on to the consumers in the PBSs in some form. The REB and the PBSs will need to participate actively in the discussions surrounding power tariffs and the social subsidies that may be provided by the GOB to ensure that the viability of the PBSs is not undermined and that electricity remain within affordable limits to rural consumers.

4.3 REB Requested Assistance Items

The REB, with support from NRECA, has provided the energy team with a concept paper of proposed assistance activities. In general, the paper recognizes the need for a transitional program and concentrates on direct RE tasks. The full text of this paper is contained in the Appendix, and a summary follows:

- Enhanced Distribution System Reliability – This activity deals primarily with engineering and operations:
 - Operation and systems maintenance practices
 - Systems planning and engineering
 - Small power generation and power supply planning
- Continued Enhancement of REB's Training Function and Development of the RE Academy – This activity concentrates on training strengthening and enhancement, and the proposed Training Academy:
 - Training academy feasibility study, curriculum, planning, and design
 - Improved PBS staff training in management, finance, accounting, engineering, technical, and computerization
- Enhanced Information Technology and Overall Management Development – The need to develop MIS systems and train management on the utilization is well recognized at the REB and PBS level:
 - Develop an integrated MIS system for all PBSs and the REB
 - Improve utilization of the REB revolving loan fund
 - Expand socio-economic data gathering and analysis program
 - Enhanced management and monitoring systems
 - Expand key accounts management program
- Exploration and Utilization of Off-Grid and Renewable Energy Systems – The current RPPR program does not provide for implementation of renewable and/or off-grid systems, thus assistance has been requested for this activity:
 - Project management assistance with implementation of systems
 - Technical assistance and training for REB/PBS staff in this area

The REB requested areas of assistance are generally consistent with the energy team's recommendations. However, the REB request relies heavily on donor assistance with actual implementation activities. The recommendations in this report follow more of a phase out of donor assistance for implementation, and instead relies on institutional strengthening of existing entities (i.e. REB/PBSs) for implementation support.

5.0 Proposed Future USAID RE Assistance Program in Bangladesh

5.1 Role of USAID

Since the Rural Electrification Program started in 1978, 15 donor organizations have provided grant and loan assistance to the program (See Table 2 below). USAID, however, has played a unique leadership role to date. The original 1976 NRECA/Commonwealth study that recommended that Bangladesh draw heavily on the American rural electrification experience was funded by USAID. USAID also provided the first \$79.20 million for the construction of the distribution system infrastructure and the formation of the first 13 PBSs. These PBSs are now the most financially viable and form the core of the current system of 67 PBSs. Since program inception, USAID has used NRECA, with its unique knowledge of the 65-year old rural cooperative program in the US, to provide assistance to the RE program. While virtually all of the other donors have provided funds for construction and intensification of the RE network, only USAID has provided technical assistance since the inception of the program to build the necessary capacity within the REB and the PBSs to effectively carry out the RE program. USAID's unique contribution, and that of NRECA, is highlighted in every REB Annual Report and in every Directory of Rural Electrification Program Information and Statistics.

Table 2 – Donor and GOB Contributions to the RE Program (in millions of \$s).

Donor	Loan Funds	Grant Funds	Total (million \$s)
USAID	38.80	172.16	210.96
KFAED	79.98		79.98
Finland		23.02	23.02
Japan (JDRG/JBIC)	19.00	80.03	99.03
OPEC	23.60		23.60
CIDA		58.00	58.00
SFD	25.50		25.50
France		1.08	1.08
NORAD		35.15	35.15
China Barter		20.00	20.00
Saudi Arabia		5.73	5.73
Netherlands		38.71	38.71
World Bank (IDA/IDB)	252.40		252.40
ADB	82.35		82.35
GOB		118.34	118.34
TOTAL=	521.63	552.22	1,073.85

In 1997, USAID shifted its RE assistance program from the provision of technical assistance and commodities/construction support to the provision of technical assistance. The Rural Power for Poverty Reduction (RPPR) Program (1997-2002) focuses principally on strengthening selected administrative and management skills pivotal to the sustainability of the overall RE program. Examining donor assistance from USAID, other bilateral donors, the multilateral

development banks (MDBs), and the Government of Bangladesh (GOB) during the 1977-1997 and post-1997 time periods reveals two important trends (see Table 3). First, the GOB contribution to the RE program has grown from 1% to more than 25% of the entire donor funding. Second, USAID's contributions have leveraged significant funds from other bilaterals and the MDBs, despite the reduction in USAID assistance during the post-1997 period and the TA-only focus of the USAID program. Once the upcoming World Bank and ADB loans come on line, USAID's funding leverage in the post-1997 period should grow even greater.

Table 3 – Donor Contributions Over Time and USAID Leveraging (in millions of \$s)

Donor	1977-1997 Period	Post-1997 Period
USAID	179.20 (28%)	31.76 (7%)
Other Bilaterals	173.51 (28%)	236.29 (53%)
MDBs	274.30 (43%)	60.45 (14%)
GOB	3.92 (1%)	114.42 (26%)
TOTAL=	630.93 (100%)	442.92 (100%)
Bilateral/USAID:	1.0	7.4
MDB/USAID:	1.5	1.9
(Bilateral+MDB)/USAID:	2.5	9.3

As a consequence of USAID's seminal role in the creation of the RE program and in creating the institutions that carry it out, the other international donors appear to have tacitly delegated to USAID the ongoing role of providing technical assistance to the REB/PBSs to ensure the continued success of the RE program. Staff at the ADB indicated that in 1996, they cut a deal with USAID that if USAID provided TA through NRECA for five more years, they would provide funds for hardware. The 1996-2000 Netherlands RE assistance program deliberately provided no funds for program monitoring, instead relying entirely on reports from the REB and NRECA to monitor program progress and the utilization of their \$38.71 million. The evaluation report on the Netherlands program recommends that NRECA continue to provide assistance to the REB for five more years, and that the Netherlands speak with USAID as soon as possible about this matter⁵. The REB has indicated that it wishes USAID to resume its funding support for construction/intensification, and not just provide TA. NRECA has also expressed its occasional frustration with the narrowing focus of its technical assistance program, as opposed to its previous assistance role where it was involved in all aspects of REB's management and implementation of the RE program.

⁵ Final Evaluation of the Netherlands Program Aid to the Rural Electrification in Bangladesh, 1996-2000 (pages 7, 25, and 29).

Despite its long history supporting the Bangladesh RE program through NRECA, in the future USAID should:

- 1) Continue its policy of letting other donors provide funds for construction and intensification while USAID provides funds for technical assistance;
- 2) Continue narrowing the focus of its TA to concentrate on overcoming those institutional management challenges faced by the REB and the PBSs that will undermine the sustainability of the RE program in coming years; and
- 3) Resist assuming the responsibility for providing technical assistance to the REB to provide oversight of how well REB manages the resources provided by other donors, especially committing to funding the involvement of NRECA beyond the point where their technical value is at an end solely to provide a “comfort factor” for other donors; if the other donors have concerns about the institutional capacity of the REB or the PBSs, then they should be encouraged to fund technical assistance to strengthen and/or monitor the REB and PBSs.

5.2 The Role of Other Donors and the MDBs

A number of bilateral donors and multilateral development banks (MDBs) have expressed continued support for the RE program in Bangladesh. The Netherlands has expressed interest in providing further capital assistance to the GOB on intensification of the PBSs and in providing support, both TA and commodities, for providing electricity services to off-grid areas utilizing renewable energy technologies. The Germans, through GTZ, are interested in providing \$4 million to the GOB to support renewables in rural areas. The World Bank is also preparing a large capital loan, with associated TA, to support both the intensification of the PBSs, the Rural Power Program, and the use of renewables and other mini-grid approaches to providing electricity to rural populations. The Asian Development Bank (ADB) is focusing capital assistance to the GOB on supporting those PBSs taking over service areas from PDB/DESA, large power generation projects, and the improvement of the transmission system. [The loans currently under consideration by the two MDBs are summarized in Table 4.] From the limited available information, it appears that there is substantial donor support for both commodities for intensifying the distribution grid in rural areas and for supporting the use of renewable energy sources in off-grid areas.

Table 4 – Loan Programs Under Consideration by the MDBs.

Description	World Bank	Asian Development Bank
Technical Assistance Component	Some small TA may be a component of loans and proposed GEF grant for SHS. New project assumes \$45 M in co-financing by other donors (part TA, part loan).	ADTA for renewable energy. PPTA for rural power T&D, and training center.
Capital for Infrastructure and/or Commodities	On-grid: extension, rehabilitation, & rehabilitation of rural grid. Off-grid: supply, co-financing, & renewables.	Rural Power T&D Project
Term	All components to begin in 2001	Renewables TA to begin in 2001 T&D Project to begin in 2002
Funding Level	On-grid: \$120 M loan Off-grid: \$22 M loan	Renewables: \$500 K TA grant TBD Loan T&D: \$600 K TA grant \$320 M loan (with \$3 M TA)

5.3 Proposed Program Elements

To address the evolving RE program enhancements, issues, and needs discussed above, the following two-part transition program is recommended:

Strengthening Business Operations

The goal of this assistance is to increase the resources available to the REB and the PBSs and to strengthen their operations in order to achieve their mandate of providing reliable electricity to the maximum number of consumers in an economically sound fashion.

In order to improve the financial viability of the PBSs through focused intensification efforts, while ensuring adequate resources for ongoing maintenance, the following technical assistance activities are proposed:

- ❑ Characterizing the service territory to identify the existing and potential customer mix, i.e. customer class (industrial, commercial, residential, agricultural, other), location, ability to pay, etc.; and to identify those customers that are un-viable and may not qualify for grid connection.
- ❑ Characterize the PBS itself in terms of financial performance, collections, technical and non-technical losses, operations, maintenance, procurement practices, inventory control, and general management. Areas of sub-standard performance can be identified and remedial action plans put in place.
- ❑ Developing an electrification approach that strategically: improves areas of non-performance and identifies an effective mix of high-tariff customers (industry and commercial). In this manner, revenues of the PBS will increase in a timely fashion thereby allowing the PBS to proceed to a solid foundation and to meet its social goal of serving as many customers as possible.

- ❑ Developing a business outreach program to encourage new industrial and commercial customers and to provide information to encourage and support the development of new businesses.
- ❑ Reviewing the costs of providing service and recommend suitable tariff structures within the guidelines provided by REB.
- ❑ Strengthening the financial forecasting capabilities of the PBS.
- ❑ Improving the collection of socio-economic information to better document the impact of electrification on rural development.
- ❑ Supporting the design and implementation of effective maintenance programs that meet international standards.
- ❑ Supporting the design and implementation of effective safety programs that meet international standards.
- ❑ Working with the REB to develop suitable business planning modules to include within the curricula of the new training academy.
- ❑ Supporting the automation of the collections and billing functions and the financial systems of the PBS.
- ❑ Implementing Geographic Information Systems (GIS) into the business of the PBSs to support identifying the location of potential load centers and to assist with system and maintenance planning.

After piloting these programs at selected PBSs, a model “PBS Business Strengthening Package” would be rolled out to remaining PBSs with the support and promotion of REB.

Strengthening Sector Management

The goal of this assistance is to support the REB and PBSs through the transition of the RE sector from one based on expansion to one based on intensification, sustainable operation, and maintenance of a nation-wide distribution network.

To improve the ability of the REB to target its human and financial resources as effectively as possible, and to support the PBSs, the following technical assistance should be provided:

- ❑ Strengthen the training program and procedures and firmly establish the staff and curricula at a well-managed and appropriately designed and equipped facility that could also be utilized by other Bangladesh power sector entities.
- ❑ Develop preventative and ongoing maintenance programs that address technical and financial issues at the PBS level.
- ❑ Establish suitable maintenance equipment and supply systems to support the PBSs.
- ❑ Establish effective safety programs, reporting, promotion, and accident prevention programs for the PBSs, including appropriate training programs at the institute and a mechanism for acquiring modern safety related equipment. The Performance Targeting Agreements for each PBS should add firm safety programs and accident prevention as a evaluation parameter.

- Update the master plan for electrifying the rural areas of the country with the aim of identifying those areas that would be most difficult to reach through grid extension. This plan would inform the national planning process and would help forecast load demand, power supply needs, and necessary transmission system improvements.
- Establish a power generation unit and finish building up the capacity of REB to continue the Small Rural Power Program into the future until the national power supply deficit problem is overcome.
- Classify the PBSs into separate categories based on potential financial viability and begin a graduated system of human and financial support that will focus more resources on the weaker PBSs while allowing the successful ones greater autonomy and reduced access to subsidized resources, especially loans.
- Analyze the tariff-setting methodologies to explicitly define the costs-of-service for each customer category, the degree and level of cross-subsidies, the level of subsidy received from the GOB for selected customer classes, and the costs of power supply and transmission wheeling. This analysis would position the REB to deal more effectively with the regulator and respond to changes associated with the rationalization of power sector tariffs.

To complement these two areas of assistance to the RE program, the Mission must also address the following elements in its ongoing energy sector reform program. The RE program is an integral part of overall power sector reform and coordination is necessary to protect RE from being negatively impacted by the sector reform process:

- Power Sector Reform Strategy -- A comprehensive analysis of how the RE sector does, and should, fit in with the broader power sector reform strategies being developed.
- Regulatory Reform -- Support to the GOB in creating a regulatory body that would cover all aspects of effective power sector regulation, with particular attention to the RE sector.
- Small Power Development and Distributed Generation -- An investigation into expanding the RE small power development program and potential sources of supply from distributed generation.
- Tariff Reform and Rationalization -- Study on tariff reform and rationalization.
- Renewables and Off-Grid Alternatives -- Investigation into the application of renewable technology and off-grid RE networks in Bangladesh.

5.4 Proposed Implementation Arrangements

In terms of implementing the above program, the energy team has the following recommendations:

1. USAID should provide assistance to the RE program for only 5 more years with the objective of transition, and then phase out all support. This approach recognizes that the USAID/NRECA partnership has created sound institutions that can carry out their mission effectively without further support. Any future assistance should be provided within the context of furthering the economic reform of the energy sector of Bangladesh, and preventing any negative impacts on the RE program.
2. USAID should diversify the source of assistance to the RE program. NRECA should be kept on board, but they should be focused on technical and operational activities being dealt with by the REB and the PBSs. A second assistance provider or providers should be brought in to provide support to the REB and PBSs in strengthening their business planning and management functions while still striving to meet their social mandate. Managing this change in the program will obviously require a great deal of diplomacy on the part of the Mission in dealing both with NRECA and with the REB, but the energy team feels strongly that fresh ideas and insight must be brought in to the assistance program, and that NRECA must begin the process of phasing out. Coordinating the work of two assistance providers in the RE sector will place a larger burden on the Mission, but the expected improvements in program impact are worth the additional effort on the part of the Mission.
3. Obviously, the two assistance providers will need to coordinate their activities since the REB generally develops guidelines for programs implemented by the PBSs. There will also be issues where the two providers will have to work closely together – tariff structure, system planning, computerization/GIS, business training modules, and changes in REB loan conditions to the PBSs among others.
4. Both assistance providers to the RE program should be engaged through contractual mechanisms that will provide the Mission with the necessary level of program management authority. In the case of NRECA, a sole-source contracting procedure is justified for program continuity. For the second provider, a competitive process should be followed. Given the specialized nature of the expertise required, and the potential impact on the RE program, it is recommended that the Mission look beyond their current assistance providers and seek out the best available talent. USAID should also seriously consider eliminating expatriate long term advisors and concentrate on focused short term technical assistance.

5. To better define the program activities described above and to provide resource estimates that can be turned into contractible scopes of work and government budget estimates, it is recommended that the Mission bring in a project design team.
6. In terms of the use of the Mission's local currency resources, the team feels that one high-priority use would be to set up a small revolving loan fund in the REB to support the computerization of the PBSs, especially in support of the collections and billing and financial management systems, as well as the GIS systems. The terms of the loans would be differentiated according to the financial viability of the PBS requesting funds – this policy would support the REB's efforts to target assistance resources to those most in need.

A representative program design and implementation schedule is presented in the following figure.

Appendix

Socio-Economic Benefits of Rural Electrification – Reference Findings

1. NRECA/Sheladia Report of 1996 – The report surveyed 1,000 households, 50 irrigation users, 300 commercial and 59 industrial consumers in 30 villages in 10 PBSs for the quantitative analysis, and 142 village members from four PBSs for the qualitative analysis. The key findings are as follows:
 - ❑ Electrification was ranked as the top priority for infrastructure development which would improve their general quality of life,
 - ❑ Electrification has had a positive impact on every socio-economic factor,
 - ❑ Income has increased and job opportunities expanded (average income of electrified households is twice that of non-electrified households),
 - ❑ The poverty rate is 27%-34% in electrified villages, while the National average is 46%,
 - ❑ Improvement in health care, particularly immunizations and use of latrines,
 - ❑ Improvement in sanitary conditions
 - ❑ Electrification was cited as the primary influence in betterment in education for children (96%),
 - ❑ Breaking down the isolation of villages,
 - ❑ Significant improvement in the well being of Women,
 - ❑ Non-farm income increased by 67% in electrified villages, and
 - ❑ Electrified households save 40% more than non-electrified households and have significantly more disposable income to improve their quality of life.
2. ADB Dhaka Power Systems Upgrade Project Appraisal Report 1999 – The report cites the above study, ADB's internal socio-economic evaluation, and the 1995 report "Rethinking Rural Poverty – Bangladesh as a case study". ADB's appraisal report cites the following socio-economic impacts of rural electrification:
 - ❑ The multiplier effect of the USAID program is that the creation of PBSs has caused local markets to expand and spawned a new class of entrepreneurs,
 - ❑ Use of local raw materials has expanded creating a significant number of local jobs and businesses,
 - ❑ One of the six principal infrastructure factors identified as a detriment to poverty was rural electrification, and
 - ❑ Poverty was found to be substantially lower in villages with electricity.
3. SARI Energy Workshop on Rural Energy 2001 – The presentation by Mr. Najmul Hossain of Data International cited the following findings:
 - ❑ Direct benefits of electrification – Multiple cropping, home based economic activities, increased employment and income generation, and enhanced investment opportunities,
 - ❑ Indirect benefits of electrification – Multiplier effect of enhanced economic activity
 - ❑ Electricity compliments other rural development activities, and
 - ❑ Benefits of electricity are greatest where the economic and social climate are conducive to growth and enhanced opportunities.

4. Final Evaluation of the Netherlands Rural Electrification Aid Program 2000 – The reports cites the following effects of rural electrification:

- The most significant benefit at the household level is the savings on fuel (kerosene), batteries, and fuel time/transport costs,
- Quality of life has increased,
- Street lighting has improved the safety of Women, and
- Productive use benefits of electrification.

The report then cites similar statistics as the NRECA/ Sheladia Report of 1996. Unlike other reports and studies, the Netherlands report cautions against overrating the socio-economic benefits of electrification, and credits much of the general improvement in socio-economic conditions as normal improvement in a developing country which addresses these issues in a number of ways (not solely electrification).

5. The World Bank's Implementation Completion Report for the Third Rural Electrification Project in Bangladesh (June 2000) – This report cites the following benefits of rural electrification and the economic benefits of their project.

- The project resulted in several outcomes ranging from the benefits of better household lighting (higher quality of life, opportunities for study, extra household earnings) to more productive energy use in industry and agriculture.
- Using a simplified methodology for economic analysis based on: (a) the minimum lighting benefits for domestic and commercial consumers in comparison to kerosene oil lamp usage (this method quantifies benefits only for the first 10 kWh per month out of an average of 37 kWh/month [for the 216,971 new customers]; and (b) opportunity cost of alternative diesel driven equipment for industrial and irrigation consumers [9,590 new customers], the World Bank calculated that the EIRR [economic internal rate of return] computed on this basis works out to 95.3% and the net present value is Tk. 3613 million.
- The subsidy element required (by soft on lending terms, low bulk supply tariffs and initial operating subsidies to the PBSs) has been acknowledged and justified on account of the high economic gains and the national importance in improving access to rural areas.

Bangladesh Rural Electrification Program

Concept Paper - Potential Areas of Technical Assistance From USAID

(Prepared – 6/6/01)

Background

USAID was the pioneer of the rural electrification effort in Bangladesh with the initial funding of a feasibility study in 1976 that led to the creation of the Rural Electrification Board in 1978. Since that time, USAID has partnered with REB and NRECA to provide funding for commodities and technical assistance, which was provided by NRECA.

The USAID funded technical assistance program currently being implemented as the Rural Power For Poverty Reduction (RPPR) Program is addressing four main areas that complement the USAID Mission's Strategic Objectives for the energy sector. These four major areas include the following: IR #1- Improving Member-User Satisfaction and Increasing Their Participation; IR #2 - Enhancing REB and PBS Management; IR #3- Enhancing PBS Support Services; IR #4 - Developing the Framework for A Small Power Generation Program. There are twenty-one individual activities under these four major areas. The overall RPPR Program will promote the RE Program as a "means" for improving socio-economic conditions of the rural people rather than an end in itself.

This document is based on identified needs of the Bangladesh RE Program as presented to the USAID Team during meeting with REB Chairman and four full-time Members on June 4, 2001. At the conclusion of the meeting, the USAID requested REB that a summary of the identified needs be prepared with priorities given as to the importance of providing future resources to address the needs. In order to focus the Program's identified needs as presented, this document also attempts to consolidate these identified needs into specific functional/related areas in such a way as to allow TA activities to be developed to address these needs.

Potential Areas of USAID Assistance to Meet Needs of RE Program

Despite the Program's recognized success, the major requirements related to the continued development and expansion of the RE Program continue to exist. While many of the functional areas are being handled well by the REB and PBSs (rural electric societies), there are specific functional areas that require further capacity building in order to achieve GOB's objectives for the power and energy sectors. Also the "development needs" of the Program have changed as the Program has grown and evolved from being simply a major construction effort to now being one that requires effective management and operation of the systems. This is particularly important with regard to REB being properly prepared to function within the sector that is currently undergoing major reform.

The RPPR Program initiated a number of activities that need further development and implementation in order to more fully achieve the results that were initially envisioned. The following is a list of potential areas that USAID could support to help REB/PBSs address some of the RE Program's current needs:

▪ ***Enhanced Distribution System Reliability***

As successful as the REB program has been, it has only reached 20% of the rural population of Bangladesh, so it is clear that the task of extending new lines to non-electrified areas will continue for the foreseeable future. However, with the growth of the constructed system new challenges have emerged. Proper power supply planning is needed for all PBS systems, particularly the larger ones, in order to effectively address changes in load patterns and growth. Load growth in the electrified areas also requires increased attention to upgrading the capacity of the existing system and utility plant. The increasing age of the lines and facilities previously constructed by REB requires an increased level of maintenance attention if they are to continue to provide an acceptable level of service to the PBS consumers. The transfers of service territory from BPDB and DESA often include facilities incorporating designs different from those typically used by PBSs or lines and equipment in poor condition due to lack of maintenance, raising the question of how or whether to incorporate these facilities into the REB plant. All of these challenges call for an increased effort on the part of REB to address the requirements for rehabilitation, upgrading of existing system components, and continuing with standard maintenance practices, without losing focus on needs for system expansion into non-electrified areas.

Priorities: Key technical assistance components for addressing system reliability deal with both engineering and operations and include:

- Operations and System Maintenance Practices: Implementation of fully functioning supply system for Operations, Maintenance, Repair and Replacement (OMRR) materials; Establishment of "model" facilities for providing opportunities for on-the-job training; development of appropriate monitoring tools and techniques for REB; Effective implementation of an appropriate job training and safety program for technical skill development of personnel and proper safety.
- System Planning and Engineering: Long Range Plans and Construction Work Plans for PBSs; Analysis of alternatives for sub-transmission and distribution system improvements; Utilization of engineering analysis software as planning tool for REB and its consultants; Preparation and utilization of engineering planning studies; Expanded utilization of modern planning tools (i.e., GIS) for REB's Program Planning and System Engineering & Design (SE&D) Directorates.
- Small Power Generation and Power Supply Planning: Ongoing support for development of SPG Program that includes a total of 11 small power generation sites (Build, Own, Operate (BOO) basis) serving the PBSs; Power requirements

analysis; Resource planning and analysis; Private power contracting and administration

- ***Continued Enhancement of REB's Training Function and Development of the RE Academy***

Throughout the RPPR Program efforts have focused on enhancing the REB Training function through staff development and the preparation of curriculum materials for use in Programs included in REB's Curriculum Plan. This is ongoing and will continue to remain as a critical component related to enhancing REB's training function. Prior to this activity, no major effort had been devoted to developing the materials needed for conducting these programs, particularly the programs dealing with more advanced subject areas associated with utility planning, management and technical operations.

While REB and PBS staff have been trained throughout the development of the RE Program, the needs of the Program have changed from being mainly focused on a major system construction effort to one that has evolved into a large nationwide Program that has far more sophisticated management and operational requirements. As such the skills of REB/PBS staff and the consulting engineers must be further enhanced to meet these changing requirements. In addition to need for enhancing the skills of existing staff, many fresh candidates are being recruited as new employees to fill new positions. Also, as turnover occurs, there is a constant need to provide training to personnel who are being promoted into new positions that have occurred through retirements and departure of previously trained staff, many of whom were well qualified in their specific jobs. These development requirements cover all areas of technical, engineering, management, finance/accounting, and computerization/information technology. The development of PBS management personnel continues to remain as an important institutional requirement for the Program, as well as the development of those who serve as Directors on the PBS Boards.

To better meet the ongoing need for trained personnel, REB is currently proceeding with plans for the development of a full-fledged Training Academy for the RE Program with potential use by the Power/Energy Sector. The Asian Development Bank has already agreed to provide funds (approximately \$300,000) for the technical assistance required for the initial planning and design of the Academy, as well as the eventual construction of the facility. Due to various procurement modalities that are time consuming and which cause difficulties in predicting the final selection of consultants, REB prefers to have NRECA assigned to do this work under the USAID funding. As NRECA knows the RE Program and the needs of the Program, REB feels NRECA would provide the consultancy services that would be the most effective in achieving REB's desired results for the full development of the Training Academy. The effort required for the institutional development of the Training Academy will need to extend over a period of time, which would include requirements involving the Academy's overall administration, program delivery, staff development, ongoing curriculum/program development, and facilities management. At an earlier date during the initial analysis and planning for the Academy, REB had expressed in writing to NRECA and USAID that they would like to

have an NRECA advisor involved in helping to provide actual oversight of these technical assistance activities on behalf of REB. This institutional development effort is a high priority for the entire REB management.

Priorities: Key areas of importance for the development of trained manpower include:

- Providing necessary expertise and having continuity of technical assistance throughout the entire process related to the development of the new Training Academy, including the initial feasibility study, planning and design;
- Continued need for the development of REB/PBS personnel through improved training, particularly in more sophisticated topics related to all areas – management, finance/accounting, engineering, technical, and computerization.

▪ ***Enhanced Information Technology and Overall Management Development***

In recent years the use of computers has been a gradual development within the RE Program with the introduction to basic computerization through stand alone computers being used for standard applications. This initial step is only the beginning as the size of the Program now demands an expansion of the use of information technology that will include the development of integrated systems that support all functional areas including, management, engineering, finance, accounting, materials management, procurement, and administration. The capability to generate timely reports that provide the management with current information for improved decision making is a critical need.

The ongoing need for further management enhancement within the REB organization and the PBSs remains essential to the viability of the Program. This is especially true as it continues to grow at an even faster rate than in previous years. Again an important factor is sheer size of the Program and the resulting requirement for the introduction and utilization of more effective management and monitoring tools for providing the proper oversight of the REB and PBS activities. Because of these developments, the close monitoring and supervision of the PBSs that was once possible during the earlier years of the Program is not there now. The idea of “strengthening the PBSs” so that they can perform more effectively with proper REB monitoring needs to become the new paradigm as the Program continues to expand.

Priorities: Some key areas to address these needs include the following:

- Development of integrated information system at REB and PBSs (i.e., general ledger, customer billing, materials management, management information reporting, etc.);
- Improved utilization of the REB Revolving Loan Fund;
- Expanded development and implementation of data gathering “system” for use in measuring and monitoring the socio-economic impact of RE Program – vitally important to GOB and donor community.;
- Enhanced management and monitoring tools (i.e., Performance Target Agreements (PTA), Benchmarking, Financial Forecasting, Cost of Service

- Studies, etc.) that provide effective results and timely information for more effective decision making
- Expanded implementation of Key Accounts management program and other member services activities (customer awareness, power use, economic development linkages and member education).

▪ ***Exploration and Utilization of Off-Grid and Renewable Energy Initiatives***

While the RPPR program is providing assistance to REB in the preparation of the components for an overall Renewables Program, no provisions were included in the current RPPR design to assist with the renewable energy program implementation. The assistance that is already underway will go a long ways towards developing the various elements (i.e., policies, technical specifications, initial GIS capabilities, etc.) needed to manage the renewable program, however it is clear that assistance with implementation will be necessary to assure that it is successful and sustainable. This is of particular important given the fact that the proposed Renewable Energy Project that was submitted to the GOB has been recently approved. Also the new project funding currently under appraisal by the World Bank includes a renewable energy component (Solar Home Systems – SHS), a portion of which would be provided to REB.

Priorities: The proposed TA to support REB’s renewable energy program includes two components that were not adequately supported under the current RRPR program. These are:

- Project management assistance in implementation of the REB program for renewable energy electrification.
- Technical assistance and training support for REB/PBS staff involved in the schemes used for the renewable energy program initiatives, as well as private sector agents who will be potentially involved with the proposed schemes.

List of Meetings, Site Visits, and Participants

- June 3, 2001 – w/USAID/Dhaka

Gordon West, Mission Director
Charles Uphaus, Director, Office of Economic Growth, Food & Environment
Bruce McMullen, Senior Energy Advisor
Md. Kamaruzzaman, Engineer (General)

- June 4, 2001 – w/NRECA

James Ford, Team Leader
Kent Wick, CPA & Management Advisor
Mike Cross, Engineering & Operations Advisor
Md. Kamaruzzaman, USAID Engineer (General)

- June 4, 2001 – w/REB

Mesbah Uddin Ahmed, Chairman
Md. Abdus Samad, Member (Engineering)
Golam Mustafa, Member (Finance)
Md. Tauhidul Islam, Member (PBS & Training)
Nirmal Chandra Sarkar, Member (Administration)
James Ford, NRECA Team Leader
Md. Kamaruzzaman, USAID Engineer (General)

- June 6, 2001 – w/Mymensingh PBS-2

Saleh Ahmed, General Manager
One other (?)
Md. Kamaruzzaman, USAID Engineer (General)

- June 6, 2001 – w/Dhaka PBS-1

Md. Wakhilur Rahman, President
Abdud Sabur, General Manager
One other (?)
Md. Kamaruzzaman, USAID Engineer (General)

- June 6, 2001 – at the Ashulia 10 MW Power Station

Dr. Mirza Khairuzzaman, Executive Director, United Summit Power Co., Ltd.
A.N.M. Tariqur Rashid, Manager Development & Operations, United Summit Power
Nidhu Chandra Das, B.Sc. Engg. Elect. (BUET), REB

Abdud Sabur, General Manager, Dhaka PBS-1
One other (?)
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 7, 2001 – w/Dutch

Paul C.F. Zwetsloot, Deputy Head, Development Cooperation, Netherlands Embassy
Drs. Jo-ella P. van Rijn, Energy & Climate, Ministry
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 7, 2001 – w/ADB

Shamsuddin Ahmed, Head, Energy
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 7, 2001 – w/WB

Md. Iqbal, Energy Specialist, Energy & Infrastructure Team
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 7, 2001 – w/PGCB

A.N.M. Rizwan, Managing Director
N. G. Saha, Director (Technical)
Md. Anisur Rahman, Director (Finance)
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 10, 2001 – w/NRECA

Kent Wick, CPA & Management Advisor
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 11, 2001 – w/USAID Dhaka

Bruce McMullen, Senior Energy Advisor
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 13, 2001 – w/REB

Golam Mustafa, Member (Finance)
Md. Tauhidul Islam, Member (PBS & Training)
Nirmal Chandra Sarkar, Member (Administration)
Belayet Hossain, Deputy Director, Planning
Abdul Halim Mollah, Chief Engineer, Planning & Operations
Md. Kamaruzzaman, USAID Engineer (General)

➤ June 13, 2001 – w/USAID/Dhaka

Charles Uphaus, Director, Office of Economic Growth, Food & Environment
Bruce McMullen, Senior Energy Advisor
Md. Kamaruzzaman, Engineer (General)

➤ June 14, 2001 – w/USAID Dhaka

Mary Ott, Deputy Mission Director
_____, Program Officer
Charles Uphaus, Director, Office of Economic Growth, Food & Environment
Bruce McMullen, Senior Energy Advisor
Md. Kamaruzzaman, Engineer (General)

List of Contacts

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U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
OFFICE OF ENERGY, ENVIRONMENT, AND TECHNOLOGY
CENTER FOR ENVIRONMENT
BUREAU FOR GLOBAL PROGRAMS, FIELD SUPPORT AND RESEARCH

The Office of Energy, Environment and Technology (EET) helps developing countries improve the quality of life, increase economic growth and promote sustainable communities by increasing access to environmentally sound energy and improving environmental management practices.

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