

ASIAN DEVELOPMENT BANK

TAR: TAJ 38179

TECHNICAL ASSISTANCE
(Financed by the Poverty Reduction Cooperation Fund)

TO THE

REPUBLIC OF TAJIKISTAN

FOR

DEVELOPMENT OF COMMUNITY BASED MICRO-HYDROPOWER SUPPLY

IN REMOTE RURAL AREAS

November 2004

CURRENCY EQUIVALENTS

(as of 24 September 2004)

Currency Unit	–	somoni (TJS)
TJS 1.00	=	\$0.3304
\$1.00	=	TJS 3.0262

ABBREVIATIONS

ADB	–	Asian Development Bank
TA	–	technical assistance
DFID	–	Department for International Development

WEIGHTS AND MEASURES

kWh	–	kilowatt-hours
GWh	–	gigawatt-hours

TA CLASSIFICATION

Targeting Classification	–	Targeted Intervention
Sector	–	Energy
Subsector	–	Renewable energy generation
Theme	–	Sustainable economic growth
Subtheme	–	Developing rural areas

NOTE

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

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I. INTRODUCTION

1. The Government of Tajikistan (the Government) is considering pursuing the option of community-managed micro-hydropower to meet the wide energy supply gap during the winter in remote villages. It requested the Asian Development Bank (ADB) to carry out a technical assistance (TA) to identify micro-hydropower projects in remote rural areas and involve rural communities in management of rural utility power services. The TA was included in ADB's 2004 TA program,¹ and will complement the earlier ADB TA² for developing a hydropower strategy for Tajikistan. The proposal was endorsed for funding by the Poverty Reduction Cooperation Fund in March 2004. The Fact-Finding Mission in May 2004 reached an understanding with the Government on the goals, purpose, scope, approach, cost estimates, implementation arrangements, and terms of reference for consulting services for the TA. The TA framework is in Appendix 1.

II. ISSUES

2. Despite the high capital investment involved, many remote rural communities in Tajikistan were connected to the main electricity grid under the former Soviet regime. Nearly all the power is generated by hydropower projects fed by glacial water. These have a lower output in winter. The whole electricity system (generation, transmission, and distribution) in Tajikistan is very old and significant investment is needed for rehabilitation and modernization. The Government's focus is on modernization of existing energy infrastructure for industry and commercial use, and on the overall national need to attract foreign investment. Meanwhile, the electricity supply in remote rural areas is deteriorating. There is little electricity supply in winter when communities' become very vulnerable. Households, especially women and children, resort to using wood fires and kerosene for heating, cooking, and lighting, which cause respiratory diseases, and the natural environment is also damaged due to uncontrolled deforestation. The Government identified increasing access of the poor to electricity as one of the main issues in its poverty reduction strategy paper in 2002. So, in order to maintain the livelihoods of remote rural communities as well as the natural environment, consumers in remote areas—where most of the poor live—need to be included in the direct benefits of the Government's and ADB's energy sector strategy.

3. The ADB Country Strategy and Program (CSP), 2004–2008³ for Tajikistan focuses on integrated rural development. Energy services constitute a key building block for successful, integrated rural development. Off-grid electricity—despite relatively higher generation costs—is a viable alternative to supplement the existing unreliable supply. Because of the mountainous topography, run-of-river micro-hydropower generation tends to be the least-cost solution for providing additional electricity supplies to remote communities. Further, it is a solution based on local resources with minimal environmental impact and no combustion emissions. Tajikistan has very few fossil fuels, such as oil, natural gas, or coal, and relies on imports from Uzbekistan and Kazakhstan. People in remote areas resorted to cutting down trees and bushes for use as fuel after coal and gas supplies became unreliable with the collapse of the Soviet Union in 1991. Other renewable sources of energy, such as wind and solar power, are likely to have a higher life-period cost as the region lacks an appropriate maintenance system.

¹ The TA first appeared in the Internet edition of *ADB Business Opportunities* in May 2004.

² ADB. 2002. *Technical Assistance to Tajikistan for the Hydropower Development Strategy Project*. Manila.

³ ADB. 2003. *Country Strategy and Program 2004-2008: Tajikistan*. Manila.

4. Poor people often use inefficient appliances that are inexpensive to buy but consume more electricity. People living in remote areas have not yet been introduced to efficient and modern appliances, such as neon and compact florescent lights, convective space heaters, and electric blankets. They can be assisted in making informed buying decisions. Use of efficient appliances will also extend electricity supplies to more consumers with the same power generation capacity.

5. Barki Tajik, the state-owned electricity company, is responsible for management of the power sector and supply of electricity to all consumers. Its attention is at present focused on rehabilitation and modernization of the main grid system for urban centers; the problems of remote areas remain unresolved.⁴ The micro and small hydropower projects are viable options for power supply in the remote regions of Gorno Badakhshan Autonomous Region.⁵ Field inspections revealed that well-designed projects with proper equipment are being successfully operated by local people; however, a subsidy for the capital costs and the participation of the local community were essential for sustainability. Local communities can be encouraged to be involved in project design, implementation, and subsequently, the supply of electricity in remote areas, mainly because (i) micro-hydropower equipment is simple⁶ and a large part of the population possesses the necessary skills as they worked in factories under the Soviet system, and (ii) community-based water management systems are already functioning. Further, community participation can also increase income-generating activities that are made possible by more reliable power supply. However, there is a need to prepare simple business models that village residents can appreciate and get fully involved in, and later develop partnerships with other agencies in terms of credit and marketing facilities.

6. The implementation of the two proposed pilot projects will support the Government's development effort to poor households that have either an unreliable electricity supply or no supply at all in winter. Lessons learnt in hydropower sector and past-related donors and ADB projects⁷ have been taken into account in the preparation of the TA.

III. THE TECHNICAL ASSISTANCE

A. Purpose and Output

7. The purpose of the TA is to improve utility power services in remote rural areas in winter.

8. The TA will be divided into two distinct phases and the implementation of Phase 2 will depend on a satisfactory output of Phase 1. The expected outputs of Phase 1 are: (i) identification of two sites suitable for pilot hydropower generation and assessment of project feasibility, (ii) identification of community organizations that are motivated and capable of managing and owning a micro-hydropower project, and (iii) preparation of an appropriate organization framework for providing the utility power services. The Department for International

⁴ The Islamic Development Bank approved a \$10 million loan in February 2004 for the rehabilitation of five small hydropower stations in remote areas.

⁵ R. Droux and T. Hoeck. 2004. *Energy for Gorno Badakhshan: Hydropower and the Cultivation of Firewood*. Joint Diploma Thesis. Faculty of Natural Resources of University of Berne, Switzerland.

⁶ A 200 kW micro-hydropower machine will produce about the same amount of power as a mid-size car, but has only one low-speed water turbine coupled to a power generator. The micro-hydropower machine is designed to last about four times as long as a car but requires about a fourth of the skills to keep it operating.

⁷ Smail Khennas and Andrew Barnett. 2000. *Best Practices for Sustainable Development of Micro Hydropower in Developing Countries*. Department for International Development, United Kingdom.
ADB. 2002. *Project Performance Audit Report on the Theun-Hinboun Hydropower Project in the Lao People's Democratic Republic*. Manila.

Development will assess the Phase 1 report along with ADB's recommendation to determine the funding for Phase 2. The expected outputs of Phase 2 are (i) establishment of two viable community-based energy organizations, (ii) implementation of two pilot micro-hydropower projects and strengthening of distribution networks, (iii) supply of energy in pilot project areas, (iv) greater awareness of energy saving in pilot project areas, and (v) creation of partnerships with other agencies for income-generating activities. Taking account of other development partner activities and local needs, the Government has indicated several possible pilot project sites: one project may be located in Tajikabad, about 240 kilometers (km) from Dushanbe, and the second in one of the following possible locations: Faisalabad, Gar, Jerakabad, Liakso, or Nurabad. Each micro-hydropower project would have a capacity of 50–100 kilowatt (kW) and would supply electricity to approximately 1,500 households.⁸

9. The outcomes of the TA will be disseminated by publications, workshops, and ADB web site. The TA will evaluate the pilot projects and define the critical factors needed to replicate their success in other locations. It will develop training programs to build the capacity of the Government and the Ministry of Energy, to (i) ensure continuing policy support and removal of any institutional and regulatory barriers to scaling up the community-based micro-hydropower projects, and (ii) establish community-based organizations to install and operate the utility power services.

B. Methodology and Key Activities

10. The participation of a wide range of stakeholders is essential for this TA. Such participation, including the poorest people and vulnerable groups like households headed by females, the elderly, or disabled, and indigenous people, will directly contribute to the success of the TA. The community will participate throughout the project cycle and will help make decisions. The TA will also create an enabling environment for micro-hydropower generation by improving the existing legal and regulatory framework. The TA will seek continual support of government agencies and will initiate dialogue to adopt a community-based micro-hydropower strategy in the energy sector policy. Budget allocation will be sought for its replication.

11. Information sharing is another important principle in this TA. Information on project design, organization framework, and community participation will be shared through formal and informal meetings, conferences, and the media, depending on who the target audience is.

12. **Phase 1** (3 months). The following outputs will be available after Phase 1:

- (i) **Hydrologic and geologic feasibility study.** The study will examine local hydrologic statistics and geologic stability (landslides, etc.) for the pilot project sites proposed by the Government and will determine project feasibility.
- (ii) **Social feasibility study.** The study will identify functioning community-based organizations for owning and managing the pilot projects, taking into account the communities' willingness and keenness to own the project, and their willingness to pay for the utility power services. In parallel, various surveys and analyses will be carried out at these sites, such as stakeholder analysis, gender analysis,

⁸ According to the Ministry of Energy, the average cost of fully installed units is \$600–800 per kW for Russian equipment. Equipment made in Pakistan or the People's Republic of China would cost less. The view of the experts of the Aga Khan Foundation in Dushanbe is that prices are even lower.

a socioeconomic survey, a household energy survey,⁹ field surveys to comply with ADB's safeguard issues, analysis of opportunities and risks for income-generating activities, and identification of other agencies that would be interested in partnering.

- (iii) **Pilot project technical design.** The study will carry out the technical design and economic feasibility study, including detailed cost estimates, contract packaging, and time scheduling for implementation of the selected pilot projects under activity (i).

13. **Phase 2** (12 months). The following activities will be carried out in Phase 2:

- (i) **Institution building.** First, the basic rules of the community-based organization will be prepared by the community members with assistance from government agencies and consultant. The rules will cover areas like the organization, by-laws, appointment of executives, tariffs, billing and collection method, project monitoring and evaluation, customer relations management, and social and environmental monitoring mechanisms and criteria. Simultaneously, the basic skills for operation and maintenance will be provided by Barki Tajik and the consultant. Second, the detailed design of the pilot projects (including tender documents) will be prepared. The community members need to understand the project implementation plan, which will increase the ownership and transparency of the project. Third, an action plan for an awareness campaign on energy saving will be formulated for key stakeholders, such as community members, local NGOs, local governmental agencies, media, and local social organizations.
- (ii) **Implementation of pilot projects (micro-hydropower and distribution networks).** This will include procurement, installation, and operation of the two pilot micro-hydropower projects, and strengthening of the distribution networks in the project areas. The work will be shared by community members, and assisted by government agencies and consultants. On-the-job operation and maintenance training will be provided to community members. In parallel, an awareness campaign on energy saving will be carried out by the concerned stakeholders according to the action plan in (i) above.
- (iii) **Implementation of pilot project (income-generating activities).** Outline business plans will be prepared by community members with assistance from local government agencies and consultants. Based on these plans, the community-based organization, with assistance from the government consultant, will seek partnerships with other agencies in the region to acquire related services, such as microfinance and marketing.
- (iv) **Pilot project monitoring and evaluation, and replication.** After TA completion, the pilot project evaluation will be carried out in a participatory manner. All stakeholders will share their concerns, on both the positive and negative aspects of the project, and suggest ways to further improve the quality of the project.

⁹ Questions will include: (i) What types of energy are used for different purposes? (to understand the substitution effect); (ii) What portion of the household's income is spent on energy? (to understand trade-offs); (iii) What are the coping strategies in the face of unreliable energy supply, or the impact of large price increases? (to understand energy conservation possibilities).

Lessons learned will be documented to help in the design of future similar projects. Besides this activity, community based organizations will conduct periodic ex-post project monitoring as a part of customer relations management. They will look into not only technical, organizational, and financial aspects, but also social aspects like the impacts of the project on the life of community members.

C. Cost and Financing

14. The total cost of the TA is \$1,000,000 equivalent, including a foreign exchange component of \$563,000 and a local currency component of \$437,000 equivalent. The Government has requested ADB to finance \$800,000 equivalent to cover the entire foreign exchange cost and \$237,000 equivalent of the local currency cost. The Government will finance the balance of the local currency cost. The TA will be financed on a grant basis from the Poverty Reduction Cooperation Fund. The detailed cost estimates and financing plan are presented in Appendix 2.

D. Implementation Arrangements

15. The TA will require 131 person-months of consulting services: 11 person-months of international consultants, and 120 person-months of domestic consultants, including NGOs. The consulting team, to be recruited through a firm, will comprise hydropower, economics, financial, environmental, social development, and legal specialists. All consultants will be selected and engaged by ADB in accordance with its *Guidelines on the Use of Consultants* and other arrangements satisfactory to ADB for selecting and engaging domestic consultants. All procurement of goods and works under the TA will be in accordance with ADB's *Guidelines for Procurement*. Goods will be procured under international shopping arrangements and works will be procured under local competitive bidding procedures.

16. The Ministry of Energy will be the Executing Agency for the TA. The village organization or the local administrative body at the pilot project sites will be the implementing agencies. The Executing Agency will assign a project leader and counterpart staff, and monitor the domestic consultants' work in close coordination with ADB. The TA will be implemented over 15 months starting in January 2005 and ending in March 2006. Outline terms of reference for consulting services are given in Appendix 3.

17. **Involuntary Resettlement Issues.** The pilot projects are each expected to have a small amount of voluntary or involuntary land donation/acquisition for the powerhouse (of about 10 to 15 square meters), intake water pipes, and few wooden poles for the distribution network. The consultant will assist in dealing with any losses that arise.

IV. THE PRESIDENT'S DECISION

18. The President, acting under the authority delegated by the Board, has approved ADB administering technical assistance not exceeding the equivalent of \$800,000 to the Government of Tajikistan to be financed on a grant basis by the Poverty Reduction Cooperation Fund for Development of Community Based Micro-Hydropower Supply in Remote Rural Areas, and hereby reports this action to the Board.

TECHNICAL ASSISTANCE FRAMEWORK

Design Summary	Performance Indicators/Targets	Monitoring Mechanisms	Assumptions and Risks
<p>Goal</p> <p>Improved quality of life during the winter in the remote rural project areas and demonstration of community-based micro-hydropower as a viable option.</p>	<p>Average score of level of service satisfaction and quality of life index is more than 3.5 on a scale of 5.</p> <p>Implementation of five other micro-hydropower projects by 2008.</p>	<p>Community energy organizations to conduct annual surveys during and after the TA implementation period. Suitable survey questionnaires will be prepared, and necessary capacity building will be done during TA implementation.</p>	
<p>Purpose</p> <p>Improvement in utility power services during the winter.</p>	<p>Reduction in ratio of outage of power supply for households in project areas by 50%</p>	<p>Energy generation log sheet during winter, maintained by community-based organizations.</p>	<p>Assumption: Power is generated as expected.</p>
<p>Outputs</p> <p>1. Phase 1</p> <p>Identified project sites</p> <p>Identified local community organizations</p> <p>Developed organization rules and procedures for pilot projects</p> <p>2. Phase 2</p> <p>Implemented pilot micro-hydropower projects</p> <p>Strengthened distribution network</p> <p>Supplied energy in target communities</p>	<p>Identification of two project sites.</p> <p>Identification of two community organizations in each project area.</p> <p>Description of one organization structure model by the end of Phase 1.</p> <p>Implementation of two micro-hydropower projects with 50–100 kW capacity.</p> <p>Installation of 0.4 kV distribution network and connections to cover 75% of households in project areas.</p> <p>Supply of electricity to 1,500 households in two project areas during winter.</p>	<p>Phase 1 consultant report.</p> <p>Phase 2 consultant report and ADB mission review.</p> <p>Progress report of community-based organization.</p>	<p>Assumptions: Documents on existing projects for review are available.</p> <p>DFID decides to continue funding for Phase 2.</p> <p>Equipment is in stock.</p>

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Design Summary	Performance Indicators/Targets	Monitoring Mechanisms	Assumptions and Risks
<p>Established viable community-based energy organization</p> <p>Raised awareness on energy saving</p> <p>Formed partnerships with other agencies for income-generating activities</p>	<p>Incorporation of one organization in each project site and appointment of 80% of executive members.</p> <p>At least 75% of target households covered by the campaign.</p> <p>At least one other agency in each project area having a partnership for income generation.</p>	<p>Summarized information on by-laws and membership prepared by consultant and community-based organization.</p> <p>Progress report and final report prepared by consultant.</p>	<p>Assumption: Other agencies with complementary resources are available and community members are willing to enter into a partnership.</p>
<p>Activities</p> <p>Phase 1</p> <ol style="list-style-type: none"> 1. Conducted hydrologic and geologic feasibility study 2. Conducted social feasibility study 3. Conducted pilot project technical design <p>Phase 2</p> <ol style="list-style-type: none"> 1. Conducted institution building and training 2. Implemented pilot project (micro-hydropower and distribution networks) 3. Implemented pilot project (income-generating activities) 4. Conducted pilot project monitoring and evaluation, and replication 	<p>Phase 1 to be completed within 3 months of TA inception.</p> <p>Phase 2 to be completed within 12 months.</p> <p>In months 4–6 of TA inception</p> <p>In months 6–12 of TA inception</p> <p>In months of 8–15 of TA inception</p> <p>One evaluation report for each project site by the end of TA period.</p>	<p>Progress report prepared by consultant.</p> <p>Progress report and final report prepared by consultant.</p> <p>Progress report and Phase 1 report prepared by consultant.</p> <p>Progress report and final report prepared by consultant.</p> <p>Progress report and final report prepared by consultant.</p>	<p>Assumptions: Existing data are available for review. Selected respondents and communities are willing to disclose their information.</p> <p>Existing design is available for review.</p> <p>DFID agrees to continue funding for Phase 2.</p> <p>Other agencies are available and community members are willing to work with them.</p>
<p>E. Inputs</p> <ol style="list-style-type: none"> 1. Consultants 	<p>\$390,600 for a total of 131 person-months, comprising 11 person-months of international and 120 person-months of domestic consultant including NGOs.</p>	<p>TA administration report</p>	<p>Assumptions: Qualified consultants are available.</p>

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Design Summary	Performance Indicators/Targets	Monitoring Mechanisms	Assumptions and Risks
2. Equipment	\$252,000, including (i) \$120,000 for the supply of two micro-hydropower units in the range of 50–100kW each; (ii) \$120,000 for support costs; (iii) \$5,000 for the supply of computer and software; and (iv) \$7,000 for conducting the initial surveys	Contract award	Equipment is in stock.
3. Training, seminar, and conferences	\$32,000, including (i) \$24,500 for workshop and study tour and (ii) \$7,500 for capacity-building and awareness campaign	Attendance sheet and record/minutes of discussion	Sufficient counterpart support and absorptive capacity of local community
4. Initiatives for income-generating activities	\$3,800	Progress report	
5. ADB support and supervision	\$30,000 (toward staff resources)	ADB review mission back-to-office report	
6. Government contribution	\$200,000	Counterpart staff work log sheet	

ADB = Asian Development Bank, DFID = Department for International Development, kV = kilovolt, kW = kilowatt, NGO = nongovernment organization, TA = technical assistance.

COST ESTIMATES AND FINANCING PLAN
(\$)

Item	Foreign Exchange	Local Currency	Total Cost
A. Poverty Reduction Cooperation Fund Financing^a			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	270,600	0	270,600
ii. Domestic Consultants (including NGOs)	0	120,000	120,000
b. International and Local Travel			
i. International	17,600	0	17,600
ii. Domestic	0	8,000	8,000
c. Reports and Communications	6,000	0	6,000
2. Equipment			
a. Support Cost for Pilot Projects ^b	60,000	60,000	120,000
b. Equipment for Pilot Projects ^c	120,000	0	120,000
c. Computer and Computer Software	5,000	0	5,000
d. Surveys	5,000	2,000	7,000
3. Training, Seminars, and Conferences			
a. Initial Workshop (2 Locations)	2,500	12,000	14,500
b. Workshop and Study Tour	5,000	5,000	10,000
c. Capacity Building and Awareness Campaign	2,500	5,000	7,500
4. Representative for Contract Negotiations	5,000	0	5,000
5. Miscellaneous. TA Administration and Support Cost ^d	3,800	0	3,800
6. Contingencies	60,000	25,000	85,000
Subtotal (A)	563,000	237,000	800,000
B. Government Financing			
1. Office Accommodation and Transport	0	20,000	20,000
2. Remuneration and Per Diem of Counterpart Staff	0	29,000	29,000
3. Local Travel and Transport	0	5,000	5,000
4. Secretarial Support and Offices Services	0	110,000	110,000
5. Office Equipment	0	10,000	10,000
6. Miscellaneous	0	26,000	26,000
Subtotal (B)	0	200,000	200,000
Total	563,000	437,000	1,000,000

NGO = nongovernment organization, TA = technical assistance.

^a Administered by the Asian Development Bank.

^b Includes the related expenditure for the pilot projects, other than the direct equipment cost.

^c Two micro-hydropower units.

^d This will be used to support community-based income-generating activities. The grant will be awarded directly to the appropriate organization. The mechanism of disbursement will be based on an agreement between ADB and the eligible organization; terms of payment will be indicated in the agreement. The detailed eligibility criteria of the organization, the disbursement mechanism, and the performance indicators will be determined during the TA.

Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

1. The technical assistance (TA) will be implemented in consultation with concerned stakeholders—local communities, nongovernmental organizations (NGOs), national and local governments, private sector bodies, and other development agencies. The TA consultant will review evaluation reports of similar projects funded by the Asian Development Bank (ADB) and other agencies, especially with regard to the lessons learned and factors that influence sustainability.¹

A. Scope of Work

1. Phase 1: Pilot Project Preparation

2. The international consultant team will perform the following tasks:

3. **The hydropower specialist (team leader)** (3 person-months) will (i) establish a project advisory board, to include government and ADB staff, existing small hydropower development professionals, experts within the Ministry of Energy (MOE), the President's Office, and Barki Tajik; (ii) analyze existing micro-hydropower projects, evaluate lessons learned, and recommend solutions for implementation problems faced by other community-based projects in rural areas; (iii) review previous hydropower studies, discuss the suitability of the possible location of the pilot projects with the Government and liaise with various NGOs, in particular with the Aga Khan Foundation; (iv) evaluate and confirm suitability of micro-hydropower against other alternatives for providing electricity in remote areas; (v) based on engineering surveys, identify and rank the identified sites for pilot projects, confirm potential electricity demand, and develop three candidate sites where micro-hydropower is the least-cost alternative; (vi) select the two micro-hydropower sites for pilot projects, based on, but not limited to, local hydropower potential, village-level demand and number of users, proximity to community infrastructure potential grid connections, access to telecommunication facilities, potential for income-generating activities, and access to largest number of households; (vii) assess the local community's ability to construct, operate, and manage a micro-hydropower project; (viii) prepare detailed cost estimates for the pilot hydropower projects and associated costs of strengthening the distribution network and connections; and, (ix) in consultation with the other members of the team, prepare the technical design, contract packaging, project implementation schedule, and drawings for the two pilot micro-hydropower projects, including a proper assessment of environmental and social impacts, as well as costs and benefits according to ADB policies.

4. **The economist** (0.75 person-months) will: (i) summarize the current and projected energy situation in the possible locations; (ii) analyze the energy consumption and possible energy savings by demand-side management; (iii) assess the willingness to pay for electricity; (iv) determine the economic internal rate of return; (v) determine financial, institutional, and operational parameters for sustainability and replication of pilot projects; (vi) analyze energy efficiency initiatives in the project area, and examine cost-effective options for heating; (vii) assess economic costs and benefits of the pilot projects; and (viii) design simple tariff structure, billing, and revenue collection systems to ensure future financial sustainability.

5. **The financial specialist** (0.75 person-months) will: (i) in accordance with ADB's *Guidelines for the Financial Governance and Management of Investment Projects Financed by the Asian Development Bank*, carry out financial analysis of the proposed projects, including calculation of the financial internal rate of return and weighted average cost of capital, conduct

¹ Khennas Smail and Andrew Barnett. 2000. *Best Practices for Sustainable Development of Micro Hydropower in Developing Countries*. Department for International Development, United Kingdom.

relevant sensitivity analysis on the financial results; (ii) prepare a financing plan for the projects, and (iii) identify specific sources and projection of revenue from the projects.

6. **The environmental specialist** (0.5 person-months) will: (i) assess the potential environmental impact for the two pilot projects according to ADB's Environmental Policy (2002) and quantify them to the extent of possible; (ii) recommend appropriate environmental mitigation measures for identified significant impacts and monitoring plans to address these impacts; and (iii) ensure that the cost of implementing recommended mitigations measures, environmental management and monitoring plans are included in the cost of the pilot projects.

7. **The social development specialist** (1.25 person-months) will: (i) provide input to maximize community participation in the technical design, institutional building, procurement, installation, operation, and monitoring and evaluation; (ii) identify one viable community-based organization in each project site; (iii) determine the willingness to pay; (iv) assess the potential involuntary resettlement impact, complying with ADB's Involuntary Resettlement Policy (1995); (v) identify project stakeholders including the poorest people and vulnerable groups; (vi) describe current household monthly energy expenditure by energy source, and energy consumption practices/patterns in winter; (vii) identify possible income-generating activities; (viii) identify other agencies, including NGOs, which can be potential partners for income-generating activities in pilot project areas, (ix) propose the structure of the village organization responsible for the construction, and operation and maintenance of the pilot projects; and (x) prepare an initial customer satisfaction survey form and initial quality of life index.

8. **The legal expert** (0.75 person-month) will: (i) review the existing legal and regulatory framework and propose, improvements to accommodate the pilot projects; (ii) make policy makers and regulators in Tajikistan aware of the needs for policy, regulatory, and licensing support for development of community-based initiatives; and (iii) design an appropriate legal structure that will enable significant community ownership.

9. **The team of domestic consultants** (including NGOs as consultants where possible) will assist the international team leader in the preparation the detailed terms of reference for the domestic consultants under Phase 2 of the TA, and will assist the international consultants in the following tasks:

10. **Two civil engineers** (6 person-months total) will assist in: (i) collecting data; (ii) assessing local resources for implementing the projects (experts, local contractors and communities and local materials); (iii) designing the dam and associate civil works; (iv) preparing detailed cost estimates and bill of quantities; and (v) preparing the relevant drawings, draft technical specifications, and implementation schedule.

11. **Two electro-mechanical engineers** (4 person-months total) will assist in similar tasks as the civil engineers (para. 10) with respect to equipment.

12. **One hydrologist engineer** (3 person-months) will assist in: (i) reviewing and updating the hydrological studies and records; and (ii) assessing the potential river flows and power generation, probable maximum flood flow and level, river sediment carrying characteristics, minimum environmental flow requirements of the river, and the effect on the dam, water and river level bed.

13. **One geologist/ geotechnical specialist** (3 person-months) will assist in: (i) reviewing the data and results of previous studies; (ii) recommending additional geological and geotechnical investigations if needed; and (iii) assessing the geological risk with regards to possible landslide/mudslide and earthquake hazards.

14. **Two power economists** (6 person-months total) will assist in: (i) assessing the energy consumption and possible energy savings; (ii) identifying and analyzing economic uncertainties and carrying out risk analysis; and (iii) designing simple tariff structure, billing and revenue collection.

15. **One financial analyst** (3 person-months) will assist in: (i) preparing a financial plan for the pilot projects; (ii) identifying sources and projections of revenue from the Project; and (iii) designing a simple tariff structure.

16. **Two environmental specialists** (6 person-months total) will assist in: (i) assessing the potential environmental impact for the selected project sites; (ii) recommending appropriate environmental mitigation measures and monitoring plans; and, (iii) assessing the cost associated to the implementation of the mitigation measures and the monitoring plan.

17. **One lawyer** (2 person-months) will assist in: (i) reviewing existing legal and regulatory frameworks; and (ii) designing the appropriate legal structure that will enable significant community ownership.

18. **Four social development specialists** (12 person-months total) will assist in: (i) identifying viable community-based organizations in each project site; (ii) assessing the willingness to pay; (iii) assessing the potential involuntary resettlement impact; (iv) identifying the project stakeholders including poorest people and vulnerable groups; (v) describing current household monthly energy expenditure by energy sources and energy consumption practice/pattern in winter season; (vi) identifying possible income-generating activities; and (vii) preparing the initial satisfaction survey form and initial quality of life index.

2. Phase 2

19. **The hydropower specialist (team leader)** (3 person-months) will: (i) prepare the detailed technical specifications and bidding documents in accordance with ADB's *Guidelines for Procurement*; (ii) assist the Executing Agency (EA) to advertise the bids, carry out the bid evaluation, and prepare bid evaluation reports, contract negotiations, and contract awards; (iii) supervise the supply and installation of equipment, including related activities, until commissioning of the projects; (iv) carry out on-the-job training on the different aspects of the project; (v) prepare the TA completion report in accordance with ADB's requirements; (vi) establish a model for utilizing the generated power for income-generating activities of the community; (vii) assist stakeholders to formulate an action plan for awareness campaign on energy saving; and (viii) identify appropriate institutions for replication of pilot projects in other areas, develop project packages of various sizes that can be replicated, estimate the capital and human resource requirements, the optimum village organizational structure, operational procedures, decision-making and dispute resolution frameworks, and prospective sites for replication of pilot projects to be built over a period of 3 years.

20. **The social development specialist** (1 person-month) will: (i) maximize community participation in technical design, institutional building, procurement, installation, operation, and monitoring and evaluation; and (ii) supervise domestic consultants who are responsible for institution building, awareness raising on energy saving, and income-generating activities to maintain a high standard.

21. **The domestic consultants** (total 75 person-months) will assist the international consultant in design, construction, and commissioning of the pilot projects. They will also assist in the setting up, training, and capacity building of the village organization, awareness campaign,

and promoting income-generating activities, and in conducting customer satisfaction surveys. The detailed terms of reference and allocation of person-months will be developed during Phase 1.

3. Reporting

22. All reports should be submitted in three copies in both English and Russian. The final feasibility study report at the end of Phase 1 and the final completion report at the end of Phase 2, will also be submitted as a soft copy on CD-ROM.

a. Phase 1

23. The consultant will prepare and submit the following reports: (i) two weeks after the beginning of the assignment, the consultant will submit a brief inception report; (ii) three months after the beginning of the assignment, the consultant will submit a draft Phase 1 report, including the result of the feasibility study with technical specification, economic analysis, financial analysis, and environmental and social assessment; (iii) one month after its review, a tripartite meeting will be held to endorse the Phase 1 report. Thereafter, the consultant will submit the final Phase 1 report, approbation of which will constitute the start of the second phase. The approval of the Phase 1 report will involve the Government and ADB, and consultation with the Department for International Development (DFID).

b. Phase 2

24. The following reports will be submitted by the consultant: (i) two months after the beginning of the Phase 2, the consultant will submit the bid evaluation report and the signed contracts for the main equipment for the two pilot projects; (ii) eight months after the beginning of Phase 2, the consultant will prepare a draft final report of the TA which includes information of lessons learned in community based approach and assessment on sustainability. One month after receiving the comments, the consultant will submit the TA final report.

25. In addition to the abovementioned reports, the consultant will prepare an interim report at month four after the beginning of Phase 2, which will include among others: (i) activities carried out; (ii) activities planned; (iii) contract awards and actual disbursement; (iv) projected contract award and disbursement, if any; (iv) update of the implementation schedule; and (v) any problem or difficulties that arise with action taken or proposed actions.

c. Ex-Post Monitoring and Evaluation

26. After the TA completion, the community-based energy organizations responsible for the utility power services funded under the TA will submit at least three annual reports to ADB, which will cover technical, organizational, and financial aspects, and also social aspects such as impacts of the TA on customers' lives and results of the periodic customer satisfaction surveys.

B. Implementation Arrangement Support from the Executing Agency

27. The EA will provide office space including office furniture, telephone, and Internet connections. The consultant will make its own arrangements for office space in the pilot project areas, and for communications and transportation.