

TAR: AFG 38044

Technical Assistance to the  
Islamic Republic of Afghanistan for  
Poverty Reduction and Rural  
Renewable Energy Development  
(Financed by the Poverty Reduction  
Cooperation Fund)

December 2004

## **CURRENCY EQUIVALENTS**

(as of 8 November 2004)

Currency Unit	–	afghani (AF)
AF1.00	=	\$0.022
\$1.00	=	AF45.00

## **ABBREVIATIONS**

ADB	–	Asian Development Bank
NGO	–	nongovernment organization
TA	–	technical assistance

## **TECHNICAL ASSISTANCE CLASSIFICATION**

<b>Targeting Classification</b>	–	General intervention
<b>Sector</b>	–	Energy
<b>Subsector</b>	–	Renewable energy generation
<b>Theme</b>	–	Sustainable economic growth
<b>Subtheme</b>	–	Developing rural areas

## **NOTE**

In this report, "\$" refers to US dollars.

Prepared by A. Azimi and S. Tanaka.

## I. INTRODUCTION

1. During the Country Strategy and Program Update Mission in March 2003, the Government of the Islamic Republic of Afghanistan requested the Asian Development Bank (ADB) for technical assistance (TA) to develop renewable energy resources in remote areas to support its poverty reduction efforts. The TA is included in ADB's 2004 TA program and the Country Strategy and Program Update for Afghanistan.<sup>1</sup> This initiative will complement the March 2003 ADB TA for promoting the development of renewable energy in small towns and rural areas financed from the Danish Fund for Renewable Energy Development for the Poor.<sup>2</sup> The current proposal was endorsed for funding by the Poverty Reduction Cooperation Fund in January 2004. The ADB Fact-Finding Mission visited Afghanistan 10–16 June 2004 and reached understanding with the Government on the goals, purpose, scope, implementation arrangements, cost, financing arrangements, and terms of reference of the TA. The TA framework is in Appendix 1.

## II. ISSUES

2. Most of Afghanistan's 25 million people have no access to modern forms of energy, such as electricity, gas, and liquid fuels. Traditional fuels meet more than 85% of energy needs, while commercial energy sources, such as oil, gas, coal, and hydropower, meet the remaining requirements. Fuelwood accounts for about 75% of total energy supplies. More than 80% of the population live in rural areas and depend on traditional fuels (fuelwood and crop residues) for cooking and heating water and kerosene for lighting. This is having an adverse impact on forests and watersheds. In addition, burning these fuels increases indoor air pollution, which adversely affects the health of women and children in particular. Rural electrification is the only way that the majority of the rural populace can move toward attaining energy security and that social welfare can be enhanced.

3. Extreme poverty in rural areas is related to the lack of income earning opportunities, and the productive use of electricity would help reduce poverty by providing alternative sources of livelihoods. The power infrastructure consists primarily of three isolated power systems. Electricity networks are located around major urban centers. The remoteness of rural locations and the country's topography would make an expansion of the electricity supply in these areas through a centralized grid system difficult, and such an expansion may not be economically feasible. Therefore an exploration of renewable, sustainable, alternative energy sources that can be maintained at a decentralized level and that the poor can afford is urgently needed. The Government's program for environmental preservation and regeneration envisages promoting renewable energy in the private sector. An increase in the use of renewable and more efficient energy resources would result in less reliance on conventional sources of energy, such as electricity, coal, oil, and gas.

4. Solar energy is considered the most important renewable energy source. Estimates indicate that in Afghanistan, solar radiation averages about 6.5 kilowatt-hours per square meter per day, and the skies are sunny for about 300 days a year. Consequently, the potential for solar energy development is huge, not only for solar water heaters for homes, hospitals, and

---

<sup>1</sup> The TA first appeared in *ADB Business Opportunities* (Internet edition) on 28 May 2004.

<sup>2</sup> ADB. 2003. *Renewable Energy Development in Small Towns and Rural Areas*. Manila. (TA 3874), for \$450,000, approved on 21 March 2003. This TA complemented Subcluster 1 Capacity Building for Reconstruction of Agriculture and Natural Resources Management, which forms part of the TA Cluster (ADB. 2002. *Proposed Technical Assistance Cluster to the Republic of Afghanistan for Capacity Building for Reconstruction and Development*. Manila [TA 3874-AFG, for \$14.5 million, approved in 15 May 2002]).

other buildings, but also for generating electricity. In addition, some 125 sites have been identified for microhydro resources, with the potential to generate about 100 megawatts of electricity. The development of solar and other renewable energy sources will not only help reduce poverty, but will also alleviate deforestation.

5. Given the international climate of awareness of global warming and other environmental impacts caused by imprudent energy use, the time is right for developing a cohesive program to extend renewable energy to rural communities that have little or no prospect of grid electrification. A renewable energy village electrification plan should not just electrify villages, but should also achieve measurable improvements in terms of addressing the poverty-environment nexus identified as both a source and a symptom of underdevelopment in rural Afghanistan. Consistent with this approach, the Government is committed to addressing the lack of modern energy sources experienced by large parts of the rural population by means of community-based development and income generation activities.

6. Solar energy technologies have been demonstrated successfully; however, few examples are available wherein the provision of alternative energy has directly resulted in tangible and measurable improvements in the income of poor communities on any significant scale. Some of the apparent reasons for this are (i) the high initial costs of technology, which the poor cannot afford; (ii) the limited number of locally relevant productive applications suitable for alternative energy; (iii) the poor communities' limited or no access to supply markets; (iv) the absence of efficient technology service providers and of suitable projects in remote areas that could be bankable through financial institutions; and (v) the lack of support from the central energy ministries, because their mandate is energy provision and not income generation for the poor. In view of this, developing innovative and decentralized approaches to poverty reduction in Afghanistan by harnessing solar energy would be appropriate.

7. This kind of innovative, community-based approach has been successfully used in India since 1986. Under this approach, a community-based nongovernment organization (NGO), the Barefoot College, has demonstrated the effective application of solar energy, particularly in rural areas. This NGO has also pioneered the concept of so-called barefoot solar engineers working as energy entrepreneurs in remote villages. This is a unique concept in which semiliterate and unemployed village youths—called barefoot because they lack physical infrastructure and a formal education—are given specialized training in operating and maintaining solar energy systems through small workshops to enable them to undertake these activities in their villages. The barefoot engineers provide community-based expertise and train poor villagers to assemble solar photovoltaic systems. Their products come with a 10-year service warranty. The work of this community-based NGO is funded by the United Nations Development Programme, the European Union, and the Indian Government. The Indian experience has demonstrated the viability of community-managed solar energy systems that provide a sustainable solution to the solar electrification of rural villages.<sup>3</sup>

8. The successful experience with the barefoot approach in India could be replicated in rural areas of Afghanistan. This approach would involve community-level capacity building in installing and maintaining renewable energy systems through a network of rural electricity workshops and trained barefoot engineers at the grassroots level. However, for community-managed systems to work and be effective, the specific roles and responsibilities of the

---

<sup>3</sup> Since 1993, the Barefoot College and its associates in India have installed 2,300 fixed home lighting systems and 1,200 solar lanterns in 3,400 households in 114 villages with a cost-recovery fee from the poor of \$0.5 to \$1.5 a month.

stakeholders have to be clearly identified. In this context, decentralized approaches to poverty reduction in Afghanistan need to be examined through a pilot project approach to solar systems for sustainable income generation, heating, cooking, and lighting. Such a pilot project will demonstrate the role of nonconventional, renewable energy as a vital means for reducing poverty and creating sustainable livelihoods in low-income communities in remote rural areas across the country. The project design will be based on lessons learned from the experience of ADB, the World Bank, and other aid agencies in supporting renewable energy technologies in several countries in the region, including India, Indonesia, Philippines, Sri Lanka, and Uzbekistan. Some of these lessons highlight the need to (i) provide microfinance options for technologies with high front-end costs like solar photovoltaic energy systems; (ii) understand the market characteristics of renewable energy, including the willingness and capability of the poor to pay; and (iii) build capacity among stakeholders.

9. A pilot project is needed because of Afghanistan's special postconflict circumstances. The pilot project would demonstrate how solar energy could be used to enhance the quality of life for low-income communities living in remote villages with no prospects for grid electricity. It would also show how a community-based approach could lead to the success of such programs. Sustainable human development will be achieved by building local capacity within communities to set up, operate, repair, and maintain solar photovoltaic generating systems to meet local needs. Solar energy not only provides an appropriate solution for heating, cooking, and lighting in rural areas, but also contributes significantly to progress in education, health, agriculture, and rural industry and other income generation activities that could help reduce poverty. The lighting provided by solar energy could be used to run literacy and other courses in the evenings that would benefit children and adults working in the fields during the day. Solar-powered pumps could provide irrigation for agricultural production in which 85% of Afghans are engaged. This is important both for increasing incomes and for enhancing food security for vulnerable families.

10. Solar energy programs will also promote the empowerment of women by training illiterate and semiliterate women to become barefoot technicians who could install, operate, maintain, and repair solar energy systems; by freeing them from having to walk long distances to collect fuelwood; and by reducing the health hazards associated with indoor burning of firewood. Community-based ownership and management of the solar energy systems will ensure full participation by local people in all aspects of decision making, including system design and implementation. In particular, disabled people who were maimed in the conflict and tend to be marginalized could be associated with the initiative by training them as barefoot technicians. The preparation of an investment plan for the use of photovoltaic technology on a national scale using one or more proven implementation strategies is possible.

### **III. THE TECHNICAL ASSISTANCE**

#### **A. Purpose and Output**

11. The goal of the pilot project is to establish the necessary conditions for pre-electrification of remote areas using solar power. The long-term objective is to lay the foundations for sustainable dissemination and use of solar systems in those rural areas that cannot be accessed by the planned national grid in the near and medium term. The specific objective is to evaluate the potential for increased use of solar photovoltaic technology to provide solar-powered electricity in rural areas with the involvement of NGOs. The TA will also help formulate an approach toward developing renewable energy in isolated rural areas, including

implementation strategies. The strategy will identify options for mainstreaming renewable energy to improve access to electricity by the poor in rural areas.

12. The TA will have the following outputs: (i) review the potential for renewable energy options and assess needs in selected, remote, off-grid areas; (ii) develop pilot renewable energy and demand management programs in off-grid rural areas; (iii) design and establish pilot projects for solar energy systems, including photovoltaic systems; (iv) create and support alternative income generation opportunities for communities; (v) build capacity to install, maintain, and service rural renewable energy systems, particularly solar energy systems, at the community level; and (vi) establish a microfinance facility for solar energy projects.

## **B. Methodology and Key Activities**

13. The TA will establish the necessary policy, technical, financial, social, and institutional requirements for expanding the market for photovoltaic systems on a demand-driven, cost-recovery basis. It will include developing training packages to increase the number of personnel qualified to install, maintain, and finance these systems. The TA specifically targets the poor and illiterate and vulnerable people and its primary beneficiaries will be those with no formal education, especially disabled people, youth, and women. It will develop the capacity of these poor, marginalized people to design, install, and service these systems and of the public sector to promote, monitor, and evaluate the performance of these systems. It will also provide the policy framework for expanded use of solar photovoltaic systems. The TA will provide solar photovoltaic systems at the community and household level in approximately 10 villages. The villages will be selected taking into account the potential for solar energy development and the willingness of the local communities to participate in the development efforts. A small microfinance facility will be created to help households and businesses meet the high up-front costs of the solar energy systems. The TA will evaluate the success of the pilot projects, define the critical factors needed to replicate them in other locations, and outline the institutional requirements for supporting those trained in solar energy systems. The community-based solar energy systems will initially be financed through the microfinance facility under suitable terms that would enable sustainable financing of these systems.

14. The TA will have the following key activities:

- (i) Undertaking a need assessment of the needs of 10 villages in relation to solar photovoltaic systems;
- (ii) providing solar photovoltaic systems to the poor in 10 remote villages;
- (iii) investigating the feasibility of setting up solar photovoltaic-powered common facilities for income generating activities;
- (iv) training 10 people from different ethnic groups and including the disabled as solar technicians at the Barefoot College in India and training approximately 100 people (10 each from each of the 10 villages) in installing and maintaining solar systems and as energy entrepreneurs;
- (v) establishing a microfinance facility to enable communities to borrow to set up solar energy systems not covered by the initial assessment;
- (vi) carrying out project management and impact assessment activities; and
- (vii) disseminating information about the benefits of the solar energy systems.

## **C. Cost and Financing**

15. The total cost of the TA is estimated at \$900,000 equivalent, of which the foreign exchange cost is \$600,000 and the local currency cost is \$300,000 equivalent. ADB will finance

\$750,000 equivalent, which includes the entire foreign exchange cost and \$150,000 equivalent of the local currency cost. The TA will be financed on a grant basis by the Poverty Reduction Cooperation Fund and administered by ADB. The Government will finance the remaining \$150,000 equivalent of local currency costs through in-kind contributions, including office accommodation and facilities, counterpart staff, and data and other information needed for the TA. Detailed cost estimates and a financing plan are provided in Appendix 2.

#### **D. Implementation Arrangements**

16. The Ministry of Water and Power is responsible for developing electricity generation programs and will be the executing agency for the TA. The Ministry of Water and Power will coordinate with the Ministry of Rural Rehabilitation and Development and NGOs in carrying out the activities under the TA and will provide the TA leader and counterpart staff to work on the TA. A steering committee will be set up consisting of key stakeholders to guide the project activities and help disseminate its results. The steering committee will also help integrate the pilot approach into the Government's policies and plans.

17. The TA will be carried out over 2 years by internationally recognized individual consultants working in association with domestic consultants. The TA will commence in January 2005 and will be completed by December 2006. The total input of international and domestic consultants will be about 8 and 30 person-months, respectively. The consultants will procure the equipment required for TA implementation and for the pilot projects following direct purchase procedures in accordance with ADB's *Guidelines for Procurement*. The procurement of the hardware to operate village- and household-scale pilot projects will be considered in consultation with the Government and local stakeholders. The equipment will be delivered to the Government at the conclusion of the TA.

18. Due consideration will be given to involving the Indian Barefoot College and other national and regional NGOs, such as the Bangladesh rural advancement cooperatives, in the implementation of the TA. All consultants will be engaged by ADB using the quality- and cost-based selection procedures on the basis of simplified technical proposals in accordance with ADB's *Guidelines on the Use of Consultants* and other arrangements satisfactory to ADB for the engagement of domestic consultants. The following consultants will be required: (i) a renewable energy development specialist, (ii) an environmental specialist, (iii) a financial analyst, (iv) an economist, and (v) a social/poverty specialist. Outline terms of reference for consulting services are given in Appendix 3.

19. The consultants will submit an inception report 1 month after TA commencement, an interim report in 6 months, and a draft final report 22 months later. The final report will document the lessons learned from the implementation of the pilot projects and recommend measures for replicating them in other parts of the country. The results of the TA will be disseminated through a national seminar with broad participation by all stakeholders and the mass media. Regional workshops will be held to share the results of the Project and increase learning and interaction.

#### **IV. THE PRESIDENT'S DECISION**

20. The President, acting under the authority delegated by the Board, has approved ADB administering technical assistance not exceeding the equivalent of \$750,000 to the Government of Afghanistan to be financed on a grant basis by the Poverty Reduction Cooperation Fund for Poverty Reduction and Rural Renewable Energy Development, and hereby reports this action to the Board.

## TECHNICAL ASSISTANCE FRAMEWORK

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumptions and Risks
<p><b>Goal</b> Economic development and poverty reduction by expanding access to electricity in remote villages in Afghanistan.</p>	<p>Pilot renewable energy projects for electricity supply to rural consumers.</p>	<p>Monitoring reports.</p>	
<p><b>Purpose</b> Accelerating the development of power generation based on renewable energy in off-grid, remote, rural areas; building capacity for solar energy systems; and supporting sustainable livelihood opportunities at the community level.</p>	<p>Power available in selected rural communities and trained people available to operate and manage the systems.</p>	<p>Data on energy generation by community-based organizations.</p>	<p><b>Assumption</b> Local government agencies and communities cooperate.</p>
<p><b>Outputs</b> Review potential for renewable energy options and assess needs in selected, off-grid, remote areas.</p> <p>Develop pilot renewable energy and demand management projects in off-grid, rural areas.</p> <p>Design and establish pilot projects for solar energy systems, including photovoltaic systems.</p> <p>Identify alternative income generation opportunities.</p> <p>Build capacity at the community level to install, maintain, and service rural solar energy systems.</p> <p>Create and support sustainable livelihood opportunities for communities.</p>	<p>Review and assessment of renewable energy and demand management potential.</p> <p>Well-designed pilot projects that are sustainable.</p> <p>Systems are operating.</p> <p>Opportunities identified and available.</p> <p>Villagers trained as skilled workers and technicians (110 planned).</p> <p>Some productive opportunities are created.</p>	<p>Reports on energy data and trends and other reports by the consultants</p> <p>Project reports.</p> <p>Physical facilities.</p> <p>Rural poor assisted with employment opportunities.</p> <p>Training courses, manuals, and workshops.</p> <p>Communities using available power.</p>	<p><b>Assumption</b> Data are available and capable consultants are selected.</p> <p>Communities able to identify productive uses for renewable energy.</p> <p>Local government agencies cooperate and provide necessary information.</p> <p>Communities and consultants able to identify options.</p> <p>Capable instructors and training facilities available.</p> <p>Communities able to identify productive uses for renewable energy.</p>

*Continued on next page*

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumptions and Risks
Establish microfinance facility for solar energy projects.	\$100,000 available.	Fund operating.	Nongovernment organizations and communities support the fund's operations.
<p><b>Activities</b></p> <p><b>1. Assessment</b> Analyze current situation and select pilot sites depending on need, willingness to pay, and ability to sustain the technology.</p> <p><b>2. Provision of Solar Systems</b> Select suppliers, procure equipment, and install solar photovoltaic systems.</p> <p><b>3. Alternative Income Generation</b> Build community training centers, install power plants, and assemble equipment.</p> <p><b>4. Training and Capacity Building</b> Build capacity to install and maintain solar energy systems at the community level.</p> <p><b>5. Microfinance Facility for Solar Energy</b> Establish guidelines and procedures for operating, managing, and administering the microfinance facility.</p> <p>Establish mechanism for operating and administering the facility established.</p>	<p>Assessment of renewable energy and demand management potential in selected areas.</p> <p>Interim report due in 6 months.</p> <p>Equipment procured and installed on time. Installation complete in 12 months.</p> <p>Community training centers established a year from commencement of the technical assistance.</p> <p>Ten people trained at the Barefoot College in India and 100 people from 10 villages trained in 1.5 years from commencement.</p> <p>Steering and management committees established and communities empowered.</p> <p>Facility is operational a year from commencement.</p> <p>Draft final report due 22 months from commencement.</p>	<p>Policy dialogue, review mission, progress report, and consultants' reports.</p> <p>Operating solar energy systems.</p> <p>Operational reports and review missions.</p> <p>Course materials and manuals and progress reports.</p> <p>Progress reports and review missions.</p> <p>Review missions and progress reports.</p>	<p>Timely consultant recruitment and acceptable security situation.</p> <p>Delays in implementation, possible misoperation and damage of facilities.</p> <p>Communities and local stakeholders are involved in the centers' activities.</p> <p>Willingness of communities to overcome cultural and religious barriers to undergo training.</p> <p>Government agreement to involvement by nongovernment organizations.</p> <p>Community participation in utilization of funds.</p>

Continued on next page

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumptions and Risks
<p><b>6. Management and Impact Assessment</b> Prepare an assessment report.</p> <p><b>7. Dissemination</b> Hold regional and national workshops to disseminate information about the benefits of solar energy systems.</p> <p><b>Inputs</b> Consulting Services</p> <p>Costs</p> <p>Financing</p>	<p>Review identified projects and their progress and recommend measures to address concerns.</p> <p>Draft final report due in 22 months.</p> <p>National and regional workshops on solar energy held over 1.5 years.</p> <p>International consultants: 8 person-months.</p> <p>Domestic consultants: 30 person-months.</p> <p>Total cost: \$900,000 Foreign exchange: \$600,000 Local currency equivalent: \$300,000 \$750,000 equivalent from the Asian Development Bank's Poverty Reduction Cooperation Fund, \$150,000 equivalent from Government resources.</p>	<p>Review mission and progress reports on renewable energy options.</p> <p>Workshop proceedings.</p> <p>Consultants' contracts.</p> <p>Policy dialogue, review mission, and periodic reports.</p>	<p>National and local regulations are complied with.</p> <p>Participation by stakeholders.</p> <p>Timely engagement and fielding of consultants.</p>

**COST ESTIMATES AND FINANCING PLAN**  
(\$'000)

Item	Foreign Exchange	Local Currency	Total Cost
<b>A. Poverty Reduction Fund Financing<sup>a</sup></b>			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	150.0	0.0	150.0
ii. Domestic Consultants (including nongovernment organizations)	0.0	60.0	60.0
b. International and Local Travel <sup>b</sup>	18.0	10.0	28.0
c. Reports and Communications	5.0	3.0	8.0
2. Equipment			
a. Hardware for Pilot Projects <sup>c</sup>	135.0	0.0	135.0
b. Office Equipment <sup>d</sup>	15.0	0.0	15.0
3. Training, Seminars, and Conferences			
a. Training and Capacity Building <sup>e</sup>	100.0	0.0	100.0
b. Workshops	0.0	17.0	17.0
4. Surveys and Studies	0.0	10.0	10.0
5. Microfinance Facility for Solar Energy <sup>f</sup>	100.0	0.0	100.0
7. Miscellaneous Administration and Support Costs	15.0	30.0	45.0
8. Contingencies	62.0	20.0	82.0
<b>Subtotal (A)</b>	<b>600.0</b>	<b>150.0</b>	<b>750.0</b>
<b>B. Government Financing</b>			
1. Office Accommodation and Transport	0.0	50.0	50.0
2. Remuneration and Per Diem of Counterpart Staff	0.0	60.0	60.0
3. Other	0.0	40.0	40.0
<b>Subtotal (B)</b>	<b>0.0</b>	<b>150.0</b>	<b>150.0</b>
<b>Total</b>	<b>600.0</b>	<b>300.0</b>	<b>900.0</b>

<sup>a</sup> Administered by the Asian Development Bank.

<sup>b</sup> Includes domestic air and local travel costs of international and domestic consultants.

<sup>c</sup> Includes cost of pilot solar energy systems.

<sup>d</sup> Includes cost of office hardware (a photocopier, four desktop computers, and a printer) and computer software for word processing and spreadsheet analysis.

<sup>e</sup> Includes cost of training 12 people abroad in community-based renewable energy development and of domestic training for 100 people in energy entrepreneurship.

<sup>f</sup> Self-sustaining facility to finance the construction of solar energy systems in villages not covered by the initial assessment.

Source: Asian Development Bank estimates.

## **OUTLINE TERMS OF REFERENCE FOR CONSULTANTS**

1. The technical assistance (TA) will be implemented in consultation with concerned stakeholders, including the national and local governments, local communities, nongovernment organizations (NGOs), and other development agencies. The team of international consultants (8 person-months) will coordinate their work with the domestic consultants (30 person-months). The consulting team comprising international and domestic consultants will have the following expertise: (i) a specialist in renewable energy development, (ii) an environmental specialist, (iii) an economist, (iv) a financial analyst, and (v) a social/poverty specialist. The international renewable energy specialist will be the team leader and will allocate tasks among the other consultants and NGOs to maximize their contributions to the TA. The team leader will be responsible for coordinating all activities.

### **A. International Consultants**

#### **1. Renewable Energy Specialist (2 person-months)**

2. The specialist will undertake the following activities:

- (i) Review all previous renewable energy studies, ongoing studies, and Government plans and policies for renewable energy sector development and liaise with various NGOs.
- (ii) Establish potential levels of all forms of energy use in remote and rural areas in the short and medium term.
- (iii) Assess appropriate renewable energy technologies for installations such as solar water heaters, solar lighting systems, and solar photovoltaic systems.
- (iv) Develop innovative options for making renewable energy more affordable for people in rural areas and remote villages.
- (v) Examine the institutional mechanism, in particular, the legal framework, for promoting renewable energy alternatives, including the barefoot approach, and outline capacity building requirements.
- (vi) Visit villages and prepare an inventory of renewable energy technologies that are currently in use and possible new technologies, such as solar energy, that can be used in local communities.
- (vii) Examine the feasibility of increasing options for the development of solar energy, including a suitable financing mechanism.
- (viii) Assess the feasibility of community-based renewable energy development and identify suitable NGOs for collaboration.
- (ix) Select sites for pilot projects after full consultation with the Government and other local stakeholders.
- (x) Design pilot projects and develop a proposal for replicating the barefoot approach to solar energy development in other parts of the country.
- (xi) Supervise the implementation of pilot projects and develop mechanisms for regular monitoring and reporting.
- (xii) Develop, in consultation with other consultants, a proposal for establishing a self-sustaining microfinance facility for solar energy projects, including its institutional and human resource requirements, operating policies, and guidelines.
- (xiii) Present pilot designs, feasibility studies, and other findings of the TA at a national workshop and local workshops.
- (xiv) Organize international and domestic training programs in community-based renewable energy development and solar energy entrepreneurship.

## 2. Environmental Specialist (1 person-month)

3. The environmental specialist will carry out the following tasks:
- (i) Develop selection criteria for potential pilot project sites that will avoid negative impacts, enhance environmental improvement in developing pilot projects, and provide specific recommendations for project design.
  - (ii) Recommend cost-effective treatment, mitigation, and monitoring of potential environmental impacts from identified projects.
  - (iii) Outline a comprehensive environmental management plan specific to the identified solar energy pilot projects and community-based renewable energy schemes and identify resource requirements.
  - (iv) Assess the effectiveness of identified pilot project designs under consideration to reduce the impact of greenhouse gas emissions.

## 3. Economist (2 person-months)

4. The economist will undertake the following:
- (i) Review Afghanistan's plans for developing renewable energy in light of energy needs, resource endowments, development goals, and status of economic development.
  - (ii) Assess the potential market demand for and envisaged phased development of selected renewable energy sources consistent with the country's energy development program.
  - (iii) Help the renewable energy specialist assess the least-cost nature of the renewable energy development program for off-grid rural areas and small towns taking various alternatives into account.
  - (iv) In consultation with the social/poverty specialist, assess the willingness to pay for electricity by various stakeholders in off-grid rural areas and small towns based on sample surveys of the amount of energy consumed and the price paid by households.
  - (v) Help develop assessment criteria for the pilot projects.
  - (vi) Assist the team leader in preparing pilot projects, prioritizing them, and preparing prefeasibility studies.
  - (vii) Review the economic impacts of the pilot and community development projects, measure their benefits on an incremental and non-incremental basis, and undertake detailed economic analysis to ensure that the projects' benefits outweigh their costs.
  - (viii) Quantify environmental benefits to the extent possible, including reductions in greenhouse gas emissions.

## 4. Financial Analyst (2 person-months)

5. The financial analyst will carry out the following tasks:
- (i) Develop operating principles and guidelines for the proposed microfinance facility for financing solar energy systems.
  - (ii) Assist the team leader in appraising suitable NGOs for training barefoot solar energy technicians.
  - (iii) Analyze the financial feasibility, including tariff and leasing options, for the pilot projects to make renewable energy attractive to relevant stakeholders.

- (iv) Conduct a detailed financial assessment for the identified projects using the Asian Development Bank's *Guidelines on Financial Governance and Management of Investment Projects*.

#### **5. Social/Poverty Specialist (1 person-month)**

6. The specialist will do the following:

- (i) Provide inputs to the team leader on project design to maximize community participation in institution building, procurement, installation, monitoring, and evaluation.
- (ii) Undertake social mobilization activities with support from NGOs to support pilot project implementation in selected communities.
- (iii) Develop methodologies to encourage women's participation in communities selected for pilot projects, including training as barefoot technicians.
- (iv) Assess the affordability and opportunities for community participation in constructing and operating the pilot projects.
- (v) Outline sustainable opportunities at the community level that villagers could pursue either independently or through the community training centers to benefit from the electricity that will be available from the solar energy systems.

#### **B. Domestic Consultants**

7. The domestic consultants (30 person-months) will be engaged to assist the international consulting team with all tasks. These consultants should have sufficient knowledge of the energy industry and possess sufficient experience in their relevant fields, and will include (i) two renewable energy specialists (5 person-months each), (ii) an environmental specialist (5 person-months), (iii) one economist (5 person-months), (iv) one financial analyst (5 person-months), and (v) a social/poverty specialist (5 person-months). They will help the international consultants to quickly become familiar with their tasks by translating various documents into English; researching and compiling a set of Government policies, regulations, and procedures; and ensuring that the work of the international consultants is appropriate to the situation in Afghanistan.

8. The domestic consultants will have primary responsibility for obtaining detailed information about energy policy, technologies, and energy service providers to identify candidate pilot projects. The consultants will assist with the financial and economic analysis of the pilot projects and assess the social and environmental impacts of the proposed community-based renewable energy development program and candidate pilot projects. Their activities will include, but not be limited to, the following:

- (i) Review and assess the current and projected energy situation in the country and the overall impact on the environment.
- (ii) Conduct sample surveys on the amount of energy consumed and the prices paid by households and assess their willingness to pay.
- (iii) Outline alternative employment opportunities at the community level that would benefit from the electricity generated through solar energy systems.
- (iv) Support the creation of the microfinance facility for financing solar energy systems and develop operating guidelines.
- (v) Formulate a strategy to overcome cultural and religious barriers that may prevent reintegration of the disabled and other marginalized groups by means of training and other activities for the community-based solar energy programs.

- (vi) Identify the main environmental concerns in possible project areas and assess the potential environmental impacts of the identified possible renewable energy projects.
- (vii) Quantify environmental and social impacts to the extent possible.
- (viii) Recommend cost-effective treatment, mitigation, and monitoring of potential environmental impacts from the identified projects.
- (ix) Develop selection criteria that will avoid negative impacts, enhance environmental improvement in new projects, and provide specific recommendations for project design.
- (x) Outline a comprehensive environmental management plan specific to the identified renewable energy projects, identifying resource requirements.