# ASIAN DEVELOPMENT BANK

TAR: UZB 37107

**TECHNICAL ASSISTANCE**
(Financed by the Government of Denmark)

**TO**

**THE REPUBLIC OF UZBEKISTAN**

**FOR**

**OFF-GRID RENEWABLE ENERGY DEVELOPMENT**

**September 2003**

**CURRENCY EQUIVALENTS**
(as of 26 August 2003)

| | | |
|---|---|---|
| Currency Unit | – | Sum (SUM) |
| SUM 1.00 | = | 0.0010 |
| $1.00 | = | Sum 973.49 |

**ABBREVIATIONS**

| | | |
|---|---|---|
| ADB | – | Asian Development Bank |
| DEERFI | – | Department for External Economic Relations and Foreign Investments of the Cabinet of Ministers |
| kWh | – | kilowatt-hour |
| MAWR | – | Ministry of Agriculture and Water Resources |
| MW | – | megawatt |
| TA | – | technical assistance |

**NOTE**

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

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## I. INTRODUCTION

1. During the country programming mission of the Asian Development Bank (ADB) to Uzbekistan in 2002, the Government requested ADB assistance for promoting sustainable development for the energy sector.[1] The ADB Fact-Finding Mission visited Uzbekistan from 8 to 12 March 2003. An understanding was reached with the Government on the goals, purpose, scope, implementation arrangements, cost estimates, financing arrangements, and terms of reference of the technical assistance (TA). The TA framework is in Appendix 1.

## II. ISSUES

2. Uzbekistan has substantial energy resources. The total reserve of hydrocarbon fuel in Uzbekistan is estimated at over 7 billion tons of oil equivalent, natural gas at 1.88 trillion cubic meters, oil at 600 million barrels, and coal at approximately 4 billion tons. Natural gas is the predominant energy source in Uzbekistan. It produces about 62 billion cubic meters of natural gas per year, most of which is consumed domestically for power generation and production of petrochemicals.

3. Uzbekistan produces approximately 48,000 gigawatt hours of electricity annually. Electricity is derived primarily from conventional thermal power generation, with 77% of plants powered by natural gas, 7% by fuel oil, and 3.5% by coal. The remaining 12.5% of the electricity comes from hydropower. There are 11 large thermal power plants (9,870 megawatt [MW] of installed capacity) and 31 hydropower stations (1,700 MW of installed capacity), with a cumulative installed capacity of 11,570 MW. Almost all of these plants are very old, the average age being more than 30 years, and in need of substantial rehabilitation. According to recent estimates, up to $1.15 billion worth of investments will be required for rehabilitating thermal power generation plants alone in the next 3–5 years. The reliability of plant and equipment is very poor. At the same time the demand is increasing, particularly during peak periods both in summer and winter, and the system is unable to meet the increasing demand. According to recent data, the peak period deficit is about 800–900 MW in winter.

4. Power generation in Uzbekistan has been decreasing since the country's independence. Although the installed capacity for electricity generation has increased from 1992 to 1999 the electricity output dropped by 11%. Since 1996, Uzbekistan has been a net electricity importer. Production of liquid hydrocarbons (crude oil and gas condensate) has also declined, from 8.1 million tons in 1999 to 7.2 million tons in 2002. Such declines may be permanent because the producing reservoirs are experiencing drops in pressure and increased water influx. Major gas fields are going into decline, and new reserves have not been replaced.

5. A major part of electricity is consumed by industries (40%), followed by agriculture (30%), and residential consumers (16%); the remaining 14% is consumed by transport (6%) and communal services (8%). The overall system losses have been estimated at 22%. Per capita energy consumption in Uzbekistan is 1.5–2 times higher than in other developing countries. In 2000, Uzbekistan's energy intensity was about 4 times higher than the energy intensity of the People's Republic of China. Current levels of energy consumption could be reduced by up to 40–50% with no major impact on the present level of development.

6. According to estimates, with the current system of energy production and consumption, the 2010 demand in primary energy may exceed the projected power production by about 10%.

[1] The TA first appeared in *ADB Business Opportunities* (Internet version) on 24 February 2003.

In this context the Government signed the *European Energy Charter Treaty and Energy Charter Protocol* on energy efficiency and relevant environmental aspects.[2] This protocol requires each party to prepare a strategy for energy conservation. Therefore, in accordance with the *Law on Rational Use of Energy*, Uzbekistan's Cabinet of Ministers adopted an energy-saving program on 14 February 2002. The main objectives of the program are to (i) prioritize energy conservation issues and develop appropriate policies to address them, (ii) improve the efficiency of using energy resources and promote energy conservation, (iii) reduce energy intensities in the industry sector, (iv) prepare the legislation that will promote energy efficiency intensities in the industry sector, and (v) promote the development of a market-oriented energy sector.

7. In rural areas, where 62% of the country's population reside, the supply of electricity is unstable. This instability primarily impedes the operation of irrigating systems, which increases the risk of crop failure.[3] The instability of available electricity and the absence of local generating capacity increases reliance on mobile diesel pumping stations. Currently, there are 15,000 portable diesel-pumping stations burning about 15,000 tons of diesel fuel annually. The environmental costs of such operations are large due to the emission of air pollutants. The lack of electricity in rural areas also results in lower levels of higher-value agricultural processing. It is estimated that about 30% of the fruit and vegetable crops is wasted from a lack of storage or processing facilities. This provides a rationale for local decentralized electricity sources, which would also avoid losses from distribution currently estimated to be about 15% of total power generation.

8. In off-grid areas, the cost of providing electricity through a grid could be substantial.[4] Further, a considerable portion of existing power lines and substation equipment in Uzbekistan will require reconstruction. Outdated machinery creates problems in operating the power grid. Much capital investment is required for system modernization. So, the potential is good for renewable energy to commercially compete with other conventional form of energies.

9. Uzbekistan has good potential for developing renewable energy, particularly hydropower. The hydropower potential from natural water flows in Uzbekistan is about 20,000 MW, about 30% from small hydropower sources. Only 30% of the small-scale hydropower potential is used. If the potential for hydropower stations is optimized, the electricity generated will be sufficient for all pumping stations, and the water transportation systems under the jurisdiction of the Ministry of Agriculture and Water Resources (MAWR).

10. The use of solar energy could benefit 900 remote villages and 4,500 sheep farms in Uzbekistan—where energy and water supply by conventional methods is difficult or impossible. Further, the potential for harnessing wind energy, geothermal resources, and biomass can be substantial in some regions outside the national capital of Tashkent.

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[2] Signed on 17 December 1994, the main objective of the treaty is to establish a legal framework to promote long-term cooperation in the energy sector in accordance with the principles of the European Energy Charter. The important aspects of the treaty are investment protection, trade in energy materials and products, transit, and dispute settlement.

[3] About 30% of total electricity generation in Uzbekistan is used by agriculture and half of that is consumed by pumping stations.

[4] Assuming a 40% load factor, the cost of generation (assuming combined cycle gas), transmission, and distribution are $0.10, $0.30, and $0.02 per kilowatt-hour (kWh), respectively. This brings the total cost of grid generation to $0.42/kWh. Transmission costs assume: a capital cost of $35 million supplying 22 megawatt hours (420 kilovolt (kV) alternating current (AC) line with 3 conductors per phase at around $350,000/kilometer (km), 100 km carrying 5 MW and running at 50% load factor, and 245kV AC line single conductor at around $65,000/km), and 5% operations and maintenance cost, 5% depreciation, and 7% weighted average cost of capital.

11. The Government recognizes the importance of renewable energy development in rural areas, particularly in off-grid locations. The development of small-scale hydropower is a priority in the country's investment policy as embodied in the 1995 State Program of Small Hydropower Development. The program highlights the importance of regulating energy usage, nature conservation, and environmental protection along with the development of small-scale hydropower in the country. Its purpose is to effectively use the hydropower potential of rivers, improve technical aspects, and increase power supply in rural areas. Studies show the technical feasibility of constructing 43 small hydropower plants under the existing water reservoirs, and 98 on irrigation canals and collectors. The twin use of water for power generation and irrigation augurs well for sustainable development. In 2000, the Program on Development and Reconstruction of Generating Facilities in Energy Sector in Uzbekistan was developed. The program envisages the expansion of alternative energy usage such as solar and wind power installation, and installation of stand-alone power supply systems in regions that are remote and difficult access.

12. The optimization of energy production and consumption in off-grid rural areas requires the use of renewable energy sources. A wider application of renewable energy generation, particularly solar energy and hydropower, will ensure sustainable development for isolated remote areas. The cost of photovoltaic energy is $0.40–0.50/kilowatt-hour (kWh) at 20% load factor with one day's worth of battery backup. The experience from run-of-the river hydropower generation shows costs of $0.06/kWh (Kyrgyz Republic) and $0.04/kWh (Gansu, People's Republic of China), which is as little as one tenth of grid generation.

13. To review the potential to use energy efficiency technologies, various types of energy needs, and possible technology options, ADB approved a TA in December 2002.[5] The TA will also support basic reforms in the energy sector in line with ADB's country strategy for Uzbekistan. However, a more focused approach is needed to address off-grid renewable energy options in rural areas and small towns in Uzbekistan. Use of efficient appliances will ensure that consumers in remote rural areas receive maximum value from the limited supply. Increased general awareness will also reduce wastage of national energy resources and put them to better use. Increased use of renewable energy will provide a more stable energy supply in the rural areas. Rural households will benefit from increased agricultural income from improved irrigation, decreased time spent on livelihood chores, increased alternative income sources, and more income savings due to the increased use of cheap and more energy efficient appliances. Renewable energy sources are often environmentally friendly, reducing harmful environmental pollution at the local level and bringing large amounts of global environmental benefits. Such sources are cost effective, especially in remote areas, compared with grid connected high cost options.

## III. TECHNICAL ASSISTANCE

### A. Purpose and Output

14. The TA will undertake a comprehensive assessment of the potential for renewable energy options in small towns and rural areas in Uzbekistan. The TA also aims to develop a viable pilot scheme of renewable energy options in selected off-grid areas. The expected outputs include (i) a review and assessment of the potential for renewable energy development, (ii) an action plan to improve renewable energy, (iii) designs of pilot projects for the most appropriate renewable energy options; (iv) detailed feasibility assessment for the increase of

[5] ADB. 2002. *Technical Assistance to Uzbekistan for Energy Needs Assessment Project*. Manila.

pilot projects including an assessment of financing mechanisms, and (v) dissemination of TA findings.

## B. Methodology and Key Activities

15. The TA will have the following key activities:

(i) analyze potential sources for renewable energy development in off-grid rural areas and small towns; the analysis should cover the experience with similar initiatives in other countries in the region;

(ii) analyze the potential for development of all other forms of energy in off-grid areas, and compare their relative merits;

(iii) list the demand management programs that could be used by the domestic and industrial sectors while strengthening the sustainability of renewable energy options;

(iv) perform a detailed cost-benefit analysis for identified renewable energy options, including with and without options of demand management programs;

(v) prepare a detailed action plan (time-bound and incentive-based) to promote high priority renewable energy options, including appropriate demand management programs;

(vi) within the action plan, prepare pilot schemes for five prioritized renewable options and two demand management options;

(vii) assess the pilot schemes, identifying merits of technical, social, environmental, financial, and other decisive variables;

(viii) examine the institutional mechanism, in particular the policy and regulatory framework, for promoting renewable energy options in off-grid rural areas and small towns;

(ix) examine the feasibility of increasing pilot activities for renewable energy, with and without demand management options, including innovative financing mechanisms;

(x) prepare a report assessing renewable energy subsector and highlighting (a) means and ways of removing barriers, and (b) summarizing pre-feasibility study results indicating investment requirements for sector development; and

(xi) disseminate the main results of the TA

## C. Cost and Financing

16. The total cost of the TA is estimated at $500,000 equivalent with a foreign exchange cost of $305,000 and a local currency cost of $195,000 equivalent. The Government has requested ADB to finance $305,000 in foreign exchange cost and $45,000 equivalent in local currency cost. The TA will be financed by the Government of Denmark on a grant basis and to

be administered by ADB. The Government will finance the remaining $150,000 equivalent in local currency cost. The detailed cost estimates and financing plan are presented in Appendix 2.

### D. Implementation Arrangements

17. MAWR is responsible for developing small-scale hydropower in Uzbekistan. MAWR will be the Executing Agency for the TA. The Department for External Economic Relations and Foreign Investments of the Cabinet of Ministers (DEERFI) will provide an overall coordinating and advisory role to the TA. DEERFI, in consultation with ADB, will (i) assign a TA leader and counterpart staff to work on the TA; and (ii) identify and establish a TA steering committee to comprise representatives from relevant government agencies, nongovernment organizations, and other stakeholders. The steering committee will be headed by DEERFI official. Local-level participation when necessary will be assured through appointing appropriate local government representatives to undertake appropriate tasks.

18. The TA will be carried out over a 6 month period by internationally recognized consulting firms or institutes in association with domestic consultants. The TA will commence on 30 October 2003 and will be completed by 30 April 2004. The total input of international and domestic consultants will be about 8 and 10 person-months, respectively. The consultants will procure and rent the equipment required for TA implementation, in accordance with ADB's *Guidelines for Procurement*. The international consultants for the TA will be recruited by ADB on the basis of submission of simplified technical proposals in accordance with ADB's *Guidelines on the Use of Consultants* and using the quality and cost based selection procedure. The domestic consultants will also be engaged by ADB in accordance with its *Guidelines on the Use of Consultants* and other arrangements satisfactory to ADB and DEERFI for the engagement of domestic consultants. ADB will finance the attendance of Government observer(s) at the contract negotiations, which will be held at ADB headquarters in Manila. The consulting firm will be required to have the following consulting positions: (i) renewable energy specialist, (ii) environmental specialist, (iii) economist, (iv) financial analyst, and (v) social development 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, and a draft final report 4 months later. The Government and ADB will provide comments and they will be discussed at a tripartite meeting at each stage. At the end of 6 months, the consultants will submit the final report after incorporating Government and ADB comments on the draft final report. Results of the TA will be disseminated through the final report, and if considered appropriate, through a web site for renewable energy development. A high-level national workshop and a series of local workshops will be arranged to discuss the major findings of the TA.

## 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 $350,000 to the Government of Uzbekistan to be financed on a grant basis by the Government of Denmark for Off-Grid Renewable Energy Development, and hereby reports this action to the Board.

## TECHNICAL ASSISTANCE FRAMEWORK

| Design Summary | Performance Targets | Monitoring Mechanisms | Assumption and Risks |
|---|---|---|---|
| **Sector Goal**<br>To promote renewable energy initiatives in off-grid rural areas and small towns in Uzbekistan. | Assessment of potential for renewable energy in off-grid rural areas.<br><br>Project designs for renewable energy pilot projects. | List of possible project designs and pre-feasibility studies for renewable energy. | Has a high potential for renewable energy.<br><br>Government's commitment. |
| **Purpose**<br>Examine potential for renewable energy options with and without demand management in project area.<br><br>Develop pilot renewable energy and demand management programs in off-grid areas. | Review and assessment of renewable energy and demand management potential in the off-grid area based on the designed feasibility studies.<br><br>Well designed pilot projects that are sustainable. | Reports on energy data and trends, and other consultant's reports.<br><br>Lists of identified possible renewable energy and demand management feasibility studies.<br><br>Review missions. | Data are available, capable consultants are recruited.<br><br>Local government and relevant agencies cooperate. |
| **Outputs**<br>Review potential renewable energy options with and without demand management for their development.<br><br>Renewable energy improvement action plan with and without demand management.<br><br>Pilot project designs.<br><br>Pre-feasibility assessment of increased renewable energy and demand management options. | List of identified possible projects promoting the use of renewable energy and demand management.<br><br>Development of an action plan.<br><br>Review of existing policies for promotion of renewable energy and demand management.<br><br>Design of possible renewable energy and demand management program and formulation of new policies.<br><br>Identification of 5 pilot renewable energy projects and 2 demand management designs. | Institutional policies promoting the use of renewable energy and energy saving.<br><br>Country renewable energy and demand management action plan.<br><br>Review mission, progress report, and consultants' reports.<br><br>Actual programs for the top renewable energy and demand management programs identified.<br><br>Actual pilot project design. | Government remains committed to promoting energy efficiency programs.<br><br>Local government agencies cooperate and provide information necessary. |
| **Activities**<br>Analyze potential sources for renewable energy in off-grid areas.<br><br>Analyze the potential for all other forms of energy development in off-grid areas.<br><br>Prepare a list of demand management programs to be used by domestic and industrial sectors. | An assessment of renewable energy and demand management potential in off-grid areas.<br><br>Compare relative merits of renewable energy.<br><br>Financial, economic, and social aspects of the pilot projects. | Policy dialogue, review mission, progress report, and consultants' reports.<br><br>Policy dialogue, review missions, progress report, and consultants' reports.<br><br>Policy dialogue, review missions, progress reports, and consultants' reports. | Data and information are available.<br><br>Consultants are capable of the required tasks.<br><br>Local government agencies and stakeholders are involved in the study process. |

| Design Summary | Performance Targets | Monitoring Mechanisms | Assumption and Risks |
|---|---|---|---|
| Perform detailed cost benefit analysis for identified renewable energy options including with and without demand management options. | List of potential renewable energy and demand management projects. | Policy dialogue, review mission, progress report, and consultants' reports.<br><br>Actual long-list. | National and provincial laws are complied with. |
| Prepare a detailed action plan. | Identification of renewable energy and demand management priorities based on costs and benefits, including environmental and social costs. | Policy dialogue, review mission, progress report, and consultants reports. | |
| Within the action plan, prepare pilot schemes for prioritized 5 renewable energy and 2 demand management options. | Development of an action plan incorporating renewable energy and demand management objectives and programs. | Cost-benefit analyses.<br><br>Policy dialogue, review mission, progress report, and consultants' reports.<br><br>Action plan for implementation. | |
| Assess the pilot schemes identifying merits of technical, social, environmental, financial, and other decisive variables. | Action plan and financial and technical analysis of the pilot programs identified. | Policy dialogue, review mission, progress report, and consultants' reports. | |
| Examine the institutional mechanism. | Details of pilot schemes with technical, financial, economic, and social and environmental assessments. | Identified priorities. | |
| Examine the feasibility of increasing assessed pilot activities. | Identification of barriers to development of renewable energy and demand management technologies. | Policy dialogue, review mission, progress report, and consultants' reports. | |
| Prepare a renewable energy subsector assessment report and summarize feasibility study results. | Identification of possible renewable energy and demand management options.<br><br>Assessment of existing policies; recommend new policies for promotion of renewable energy and demand management.<br><br>Web site, publications, and workshops. | Policy dialogue, review mission, progress report, and consultants' reports.<br><br>Pre-feasibility studies.<br><br>Design of possible renewable energy and demand management options.<br><br>Renewable energy and demand management development web site. | |
| Disseminate the final results of the technical assistance. | Presentation of technical assistance findings to agencies concerned and stakeholders. | Disseminate results.<br>Conduct national and regional workshops. | |
| **Inputs** | | | |
| Consulting services. | International: 8 person-months<br>Domestic: 10 person–months. | Consultants' contracts.<br><br>Policy dialogue review and periodic reports. | Timely engagement and fielding of consultants. |
| Total Cost. | Total about $500,000. | | |
| Financing. | $350,000 equivalent from the Government of Denmark. | Policy dialogue review and periodic reports. | |

**COST ESTIMATES AND FINANCING PLAN**

($'000)

| Item | Foreign Exchange | Local Currency | Total Cost |
|---|---|---|---|
| **A. Government of Denmark Financing** | | | |
| 1. Consultants | | | |
| a. Remuneration and Per Diem | | | |
| i. International Consultants | 180 | 0 | 180 |
| ii. Domestic Consultants | 0 | 20 | 20 |
| b. International and Local Travel | | | |
| i. International | 20 | 0 | 20 |
| ii. Domestic | 0 | 5 | 5 |
| c. Reports and Communications | 5 | 0 | 5 |
| 2. Equipment | | | |
| a Hardware for Pilot Projects[a] | 63 | 5 | 68 |
| b. Software | 5 | 0 | 5 |
| 3. Training, Seminars, Conferences | 7 | 5 | 12 |
| 4. Representative for Contract Negotiations | 6 | 0 | 6 |
| 5. Contingencies | 19 | 10 | 29 |
| **Subtotal (A)** | **305** | **45** | **350** |
| **B. Government Financing** | | | |
| 1. Office Accommodation | 0 | 50 | 50 |
| 2. Remuneration and Per Diem of Counterpart Staff | 0 | 30 | 30 |
| 3. Local Travel and Transport | 0 | 20 | 20 |
| 4. Secretarial Support and Office Services | 0 | 10 | 10 |
| 5. Office Equipment | 0 | 20 | 20 |
| 6. Miscellaneous | 0 | 20 | 20 |
| **Subtotal (B)** | **0** | **150** | **150** |
| **Total** | **305** | **195** | **500** |

[a] Cost of office equipment such as computers, fax machine, overhead projector and other accessories are included.
Source: Asian Development Bank estimates.

## OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

1. The team of international consultants (total 8 person-months) will coordinate the domestic consultants (total 10 person months). The renewable energy specialist will be the team leader for the technical assistance (TA). The team leader will allocate tasks among the other consultants to maximize their contribution to the TA, depending on their experience. The team leader will be responsible for coordinating all activities.

2. The renewable energy specialist will do the following:

(i) review all previous renewable energy studies, ongoing studies, the Government energy policy, and plans for renewable energy sector development (if any);

(ii) visit small towns outside the national capital and prepare an inventory of existing renewable energy technologies currently in use and potential new technologies that can be developed;

(iii) establish potential volumes of all forms of energy use in remote and rural areas of Uzbekistan, in the short and medium term;

(iv) establish potential volumes of renewable energy use in remote and rural areas of Uzbekistan in the short and medium term, and compare these with other forms of energy;

(v) develop innovative options for making renewable energy more affordable for the population outside the national capital;

(vi) design a project for implementation taking into account the optimum use of existing government subsidy and possible packaging with inexpensive external finance under government guarantee;

(vii) design an action plan for a renewable energy development in consultation with the government and other stakeholders, and design a media campaign plan to educate the wider population on renewable technology;

(viii) examine the institutional mechanism, in particular the legal framework, for promotion of renewable energy alternatives;

(ix) in consultation with the other consultants, identify a package of renewable energy projects for detailed analysis, and determine its suitability for meeting the population's needs;

(x) select sites for pilot projects after full consultation with government and other local stakeholders;

(xi) examine the feasibility of increasing the renewable energy development options, including financing mechanisms; and

(xii) present pilot project designs, feasibility studies, and other findings of the TA at a national level workshop and other local workshops.

3. The economist will do the following:

(i) summarize the current and projected energy situation in Uzbekistan, including energy consumption, production, future trends, price, and subsidies;

(ii) analyze the energy consumption patterns, and possible energy savings by demand management, and estimate the potential for renewable energy development in off-grid rural areas and small towns;

(iii) review the country's development plans in light of the energy needs, resource endowments, development goals, and status of economic development;

(iv) prepare a least-cost generation plan taking into account all forms of energy, including conventional thermal sources, for off-grid rural areas and small towns;

(v) assist the renewable energy specialist to assure the least-cost nature of the renewable energy action plan for off-grid rural areas and small towns;

(vi) in consultation with the social development specialist, assess the willingness-to-pay for electricity by various stakeholders in off-grid rural areas and small towns;

(vii) in consultation with the relevant technical experts, assess economic costs and benefits of renewable energy and demand management options;

(viii) assess the market demand and envisaged phased development of the selected renewable energy sources, consistent with the country's program on energy development; and

(ix) assist the team leader in preparing pilot projects, prioritizing them, and preparing the pre-feasibility studies.

4. The environment specialist will do the following:

(i) review and assess the current and projected energy situation in the country and the overall impact on the environment;

(ii) identify the main environmental concerns in Uzbekistan and the possible project areas, assess the potential environmental impacts of the identified possible renewable energy projects; and quantify them to the extent possible;

(iii) recommend cost-effective treatment, mitigation, and monitoring of potential environmental impacts from the identified projects;

(iv) develop selection criteria that will avoid negative impacts, and enhance environmental improvement in developing projects, and provide specific recommendations for project design;

(v) outline a comprehensive environmental management plan specific to the identified renewable energy projects, identifying resource requirements;

(vi) analyze the energy consumption pattern in Uzbekistan and estimate the potential for reduction of greenhouse gas emissions through renewable energy options;

(vii) identify the current extent of greenhouse gas emissions in Uzbekistan and possible project areas; and

(viii) assess the effectiveness of identified pilot project designs under consideration with a view to reducing the impact of greenhouse gas emissions.

5. The financial analyst will do the following:

(i) document the financial performance of existing renewable energy options in off-grid rural areas and small towns;

(ii) do the detailed financial assessment of the identified renewable energy options;

(iii) evaluate the financial implications of proposed renewable energy options on all stakeholder groups;

(iv) analyze the financial feasibility, including tariff and leasing options (highlighting examples), that make renewable energy attractive to the relevant stakeholders;

(v) help develop assessment criteria for the identified renewable energy options; and

(vi) review the financial impacts of existing and proposed renewable energy initiatives identified, screen impacts, and forward the information to the economist to study what can be used in an economic assessment.

6. The social development specialist will do the following:

(i) review the social and poverty reduction impacts of proposed projects;

(ii) perform a detailed social assessment for the identified possible pilot projects;

(iii) undertake a beneficiary and stakeholder analysis, considering gender aspects;

(iv) quantify target groups for sample projects and identify all benefits accruing to the target groups relating effects on poverty reduction;

(v) assess affordability; and

(vi) assess the opportunity for community participation in constructing and operating the scheme.

7. The domestic consultants (10 person months) will be recruited to assist the international consulting team. These consultants should have extensive local knowledge in the energy industry. They will assist international consultants to quickly become familiarized with their tasks by translating various documents into English; researching and compiling a set of government policies, regulations, and procedures adopted; and ensuring the work by international consultants is appropriate to the Uzbekistan situation. Domestic consultants are expected to possess sufficient experience in their relevant fields, and will include (i) a renewable energy specialist, (ii) an environment specialist, (iii) an economist, (iv) a financial analyst, and (v) a social development specialist.

8. Reporting requirements are given in paragraph 19 of the main report.