



# Technical Assistance Report

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Project Number: 39598  
December 2005

## Technical Assistance Republic of Uzbekistan: Preparing the Rural Renewable Energy Development Project (Financed by the Government of Finland)

## CURRENCY EQUIVALENTS

(as of 31 October 2005)

Currency Unit	–	sum (SUM)
SUM1.00	=	\$0.0010
\$1.00	=	Sum1,052

## ABBREVIATIONS

ADB	–	Asian Development Bank
GW	–	gigawatt
MAWR	–	Ministry of Agriculture and Water Resources
MW	–	megawatt
SHP	–	small hydropower
TA	–	technical assistance
TWh	–	terawatt-hour

## TECHNICAL ASSISTANCE CLASSIFICATION

<b>Targeting Classification</b>	–	General intervention
<b>Sector</b>	–	Energy
<b>Subsector</b>	–	Renewable energy
<b>Themes</b>	–	Sustainable economic growth, environmental sustainability
<b>Subthemes</b>	–	Fostering physical infrastructure development and cleaner production and control of industrial pollution.

## NOTE

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

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## I. INTRODUCTION

1. During the final tripartite meeting for the Asian Development Bank (ADB) advisory technical assistance (TA)<sup>1</sup> in July 2005, the Government of Uzbekistan requested ADB assistance to develop small hydropower (SHP) plants along the existing irrigation canals and reservoirs. ADB's *Country Strategy and Program Update 2006* included the proposed Rural Renewable Energy Development Project. The concept paper for the project preparatory TA<sup>2</sup> was approved in September 2005, and a Fact-Finding Mission visited Uzbekistan from 11 to 16 October 2005. Discussions were held with the Government on the TA's impacts, purpose, scope, implementation arrangements, cost estimates, financing arrangements, and terms of reference for consulting services. The TA design and monitoring framework is in Appendix 1.

## II. ISSUES

2. Agriculture is the foundation of the Uzbek economy and accounts for about 28% of gross domestic product, 44% of employment, and 66% of export revenues. The climate and the concentration of rainfall in the winter make irrigation an absolute necessity for crop production. Irrigation determines the size of the cropping area. The irrigated area is currently 4.2 million hectares, which supports more than 95% of all agricultural production. The agriculture sector uses about 90% of available water resources for irrigation purposes through an extensive network that consists of reservoirs, canals, and irrigation pumps. The Ministry of Agriculture and Water Resources (MAWR) is responsible for the upkeep, operation, and maintenance of the irrigation network. The agriculture sector is also a major consumer of electricity, consuming about 30% of total electricity production, about 50% of which is used for pumping.<sup>3</sup>

3. Uzbekistan has substantial energy resources. The total reserves of hydrocarbon fuels are estimated at more than 7.7 billion tons of oil equivalent, 2 trillion cubic meters of natural gas, 600 million barrels of oil, and approximately 4 billion tons of coal. Natural gas is the dominant energy source, with current production of about 62 billion cubic meters per year, most of which is consumed domestically for power generation, heating, and production of petrochemicals. Electricity production is based primarily on conventional thermal power generation, which accounts for about 87% of total electricity production: 77% from plants powered by natural gas, 7% powered by heavy fuel oil, and 3% powered by coal. The remaining 13% of electricity comes from hydropower plants. Electricity production has been decreasing since independence, mainly because of aging of plants, inadequate maintenance, and underinvestment. According to published statistical data, only about 49 terawatt-hours (TWh) were generated in 2003, compared with generation of more than 56 TWh in 1990. Since 1996, Uzbekistan has been a net importer of electricity.

4. Total installed capacity for electricity generation is 11.6 gigawatt (GW) and consists of 11 large thermal power plants (9.9 GW) and 31 hydropower plants (1.7 GW). The main power utility is Uzbekenergo, which owns all the thermal power plants and about 1.4 GW of the hydropower plants. MAWR owns the remaining 0.3 GW of the hydropower plants. Uzsuvenergo<sup>4</sup> is mandated to operate and maintain MAWR owned hydropower plants. It currently operates 4 SHP plants and sells electricity to Uzbekenergo through a power purchase agreement at

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<sup>1</sup> ADB. 2003. *Technical Assistance to the Republic of Uzbekistan for Off-Grid Renewable Energy Development*. Manila.

<sup>2</sup> The TA first appeared in *ADB Business Opportunities* (Internet edition) on 3 November 2005.

<sup>3</sup> The sector also uses electricity for such activities as heating greenhouses and raising livestock and poultry.

<sup>4</sup> Uzsuvenergo was formed in 1996 as a special association under MAWR.

tariffs set by the Ministry of Finance. The tariffs are adjusted annually, and since 2000 have increased by 850% to the current tariff of sum24.60 per kilowatt-hour.

5. Almost all the electricity generation plants are old, with an average age of more than 30 years, and require substantial rehabilitation. According to a recent estimate,<sup>5</sup> investment of about \$1 billion will be required to rehabilitate just the thermal power plants in the next 5 years. The reliability of plants and equipment is poor. Available power plant capacity<sup>6</sup> is about 7,800 megawatts (MW), compared with peak demand of about 8,500 MW. The outcome is frequent brownouts, especially in rural areas, which are at the far end of the distribution system. Limited maintenance of aging infrastructure and underinvestment mean that the transmission and distribution network is also weak, resulting in excessive losses that are estimated at about 22%.

6. The Government has drawn up a plan<sup>7</sup> for additional capacity that primarily involves rehabilitating existing thermal power plants and building new gas-fired power plants located closer to the major load centers, which is unlikely to provide relief to rural consumers located at the far end of the transmission and distribution network. Reliable electricity supply is a key rural infrastructure need that is required to support and accelerate rural development. Lack of reliable electricity inhibits industrial and commercial activities, thereby constraining economic growth and employment generation in rural areas; promotes switching to more polluting fuels, with consequent environmental impacts; causes hardship to the population; and affects people's health.

7. About 70% of the country's 24.8 million people live in rural areas, often with insufficient access to quality basic services. In rural areas, the electricity supply is unstable (lower voltages, frequent brownouts and blackouts). This primarily impedes the operation of irrigation systems, which increases the risk of crop failure. The poor availability of electricity and the absence of local generating capacity increase dependence on diesel-pumping stations. Currently 15,000 portable diesel-pumping stations consume about 15,000 tons of diesel annually. The environmental costs of such operations are large because of the emission of air pollutants. The lack of electricity in rural areas also results in lower levels of higher-value agricultural processing. Estimates indicate that about 30% of the fruit and vegetable crop is wasted because of a lack of storage or processing facilities.

8. In many rural areas, decentralized generation through renewable energy sources, mainly through SHP plants, offers a competitive and environmentally-friendly option for addressing electricity shortages. The hydropower potential from natural water flows is estimated to be about 20,000 MW, about 30% of that from SHP plants. Only 30% of the SHP plant potential is currently being used. If the potential for SHP plants is optimized, the electricity generated will be sufficient to power all pumping stations under MAWR's jurisdiction. The Government recognizes the importance of decentralized generation, and the development of SHP is a priority in the country's investment policy as embodied in the state program.<sup>8</sup> The program highlights the importance of harnessing the potential of SHP plants to improve the power supply in rural areas. Studies show the technical feasibility of constructing 43 SHP plants along existing reservoirs, and irrigation canals. The dual use of water for power generation and irrigation augurs well for sustainable development.

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<sup>5</sup> ADB. 2002. *Technical Assistance to the Republic of Uzbekistan for Energy Needs Assessment*. Manila.

<sup>6</sup> This is less than the installed capacity because of aging and maintenance problems.

<sup>7</sup> Program of Development and Reconstruction of Generating Capacities of the Energy Sector of the Republic of Uzbekistan.

<sup>8</sup> State Program of Small Hydropower Development in Republic of Uzbekistan (1995).

9. In 2002, ADB approved an advisory TA grant (footnote 5) to assess the level of current energy consumption by different sectors of the economy and future demand, the balance between demand and supply, the potential for improving energy efficiency, and the options for meeting future demand in an efficient and reliable manner. The advisory TA identified considerable opportunities for energy efficiency improvements.<sup>9</sup> In the power sector, it identified decentralized generation of renewable energy as a least-cost and more energy efficient option for meeting rural electricity demand. It concluded that because of seasonal complementarity,<sup>10</sup> the development of SHP plants along the irrigation network could be the most suitable technical option for meeting peak electricity demand in the summer. It recommended further analytical work to assess the feasibility of SHP plant development.

10. In 2003, ADB approved another advisory TA grant (footnote 1) with a more focused approach to analyze the suitability of renewable energy development in the country. The advisory TA included an in-depth assessment of renewable energy resources and cost-effective options for developing them. It concluded that SHP plants along the existing irrigation canals and reservoirs are the most cost-effective and technically developed option for renewable energy that is available to most regions. It identified 20 possible sites for SHP plants in Andijan, Fergana, Samarkand, and Tashkent regions, taking into account the power supply deficit, the potential for rural industrial applications, the agricultural output, and the number of installed irrigation pumps. It short-listed seven priority SHP subprojects; undertook a prefeasibility evaluation; and found that all seven sites were technically and economically feasible and had substantial economic, social, and environmental benefits. Based on detailed discussions with relevant Government agencies and ministries, the top five SHP subprojects were recommended for ADB financing. A project preparatory TA was deemed necessary to review, supplement, and upgrade the prefeasibility evaluation, in particular, to strengthen the technical, economic, environmental, and social analyses. The project preparatory TA will analyze and prepare the proposed Rural Renewable Energy Project for possible ADB financing in 2006.

11. The development of SHP plants is a Government investment priority (para. 8). MAWR, in conjunction with Uzsuvenego, is mandated to develop SHP plants. Recognizing the unsustainability of the country's high energy intensity, in 2002 the Government launched the Energy Saving Program to improve the efficiency of energy supply. The program aims to generate an additional 2 TWh of hydropower by 2010.

12. The development of renewable, clean energy sources to provide direct benefits to rural poor is a priority of ADB's energy policy. Accelerating rural development by strengthening rural infrastructure and services is a strategic focus of ADB's country program. The strategy aims to forge linkages across rural development themes to encompass agricultural productivity; access to rural infrastructure, including water supply and renewable energy; and rural finance. In the energy sector, the strategy focuses on reforming energy utilities by means of increased transparency in financial reporting and improved sector management. The proposed project will have synergy with ongoing interventions in the agriculture sector, where farm privatization is expected by 2007. Improved irrigation and a more reliable rural electricity supply will enhance farmers' crop production and income-generating capacity, thereby contributing to the success of the ongoing policy reforms.

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<sup>9</sup> Uzbekistan's energy intensity (primary energy consumption per unit of gross domestic product) is about 1.5 to 2.0 times higher than that in other developing countries.

<sup>10</sup> The maximum output of SHP plants along the irrigation network will be during the summer peak flow period.

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

#### **A. Impact and Outcome**

13. The TA impact will be to promote economic development in the rural areas of, Andijan, Fergana, and Samarkand regions by providing reliable and environmentally clean energy. The project preparatory TA outcome will be an agreement with MAWR and the Government on the Project's design, a detailed feasibility report, and the implementation arrangements for the Project.

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

14. The TA will (i) analyze growth and electricity demand by region and assess a least-cost option for addressing the imbalance between demand and supply in the project area; (ii) prepare a problem tree and the initial project design and monitoring framework; (iii) review the technical prefeasibility study and optimize and upgrade the technical design and feasibility reports; (iv) carry out stakeholder workshops; (v) complete a baseline survey; (vi) carry out social, poverty, ethnic minority, and gender assessments; (vii) prepare draft bid documents in line with ADB guidelines and recommend measures for strengthening the management of project implementation; (viii) carry out financial, economic, and institutional analyses; (ix) complete a summary initial environmental examination; (x) assess the potential for reducing carbon emissions under the Clean Development Mechanism; (xi) finalize the project design and monitoring framework; (xii) assess the financial management capabilities of the project implementing agency; and (xiii) conduct workshops and seminars for disseminating the TA's results.

15. The major risks that need to be considered for successful implementation of the TA include (i) a change in MAWR's priorities, (ii) a lack of adequate and timely provision of data, (iii) a delay in the submission of required studies, (iv) a delay in consultant selection, and (v) the possibility of poor consultant performance. Efforts will be made to ensure that competent consultants are recruited expeditiously. MAWR has agreed to provide adequate counterpart support and data as needed and to undertake and update all required studies according to a timetable agreed with ADB. Close coordination among the consultants, executing and implementing agencies, and ADB will further mitigate these risks.

#### **C. Cost and Financing**

16. The total cost of the TA will be \$400,000 equivalent. ADB will finance \$300,000 equivalent. The TA will be financed on a grant basis by the Government of Finland and will be administered by ADB. The Government will finance the remaining \$100,000 equivalent through in-kind contributions, including office accommodation and facilities, counterpart staff, and data and other information needed for the TA. The cost estimate and financing plan is shown in Appendix 2. The Government has been informed that approval of the TA does not commit ADB to finance any ensuing project.

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

17. MAWR will be the executing agency and will provide a TA leader for day-to-day management of TA implementation. The Department of Economy and External Economic Relations of the Cabinet of Ministers will play an overall coordinating and advisory role. In consultation with ADB, the Department of Economy and External Economic Relations will set

up a steering committee consisting of representatives of relevant Government ministries and agencies and other stakeholders.

18. The TA will be carried out over 8 months by a team of international and domestic consultants. The TA will commence in December 2005 and will be completed in July 2006. The total input of international and domestic consultants will be 9 and 24 person-months, respectively. The consultants will procure office equipment<sup>11</sup> in accordance with arrangements acceptable to ADB and will deliver it to MAWR at the conclusion of the TA.

19. The international and domestic consultants will be selected and engaged by ADB in accordance with ADB's *Guidelines on the Use of Consultants* and other arrangements satisfactory to ADB for the selection and engagement of domestic consultants. The prefeasibility studies were prepared under advisory TA (footnote 1). MAWR has requested direct selection of the same consultant, because this TA's activities are a logical extension of the advisory TA's outputs and the consultant successfully completed the previous assignment. In view of this, ADB will recruit the consultant following the direct selection procedure. If some of the experts used for the previous advisory TA are not available, ADB will supplement the consultant team by recruiting individual consultants. The following international experts will be required: (i) a hydropower expert, (ii) a financial analyst and financial management specialist, (iii) an economist, (iv) an environmental specialist, (v) a procurement specialist, and (vi) a social and/or poverty specialist. Domestic consultants will be required in the same areas of expertise to support the international consultants. In addition, the domestic consultant team will include a team leader to coordinate the TA's activities. Outline terms of reference for consulting services are in Appendix 3.

20. The consultant will submit an inception report within 1 month of TA commencement, a midterm report after 3 months, and a draft final report after 5 months. The final report will be submitted within 8 months of TA commencement. To improve the participatory project design, stakeholder workshops will be held at each of the subproject sites during the initial stages of TA implementation. Workshops will be held at each of the five SHP plant sites to seek local communities' and project beneficiaries' views on improving the project design. Participation will be encouraged through workshops and seminars that will discuss and share the results of the TA. Roundtable conferences with key stakeholders will be organized following the submission of each of the milestone reports. The TA's recommendations and analysis will be disseminated through a national-level seminar with broad participation by all stakeholders.

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

21. The President, acting under the authority delegated by the Board, has approved ADB administering technical assistance not exceeding the equivalent of \$300,000 to the Government of Uzbekistan, to be financed on a grant basis by the Government of Finland, for preparing the Rural Renewable Energy Development Project, and hereby reports this action to the Board.

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<sup>11</sup> The office equipment will include two pentium computers, one printer, one photocopier, one digital camera, and one facsimile machine.

### DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
<p><b>Impact</b></p> <p>Economic development in the rural areas of Andijan, Fergana, and Samarkand regions through the provision of reliable and environmentally clean energy</p>	<p>Increased agricultural production in rural areas<sup>a</sup></p> <p>Increased use of renewable energy<sup>a</sup></p> <p>Augmented power supply to rural communities<sup>a</sup></p> <p>Developed institutional and financial management action plan</p>	<p>National and regional statistics</p> <p>Regional power data</p>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• The Government confirms that it will give priority and provide resources to promote renewable energy</li> <li>• Project design implemented effectively</li> </ul>
<p><b>Outcome</b></p> <p>Project design, feasibility study, and implementation arrangements agreed</p>	<p>Memorandum of understanding following the final tripartite meeting signed by the Government and ADB</p>	<p>Consultant's final report, memorandum of understanding, back-to-office report of the final technical assistance review mission</p>	<p><b>Assumption</b></p> <ul style="list-style-type: none"> <li>• Effective stakeholder participation and ownership developed</li> </ul> <p><b>Risk</b></p> <ul style="list-style-type: none"> <li>• Key stakeholders do not agree with the technical assessment</li> </ul>
<p><b>Output</b></p> <p>Technical assessments completed and design requirements met</p>	<p>Inception report: week 4; midterm report: week 12; draft final report: week 20; final report: week 30</p>	<p>Project reports</p> <p>Technical Assistance reviews weeks 5, 14, and 20</p>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• No restriction on the availability of and access to timely information and to personnel</li> <li>• No restriction on accessing geographic sites</li> </ul>
<p><b>Activities with Milestones</b></p> <p>1.1 Analyze regional growth and electricity demand and assess the least-cost option for addressing the imbalance between demand and supply in the project area (weeks 1–6).</p> <p>1.2 Prepare a problem tree and the initial project design and monitoring framework (weeks 1- 4).</p>			<p><b>Inputs: \$400,000</b></p> <p><b>ADB: \$300,000</b></p> <ul style="list-style-type: none"> <li>• Consultants: \$246,000 (9 person-months international, 24 person-months domestic)</li> </ul>



<p>1.3 Review the technical prefeasibility study and optimize and upgrade the technical design and feasibility reports (weeks 5–10).</p> <p>1.4 Carry out stakeholder workshops (week 5).</p> <p>1.5 Complete a baseline survey (weeks 5–10).</p> <p>1.6 Carry out social, poverty, ethnic minority, and gender assessments; recommend measures for strengthening project implementation management (weeks 8–14).</p> <p>1.7 Prepare draft bid documents in line with ADB guidelines (weeks 16–24).</p> <p>1.8 Carry out financial, economic, and institutional analyses (weeks 9–14).</p> <p>1.9 Complete a summary initial environmental examination (weeks 8–9).</p> <p>1.10 Assess the potential for reducing carbon emissions under the Clean Development Mechanism (weeks 14–20).</p> <p>1.11 Finalize the project design and monitoring framework (weeks 14–16).</p>	<ul style="list-style-type: none"> <li>• Equipment: \$10,000</li> <li>• Surveys: \$2,000</li> <li>• Training and seminars: \$22,000</li> <li>• Contingencies: \$20,000</li> </ul> <p><b>Government: \$100,000</b></p> <ul style="list-style-type: none"> <li>• Transport and office accommodation: \$30,000</li> <li>• Personnel: \$40,000</li> <li>• Logistics and others: \$30,000</li> </ul>
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ADB = Asian Development Bank.

<sup>a</sup> The consultant will develop the target and performance indicators in consultation with the Government.

**COST ESTIMATES AND FINANCING PLAN**  
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Item	Foreign Exchange	Local Currency	Total Cost
<b>A. Government of Finland Financing<sup>a</sup></b>			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	160,000	0	160,000
ii. Domestic Consultants	0	50,000	50,000
b. International and Local Travel	25,000	5,000	30,000
c. Reports and Communications	1,000	1,000	2,000
2. Equipment <sup>b</sup>	10,000	0	10,000
3. Training, Seminars, and Conferences	15,000	7,000	22,000
4. Surveys	1,000	1,000	2,000
5. Miscellaneous Administration and Support Costs	2,000	2,000	4,000
6. Contingencies	10,000	10,000	20,000
<b>Subtotal (A)</b>	<b>224,000</b>	<b>76,000</b>	<b>300,000</b>
<b>B. Government of Uzbekistan Financing</b>			
1. Office Accommodation and Transport	0	30,000	30,000
2. Remuneration and Per Diem of Counterpart Staff	0	40,000	40,000
3. Others	0	30,000	30,000
<b>Subtotal (B)</b>	<b>0</b>	<b>100,000</b>	<b>100,000</b>
<b>Total</b>	<b>224,000</b>	<b>176,000</b>	<b>400,000</b>

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

<sup>b</sup> Includes two pentium computers, one photocopier, one laser printer, one digital camera, and one facsimile machine. The ownership of the equipment will be transferred to the Ministry of Agriculture and Water Resources at the end of the technical assistance.

Source: Asian Development Bank estimates.

## OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

1. The consultants will undertake project preparatory technical assistance (TA) activities in consultation with relevant stakeholders, including the Ministry of Agriculture and Water Resources; Uzsuvenergo; other relevant ministries and agencies, such as the Ministry of Finance, the Ministry of Economics, and Uzbekenergo; relevant local communities; and other development agencies. The team of international consultants (9 person-months) will coordinate their work with the domestic consultants (24 person-months). The domestic consulting team will include a team leader, who will coordinate the activities of the international and domestic consultants and will consolidate individual team members' inputs into project reports.

### A. International Consultants

#### 1. Hydropower Development Specialist (2 person-months)

2. The hydropower development specialist will undertake following activities:

- (i) Review the feasibility reports prepared for all subprojects under the previous advisory TA (4173-UZB)<sup>1</sup> and identify key technical challenges that may threaten subproject development.
- (ii) Assess the technical and financial management capabilities of the Ministry of Agriculture and Water Resources and Uzsuvenergo to undertake the Project in a timely manner; identify any resource and skills gaps; and recommend, design, and implement training activities, seminars, and conferences to strengthen their capabilities.
- (iii) Validate the assumptions made, verify the flow of data used in the feasibility reports, and optimize the proposed design to reflect the most cost-effective solution for each subproject.
- (iv) Update the cost estimates for each subproject based on relevant international experience, identify procurement packages, and recommend the mode of procurement for these packages.
- (v) Prepare the project implementation schedule and the sequencing of subproject implementation to match the capacity of the implementing agency.
- (vi) Assess the Project's likely impact on the flow of water to the Aral Sea, if any, and incorporate steps in the project design to mitigate any adverse impacts.
- (vii) Prepare a due diligence report of technical assessment of the Project and coordinate with other team members.

#### 2. Financial Analyst and Financial Management Specialist (2 person-months)

3. In accordance with the *Guidelines for the Financial Management and Analysis of Projects Financed by the Asian Development Bank (2005)*, the consultant will conduct financial analysis of the proposed Project and assess the financial performance of Uzsuvenergo, as follows:

- (i) Assess the financial impact of each subproject to determine its financial rate of return.
- (ii) Carry out in-depth financial analysis of the proposed investment and any defined subprojects, including calculating the financial internal rate of return and the

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<sup>1</sup> ADB. 2003. *Technical Assistance to the Republic of Uzbekistan for Off-Grid Renewable Energy Development*. Manila.

- weighted average cost of capital, taking into account all the financial costs and benefits of the proposed Project.
- (iii) Identify all risks to the Project's revenues and costs and conduct relevant sensitivity analyses on the financial results.
  - (iv) Prepare an entire project cost estimate, separating foreign exchange and local currency costs and including physical and price contingencies, interest during construction, and the commitment fee and other financing charges.
  - (v) Prepare a financing plan for the Project, including proposed Asian Development Bank (ADB) lending, any prospective cofinancing, and appropriate counterpart funds for local currency expenditures. Assess the veracity of the plan to ensure that adequate counterpart funds are available in a timely manner.
  - (vi) Review the most recent audited and/or unaudited financial statements of Uzsuvenergo to assess its (a) historical financial performance, (b) retail tariff levels, (c) capital structure, and (d) sufficiency of generation of internal funds to ensure the sustainability of ongoing operations (that is, Uzsuvenergo's ability to self-finance a reasonable percentage of its capital expenditures and to service existing debt). Review recent audited project accounts of Uzsuvenergo to determine the use of proper accounting and cost control systems.
  - (vii) Prepare an appendix summarizing historical and projected financial performance, which will include 10-year pro forma financial statements (balance sheet, income statement, statement of cash flow) for Uzsuvenergo.
  - (viii) Recommend appropriate financial performance measures/ratios for Uzsuvenergo and assess compliance with such measures /ratios in pro forma statements.
  - (ix) Undertake a financial management assessment of the operating entity, which should include (a) corporate planning and budgetary control, (b) financial and management accounting, (c) cost accounting, (d) internal control and audit system, and (e) data processing. Suggest appropriate financial covenants to monitor the Project's financial conditionalities. In light of ADB's *Policy on Governance: Sound Development Management*,<sup>2</sup> recommend ways to improve the corporate governance of Uzsuvenergo.

### 3. Economist (1.5 person months)

4. The economist shall be responsible for producing an economic least-cost analysis and economic cost-benefit analyses for each identified subproject. The economist will test each of these analyses thoroughly for sensitivity to a variety of plausible scenarios and to identify improvements in the project design that would improve economic net benefits. The economist shall be responsible for delivering analyses of sufficient analytical clarity and rigor as determined by the project leader and the project economist. Analyses must be consistent with principles laid out in ADB's *Guidelines on the Economic Analysis of Projects*.<sup>3</sup>

5. In undertaking the least-cost analysis, the consultant will take the following steps:

- (i) Review and update general macroeconomic and sector information, including energy production and consumption by sector and energy efficiency as detailed in the final report of ADB's *Technical Assistance to the Republic of Uzbekistan for Energy Needs Assessment*<sup>4</sup> and analyze the Project's sectoral and policy context.
- (ii) Consult with the pricing department of the Ministry of Finance to gain an appreciation of the expected levels of electricity tariffs in local currency terms

<sup>2</sup> ADB. 1995. *Governance: Sound Development Management*. Manila.

<sup>3</sup> ADB. 2003. *Economic Analysis of Projects. Operations Manual*. Section G1/BP. Manila.

<sup>4</sup> ADB. 2002. *Technical Assistance to the Republic of Uzbekistan for Energy Needs Assessment*. Manila.

over the life of the Project. The final report of ADB's *Technical Assistance to the Republic of Uzbekistan for Energy Needs Assessment* (footnote 4) contains forecasts of the demand for power developed with the inputs of Uzbekenergo. The economist shall examine the assumptions about power prices, commercial discipline, and technical losses used to develop these forecasts and update them to cover the life of the project investments in light of information from the Ministry of Finance. Forecasts must have adequate temporal definition to capture seasonal fluctuations.

- (iii) Acquire detailed information on the financial costs of and feasible additions to the installed capacity of each of the subprojects in conjunction with the rest of the consulting team. Analogous estimates will be compiled from existing reports, industry standards, and discussions with relevant officials on other potential projects to reduce unmet demand. These alternatives will include the possibility of importing hydropower, rehabilitating existing thermal options, and building of new thermal and hydroelectric power stations.
- (iv) Convert the financial cost estimates into nominal economic prices in local currency according to *ADB's Guidelines on the Economic Analysis of Projects* (footnote 3).
- (v) Capture Uzbekistan's economic cost of capital, using a discount factor, to prepare a least-cost development plan for meeting the demand for power over the life of the Project.
- (vi) Identify key assumptions together with the project team and conduct sensitivity analyses to check the robustness of the least-cost results.

6. If the identified subprojects are shown to be least cost, the economist shall prepare a cost-benefit analysis of the subprojects. The economist will take a conservative approach to measuring the project benefits. Environmental and social benefits, as well as reliability improvements, will be described in detail. Only the benefits of increased electricity supply to the grid will be quantified. In undertaking the cost-benefit analysis, the consultant will undertake the following tasks:

- (i) Estimate the incremental electrical energy supplied throughout the life of the Project excluding technical losses and identify any nonincremental benefits, such as cost savings in relation to resources.
- (ii) Estimate consumers' willingness to pay using a representative survey.
- (iii) Estimate the economic benefits of each subproject based on consumers' willingness to pay and the incremental energy supply and aggregate the Project's benefits.
- (iv) Calculate an economic internal rate of return for each of the subprojects.
- (v) Conduct a sensitivity analysis for plausible scenarios.
- (vi) Identify and analyze likely economic uncertainties that could affect the Project's viability and carry out a risk analysis.
- (vii) Produce a report detailing all the relevant numerical analyses and the unquantifiable benefits of the Project.

#### **4. Environmental Specialist (1 person-month)**

7. The environmental specialist will undertake the following:

- (i) Prepare the environmental impact assessment or initial environmental examination for the Project in accordance with the *ADB Environment Policy 2002*<sup>5</sup> and

<sup>5</sup> ADB. 2005. *Environment Policy*. Manila.

*Environmental Assessment Guidelines 2003*<sup>6</sup> and finalize the environmental impact assessment or initial environmental examination by incorporating comments from ADB.

- (ii) Prepare the summary environmental impact assessment or summary initial environmental examination document in accordance with the *ADB Environment Policy 2002* (footnote 5) and *Environmental Assessment Guidelines 2003* (footnote 6).
- (iii) Review the environmental management capabilities of the Ministry of Agriculture and Water Resources and of local environmental monitoring units and recommend institutional strengthening measures, if required.
- (iv) Assess the global environmental benefits of the Project in terms of reductions in greenhouse gas emissions, assess the monetary value of potential emission reduction credits generated under the Clean Development Mechanism of the Kyoto Protocol, and assess Uzbekistan's regulatory framework for supporting Clean Development Mechanism projects.
- (v) Help Uzsuvenergo conduct appropriate public consultation, as required, in accordance with the *ADB Environment Policy 2002* (footnote 5) and *Environmental Assessment Guidelines 2003* (footnote 6).

#### **5. Procurement Specialist (1.5 person-month)**

8. The procurement specialist will undertake the following:

- (i) Finalize the list of procurement packages and the procurement mode for each subproject in consultation with the hydropower development specialist.
- (ii) Prepare a procurement plan for the Project and prepare outline bid documents for each of the procurement packages based on the technical data in the feasibility report.
- (iii) Help Uzsuvenergo set up a project management unit to oversee project implementation.

#### **6. Social and Poverty Specialist (1 person-month)**

9. The social and poverty specialist will undertake the following tasks:

- (i) Conduct a site visit to verify the initial poverty and social assessment. Collect available reports and published statistics relevant to the Project. Identify the project stakeholders and examine their existing rights and possible risks from the Project. Help build public acceptance of the Project. Organize and conduct surveys in the project area and consult with the Government and with nongovernment organizations to supplement secondary data. Prepare a poverty profile of the project area. Indicate the incidence of poverty, the current situation, and the trend and include poverty characteristics and the perceptions of people gathered through surveys or existing poverty assessments of the project area. Assess the pro-poor impacts of the Project, taking linkage effects into account. Identify ways to make the Project pro-poor, design a time-bound plan for monitoring, and outline the plan and resources required to implement it.
- (ii) Estimate the number of poor people who will benefit from the Project. Estimate the proportion of the poor who will benefit from Government expenditure on the Project. For net benefits to the economy, estimate the proportion of those benefits

<sup>6</sup> ADB. 2005. *Environmental Assessment Guidelines*. Manila.

- directly accruing to the poor. Conduct risk analyses for key variables and assumptions used in calculating this proportion and explain the implications.
- (iii) Provide a statement of the Project's features relating to poverty reduction. Assess social and gender considerations as part of the project design. Prepare a social analysis in accordance with ADB *Guidelines for Incorporation of Social Dimensions in ADB Operations*.<sup>7</sup> Determine the Project's likely social and gender effects. Identify any mitigation measures or complementary activity that could help reduce poverty in the project area.
  - (iv) Assess whether ethnic minorities will experience any adverse or disproportionate effects. If the impacts are significant, prepare an ethnic minority development plan based on ADB's policy on indigenous peoples.
  - (v) Assess the impacts of relocation and resettlement on the people affected in accordance with ADB's *Handbook on Resettlement*,<sup>8</sup> especially the poor, women, and ethnic minorities. If resettlement impacts will occur, help the Government prepare a time-bound resettlement plan for land acquisition and resettlement to ensure compliance with ADB's *Policy on Involuntary Resettlement*<sup>9</sup> and national laws.

## B. Domestic Consultants

10. The domestic consultants (24 person-months) will be engaged to help the international consultants perform their tasks. The domestic consultants will have extensive knowledge of the small hydropower plant sector in Uzbekistan. A team leader from the domestic consultants will coordinate the activities of the international and domestic consultants to ensure that timely data are available to the consultant team. The domestic team leader will also be responsible for organizing all relevant workshops, seminars, and roundtable conferences to disseminate the project preparatory TA findings and to finalize its recommendations. The domestic consultants will include (i) a team leader (4 person-months); (ii) three hydropower experts, namely, a hydrologist, a hydro-mechanical expert, and an electro-mechanical expert (3 person-months each); (iii) a financial analyst (3 person-months); (iv) an economist (2 person-months); (v) an environmental specialist (2 person-months); (vi) a cost estimator and procurement specialist (2 person-months); and (vii) a social and poverty expert (2 person-months).

11. The domestic consultants will help the international consultants quickly become familiar with their tasks by reviewing relevant reports, analytical data, policies, and regulations and, translating relevant documents into English.

<sup>7</sup> ADB. 1997. *Guidelines on Operational Procedures: Incorporation of Social Dimensions in Bank Operations*. Manila.

<sup>8</sup> ADB. 1998. *Handbook on Resettlement: A Guide to Good Practice*. Manila.

<sup>9</sup> ADB. 1995. *Policy on Involuntary Resettlement*. Manila.