ADB

Technical Assistance

TAR: TAJ 34515

Technical Assistance to the Republic of Tajikistan for Preparing the Power Rehabilitation Phase II Project (Financed by the Japan Special Fund)

June 2005

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 15 April 2005)

Currency Unit	–	somoni (TJS)
TJS1.00	=	$0.3286
$1.00	=	TJS3.0435

ABBREVIATIONS

ADB	–	Asian Development Bank
BT	–	Barki Tajik State Joint Stock Company
HPP	–	hydropower plant
KfW	–	Kreditanstalt für Wiederaufbau
TA	–	technical assistance
TADAZ	–	Tajik Aluminum Smelter

WEIGHTS AND MEASURES

GWh	–	gigawatt-hour
MW	–	Megawatt

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Energy
Subsector	–	Renewable energy generation
Themes	–	Sustainable economic growth, environmental sustainability
Subthemes	–	Developing rural areas, developing urban areas, and cleaner production and control of industrial pollution

NOTE

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

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I. INTRODUCTION

1. The Government of Tajikistan requested Asian Development Bank (ADB) project preparatory technical assistance (TA)[1] for the Power Rehabilitation Phase II Project. This request was considered by ADB, and the TA was included in the 2003 country strategy and program. A fact-finding mission visited Tajikistan from 28 February to 7 March 2005. At that time, a field visit was conducted and discussions were held with representatives from Barki Tajik State Joint Stock Company (BT), Ministry of Energy, Ministry of Finance, and other relevant agencies. The Fact-Finding Mission and the Government reached an understanding on the TA's goals, purpose, scope, implementation arrangements, cost, financing arrangements, and terms of reference. The TA design and monitoring framework is in Appendix 1.

II. ISSUES

2. Tajikistan is one of the poorest former Soviet Union countries, with an estimated per capita income of about $310 in 2004. The Government is implementing reforms. As a result of these reforms, the annual gross domestic product growth rate turned positive in 1997 and has averaged 9.5% between 2001 and 2003. In 2003, the poorest regions were Gorno Badakhshan and Khatlon, with overall poverty rates of 84.0% and 78.0%, respectively.[2]

3. The Government developed a poverty reduction strategy paper in 2002 that underscored the essential role of the infrastructure sector. The paper recognized that reliable infrastructure services (i) contribute to improved living conditions and are essential for economic growth, (ii) enhance freedom of movement, and (iii) improve access to health care and education. The Government's main objective in the infrastructure sector is to provide access to reliable and affordable public services in the areas of energy, transport, information and communication, and provision of safe drinking water.

4. A lack of new investment has led to considerable deterioration of the physical infrastructure. Combined with Tajikistan's inability to access adequate fossil fuels, infrastructure deterioration has seriously reduced the reliability of electricity, gas, and heat supplies. The power system was mostly built during the 1960s and 1970s, and a lack of funds and consequent shortage or absence of spare parts have led to the physical deterioration of existing equipment, leaving the system extremely vulnerable. Adding to these problems, the load pattern has shifted from industrial to residential consumers. This shift results in higher losses from overloaded transmission lines and transformers. Overall estimated technical losses currently amount to about 15%.

5. The installed power generation capacity is 4,405 megawatts (MW), comprising mainly six large hydropower plants (HPPs) totaling 4,060 MW (92%) and two fossil fuel-fired combined heat and power stations totaling 345 MW (8%). Annual hydropower energy output is about 16,000 gigawatt-hours (GWh), and the country has an extensive electricity system that provides access to nearly 100% of the population.

6. Tajikistan has three separate power systems: the southern system, the northern system, and the eastern system. The southern system (including Dushanbe) is the main system, with installed generation capacity of 3,910 MW, out of which 3,895 MW are located on the Vakhsh River. The northern system (Soghd Region) covers the Fergana Valley of the Syr Darya River plains. This system has a capacity of 126 MW. The eastern system (Gorno Badakhshan

[1] The TA first appeared in the *ADB Business Opportunities* (Internet edition) on 2 January 2003.
[2] World Bank. 2005. *Tajikistan Poverty Assessment Update.* Washington, DC.

Autonomous Region) covers a sparsely populated mountainous region. This system has a capacity of 23 MW. The annual demands for each system are about 12.00 GWh, 4.00 GWh, and 0.13 GWh, respectively.

7. The southern and the northern systems have generation deficits in winter and rely on energy imported from Uzbekistan. In Soghd and Khatlon regions, the average electricity supply during winter is currently 2–3 hours per day. This is due to lower river flows, which depend on melting snow.

8. The 3,000 MW Nurek HPP has operated for over 30 years. The power plant provides most of the energy needed in Tajikistan and also stabilizes power system operation in Kazakhstan, Kyrgyz Republic, and Uzbekistan, which have interconnected systems. However, soil subsidence has placed the Nurek switchyards at serious risk of collapse.[3] Unless they are relocated to a stable geological area, further underground erosion will cause a complete shutdown of Nurek HPP, which will stop power supply to most of Tajikistan. The Government has sought assistance from Kreditanstalt für Wiederaufbau (KfW) for Nurek HPP's rehabilitation. Based on an intergovernmental agreement signed in December 2004, KfW is implementing TA for preparing this project, which is expected to be completed by April 2006. ADB has provided inputs for the terms of reference and would use this TA outcome to prepare its assistance related to Nurek HPP.

9. The Office of the President's Fuel and Energy Department has oversight responsibility for the energy sector. The Ministry of Energy, established in October 2000, is responsible for coordinating the Government's energy policy. The Committee for Anti-Monopoly and Promotion of Small Enterprises, which reports directly to the Office of the President, regulates the prices of electricity and natural gas and district heat.

10. BT, a vertically integrated and state-owned utility, is responsible for power generation, transmission, and distribution in the northern and southern power systems. The privately owned Pamir Energy Company is responsible for operating all power facilities in Gorno Badakshan Autonomous Region, under a development partner-funded program.[4]

11. Poor collection from customers by BT has been a serious concern. Accounts receivable in December 2003 were equivalent to 6.5 months of billing.[5] The high rate of uncollected fees was attributed to weakness in commercial management and past accumulation by (i) Tajik Aluminum Smelter (TADAZ), when commodity prices were low; (ii) farmers, because of seasonal harvests and the large share of barter trade; and (iii) household consumers, because of low household incomes and a lack of proper metering. Collection from most major consumer categories improved in 2004. For industrial and commercial categories, collection was over 100%.[6] For the residential category, collection improved to 83%, from 61%. For the agriculture category, collection improved to 64%, from 30%. TADAZ, which accounted for about 42% of sales, was the main exception; collection decreased to 86%, from 97%, due to adjustments in billing. The World Bank is now preparing the Energy Losses Reduction Project, which would include the installation of energy meters for consumers in Dushanbe and further help improve collection.

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[3] Emergency repair of switchyard foundations is being carried out using counterpart funds under the ongoing Power Rehabilitation Project (footnote 8).

[4] In 2002, the World Bank provided a $10.0 million loan. International Finance Corporation provided $8.0 million ($3.5 million in equity and $4.5 million in debt). The Aga Khan Fund for Economic Development provided $8.0 million in equity. The Government of Switzerland provided a grant of $5.0 million and technical support.

[5] BT. 2003. *Report and Consolidated Financial Statements*. Dushanbe.

[6] Collection rate above 100% includes dues on previous billing.

12. The average electricity tariff increased by about 100% in 2002 and 2003. Consumers are offered discounts during summer, to reflect the low opportunity cost of generating power by using the high spillage from dam reservoirs. The average tariff is much lower than that needed for a full recovery of asset replacement cost.[7] Households in the lowest income quintile are currently spending around 16% of their income on electricity, and this proportion could increase, unless suitable measures are included with tariff increases.

13. The scope of the Power Rehabilitation Project,[8] which comprises ADB's ongoing assistance, includes the urgently needed rehabilitation of transmission and distribution systems in Khatlon Region, as well as rehabilitation work for Central HPP and Nurek HPP, on the Vakhsh River, and distribution work in Dushanbe. This project is experiencing implementation delays, mainly in awarding contracts, because of a lack of understanding of ADB guidelines and capacity to carry these out.

14. The Regional Power Transmission Modernization Project[9] has not yet been declared effective, because of the difficulty in securing the Government of Uzbekistan's agreement on the Power Trade Relations Agreement. This agreement will help increase revenue through exporting electricity during summer months, when water flows are very high and national demand is low.

15. Several options exist for improving winter power supply in Khatlon Region. These include

(i) adding new generation capacity for winter systems;
(ii) rehabilitating and uprating existing HPPs that can deliver energy even during low water flows;
(iii) rehabilitating and uprating transmission and distribution networks, to reduce losses;
(iv) developing demand-side management options, to use energy efficiently; and
(v) increasing tariffs and improving metering and bill collection, to promote more efficient use of electricity and at the same time strengthen BT's financial health.

16. The Government requested assistance for power sector improvements. Accordingly, the TA and ensuing Project will support grid strengthening, power generation, and institution strengthening. The proposed Project is in line with ADB's country strategy, which focuses on the development of the power and transport sectors and the rural development sector. The Project is also in line with ADB's ongoing assistance, which focuses on rehabilitating existing facilities in the southern system. A summary initial poverty and social analysis is attached as Appendix 2.

[7] BT has extremely low fuel and other financial costs, so present revenue is adequate to meet operating expenses. The generation and extensive network assets are very old (average age of over 30 years) and considerably undervalued. An asset revaluation study is being undertaken by the Government, and its results are expected by the end of 2005. Meanwhile, the World Bank estimated the tariff level based on the economic cost of the additional supply at $0.021 per kilowatt-hour, whereas the present tariff is $0.006 per kilowatt-hour.

[8] ADB. 2000. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grants to the Republic of Tajikistan for the Power Rehabilitation Project*. Manila.

[9] ADB. 2002. *Report and Recommendation of the President to the Board of Directors on Proposed Loans to Tajikistan and Uzbekistan for Regional Power Transmission Modernization Project.* Manila.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

17. The project preparatory TA will prepare the ensuing investment Project, which will aim (depending on the outcome of the study) to rehabilitate and uprate the existing facilities in southern Tajikistan, covering generation, transmission, and distribution. The TA will also review the power sector and propose a sector development plan, to insure the investment's long-term sustainability.

B. Methodology and Key Activities

18. The TA will be implemented in two stages. Stage 1 will consist of two levels of analysis. First, potential subprojects and policy options for reducing the winter supply and demand gap will be identified, and an assessment of their costs and technical feasibility and likely impacts (economic and social) will be made. Second, after ruling out infeasible technical options, this information will be incorporated into an analysis of the least-cost strategy for reducing the winter power deficit in the southern system. The final product of this stage will be a least-cost development plan, including a ranking of subprojects based on cost-effectiveness.

19. The expected outputs of stage 1 are

(i) a review of sector issues (tariffs, billing and revenue collection, and losses and institutional issues);
(ii) an assessment and forecast of the power demand under likely and optimal (i.e., demand-side-management) pricing and metering regimes, by voltage level, consumer class, season, and time of day);
(iii) a preliminary assessment of the uprating possibilities (including metering) for generation, transmission, and distribution facilities in the southern system, bearing in mind that the critical generators are the four HPPs on the Vakhsh River and that the Project's geographic focus is Khatlon Region, which means the distribution systems in this area will be considered;
(iv) an estimate of the cost and feasibility of new generation capacity;
(v) a least-cost analysis, leading to a ranking of the preferred subprojects according to pricing recommendations and the cost of relieving winter constraints; and
(vi) an assessment of the demand-side management measures that will help balance winter supply and demand.

20. Stage 2 will consist of the preparation of a power sector development plan[10] and detailed feasibility studies of the highest ranked subprojects. The technical, economic, and financial viability of the resulting Project will be evaluated, and a financing plan will be developed. The expected outputs of stage 2 are

(i) a policy matrix for energy development, considering sector reforms, transparency and financial stability, energy efficiency, tariff issues, and other factors;
(ii) an assessment of the technical, financial, social, economic, and environmental viability of investments that are being proposed for financial support; and
(iii) an assessment of capacity-building and institutional strengthening needs and a plan to address these and complete about 2-days of training for government and executing agency staff members, to improve their understanding of ADB guidelines and procurement and disbursement procedures.

[10] This would be an update of the energy sector action plan prepared with the Power Rehabilitation Project.

21. The social impacts of the proposed Project are anticipated to be positive, due to the increased electricity supply, particularly to the poor during winter, in areas where electricity supply is currently limited. While an expected tariff increase could burden poor households, the increase would encourage energy conservation and be partly offset by a suitable targeted subsidy program. Negative social impacts will be limited, as no land acquisition is expected.

22. The ensuing Project is expected to include very little construction of new facilities, so adverse environmental impacts will be minimal. Positive environmental impacts are anticipated from the replacement of fuelwood and agricultural waste with electricity for indoor heating. A subsequent reduction in deforestation and health impacts is also anticipated.

C. Cost and Financing

23. The total cost of the TA is $625,000 equivalent, including a foreign exchange component of $445,000 and a local currency component of $180,000 equivalent. ADB will finance $500,000 equivalent, to cover the entire foreign exchange cost and $55,000 equivalent of the local currency cost. TA cost estimates are presented in Appendix 3. The Government will finance the balance of the local currency cost. The TA will be financed on a grant basis by the Japan Special Fund, funded by the Government of Japan. The Government has been informed that approval of the TA does not commit ADB to finance any ensuing investment projects.

D. Implementation Arrangements

24. BT will be the TA's Executing Agency. Implementation of the proposed TA will benefit from knowledge and experience gained by BT staff members through the implementation of ongoing ADB projects and TAs.

25. The TA will require 16 person-months of international consultant services and 36 person-months of domestic consultant services. The consulting team will comprise electromechanical, civil engineering, financial and economics, and environmental and social development specialists. The consultants will be engaged by ADB in accordance with the *Guidelines on the Use of Consultants by Asian Development Bank and Its Borrowers* and other arrangements satisfactory to ADB for the engagement of domestic consultants. A simplified technical proposal format and the quality- and cost-based selection method will be used.

26. The TA will be implemented over a period of 8 months, from 15 August 2005 to 15 April 2006. An inception report will be submitted in September 2005, the phase 1 report in November 2005, and a draft final report in February 2006. The draft final report will be finalized in March 2006, after incorporating comments from the Government and ADB during the final tripartite meeting. No major risks are associated with the TA, and the Government has expressed its strong support.

IV. THE PRESIDENT'S DECISION

27. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of $500,000 on a grant basis to the Government of Tajikistan for preparing the Power Rehabilitation Phase II Project, and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators	Monitoring Mechanisms	Assumptions and Risks
Impact Reliable power supply and greater use of clean hydropower in southern Tajikistan and neighboring countries	Increased export of electricity during summer Increased winter generation in southern system (kilowatt-hour per customer per year) Increased reliability of transmission and distribution supply in southern system Improved financial situation of Barki Tajik Joint Stock Company (BT)	National statistics BT operating results and sales Customer surveys BT financial statements	**Assumption** • Energy demand continues to increase **Risks** • Change in Government priorities • Delay in the implementation of the Power Development Plan
Outcome Project design and feasibility study agreed, covering necessary rehabilitation and uprating in Khatlon Region, in the context of a power sector development plan	Memorandum of understanding of final tripartite meeting signed by the Government and the Asian Development Bank (ADB)	Consultant final report Memorandum of understanding Back-to-Office Report (BTOR) of final technical assistance review mission	**Assumption** • Effective stakeholder participation and ownership developed **Risks** • Availability of funds to include all high-priority subprojects in the ensuing Project • Implementation delays
Outputs 1. Technical and economic assessment and screening and ranking of projects 2. Subproject selection 3. Full project study and project design 4. Power development plan	Inception report submitted to the Government and ADB Phase I report submitted to the Government and ADB Draft final report submitted to the Government and ADB by February 2006	Progress reports Tripartite minutes of the meeting Technical assistance review and back-to-office reports	**Assumptions** • Availability and access to relevant information • Access to sites not restricted • Consensus regarding criteria for ranking subprojects

Design Summary	Performance Targets and Indicators	Monitoring Mechanisms	Assumptions and Risks
	Final report submitted to the Government and ADB by March 2006		
Activities with Milestones 1. Analyze the southern regional demand of electricity during the winter season (by November 2005) 2. Assess the technical status of Baipaza, Centralnaya, Golovnaya, and Perepadnaya hydropower plants (by November 2005) 3. Determine the potential increase of generation capacity of these hydropower plants, potential new alternative generation, and potential loss reduction in transmission and distribution (by November 2005) 4. Study alternatives for reducing demand, for example, using natural gas for heating; implementing an energy efficiency program; improving demand-side management; and using other renewable energy sources, such as solar panels for water heating (by November 2005) 5. Conduct a least-cost analysis for meeting winter demand (by November 2005) 6. Review the Government's tariff policy in light of the least-cost analysis (by November 2005) 7. Screen and rank the different rehabilitation subprojects (by November 2005) 8. Carry out technical studies of the two top-ranked subprojects, including generation, transmission, distribution, and need for new electric meters in Kurgan Tyube City, Khatlon Region (by March 2006) 9. Review BT's technical and financial status and propose additional institutional strengthening measures as well as additional capacity-building activities (by March 2006) 10. Carry out social and poverty and gender assessment (by March 2006) 11. Carry out an initial environmental examination (by March 2006) 12. Carry out financial and economic analyses of the Project (by March 2006) 13. Provide socioeconomic impact indicators, baseline data and measurement/monitoring mechanisms (by March 2006) 14. Finalize project design and monitoring framework (by March 2006) 15. Finalize financing plan, implementation schedule, and procurement packaging for the Project (by March 2006)			**Inputs** **ADB : $500,000** **Government : $125,000**

ADB = Asian Development Bank, BT = Barki Tajik Joint Stock Company, BTOR = back-to-office report.

INITIAL POVERTY AND SOCIAL ANALYSIS

A. Linkages to the Country Poverty Analysis

Is the sector identified as a national priority in country poverty analysis? ☒ Yes ☐ No	**Is the sector identified as a national priority in country poverty partnership agreement?** ☒ Yes ☐ No

Contribution of the sector or subsector to reduce poverty in Tajikistan:

Increased amounts and availability of electrical power for homes, schools, and hospitals during evening hours in the winter will contribute to the diversification of evening activities in households and communities. Moreover, improved access to reliable electricity will improve productivity of small home-based industries and facilitate conversion from burning fuelwood to using electricity for cooking and heating. This will improve indoor air quality and health-related issues. The power project will also create job opportunities during the construction period for local workers.

B. Poverty Analysis

Targeting Classification: General Intervention

What type of poverty analysis is needed?

A standard poverty and social analysis will be conducted during the project preparatory technical assistance to (i) identify potential project impacts on vulnerable groups, taking into account gender aspects, and (ii) consider measures to enhance poverty impacts, when necessary. Also, the commitment to supply energy to local communities during evening hours in the winter must be secured by the energy supply company.

C. Participation Process

Is there a stakeholder analysis? ☐ Yes ☒ No

Identification of the beneficiaries due to the increase of energy generation capacity is required during the project preparatory technical assistance. Consultations focused on demand-side management options will be conducted during the project preparatory technical assistance.

Is there a participation strategy? ☐ Yes ☒ No

Public consultation will not be needed for a resettlement plan, as minimal land acquisition is foreseen.

D. Gender Development

Strategy to maximize impacts on women:

No gender component is required in the project design, due to the Project's nature. However, gender equality must be secured during project implementation, when hiring construction laborers.

Has an output been prepared? ☐ Yes ☒ No

E. Social Safeguards and Other Social Risks

Item	Significant/ Not Significant/ None	Strategy to Address Issues	Plan Required
Resettlement	☐ Significant ☒ Not significant ☐ None		☐ Full ☒ Short ☐ None

Affordability	☐ Significant ☒ Not significant ☐ None	Based on the analysis of the current energy tariff and affordability of poor households, some measures have to be suggested to extend the project-induced benefits to the poor.	☐ Yes ☒ No
Labor	☐ Significant ☐ Not significant ☒ None		☐ Yes ☒ No
Indigenous Peoples	☐ Significant ☐ Not significant ☒ None		☐ Yes ☒ No
Other Risks and/or Vulnerabilities	☐ Significant ☐ Not significant ☒ None		☐ Yes ☒ No

COST ESTIMATES AND FINANCING PLAN
($)

Item	Foreign Exchange	Local Currency	Total Cost
A. Asian Development Bank Financing[a]			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	330,000	0	330,000
ii. Domestic Consultants	0	36,000	36,000
b. International and Local Travel	35,000	5,000	40,000
c. Reports and Communications	6,000	0	6,000
2. Translation	0	10,000	10,000
3. Surveys and Testing	30,000	0	30,000
4. Contingencies	44,000	4,000	48,000
Subtotal (A)	**445,000**	**55,000**	**500,000**
B. Government Financing			
1. Office Accommodation	0	20,000	20,000
2. Remuneration and Per Diem of Counterpart Staff	0	75,000	75,000
3. Secretariat support and Office Services	0	20,000	20,000
4. Office Furniture	0	5,000	5,000
5. Others	0	5,000	5,000
Subtotal (B)	**0**	**125,000**	**125,000**
Total	**445,000**	**180,000**	**625,000**

[a] Financed by the Japan Special Fund, funded by the Government of Japan.
Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

A. Scope of Work

1. The scope of work of the technical assistance (TA) consists of carrying out a feasibility study of the rehabilitation and uprating of hydropower plants (HPPs) on the Vakhsh River in Tajikistan and the rehabilitation of the transmission and distribution facilities in Khatlon Region, with a view to reducing the winter power deficit at minimum cost.

2. The TA will be conducted in two stages:
   (i) Stage 1 will consist of a review of sector issues and preparation of a least-cost development plan for the southern system, after reviewing and updating the existing load forecast and studying relevant options for reducing the power deficit. First, the team will conduct a rapid assessment of the rehabilitation needs of the four HPPs located on Vakhsh River and an assessment of the rehabilitation needs for the transmission and distribution systems in Khatlon Region. Second, the team will screen and rank these potential subprojects in light of likely accompanying tariff policies.
   (ii) Stage 2 will consist of the feasibility study of the top-ranked generation projects and the transmission and distribution subprojects, including bulk and residential electric metering. The technical, economic, and financial viability of the Project will be evaluated, a financing plan developed, and an initial environmental and social impact examination will be carried out.

B. Terms of Reference

3. Technical analysis: A total of 11.5 person-months of international consultant services and 14.0 person-months of domestic consultant services will be required. Expertise in hydropower (team leader), electrical engineering (transmission and distribution), electromechanical engineering, system planneing, and civil engineering will be needed.

4. **Stage 1. Sector Review and Least-Cost Development Plan**

   (i) Review and revise any study carried out on energy efficiency.[1] Propose measures that can be implemented rapidly to decrease power demand, mainly during winter months (through proper metering, tariffs, etc.).
   (ii) Carry out a system study, including load flow calculations and short circuit levels and other relevant computer studies, to formulate the optimum medium-term development for the primary power system (i.e., up to 2015).
   (iii) Review the transmission and distribution system in the southern grid and propose some critical investments that are necessary to reduce technical and nontechnical losses in Khatlon Region. These include bulk and end use metering.
   (iv) Collect and review the available information and data[2] regarding the status and uprating possibilities of the Vakhsh River cascade, including Baipaza,

[1] Asian Development Bank. 2002. *Technical Assistance to the Republic of Tajikistan for the Development of An Energy Conservation Program*. Manila.

[2] ADB. 2002. *Technical Assistance to the Republic of Tajikistan for the Hydropower Development Strategy Project*. Manila.
World Bank. 2004. *Central Asia Regional Electricity Export Potential Study*. Washington, DC.

Centralnaya, Golovnaya, and Perepadnaya HPPs.[3] Assess the potential increase of generation that can be obtained through rehabilitation and assess the related cost. Review actual and future water discharges (after rehabilitation) in Tajikistan and the impact on downstream countries.

(v) Identify feasible new generation schemes and estimate their costs.

(vi) Determine, in collaboration with the economist, the least-cost solution to address the deficit in power generation during winter through a combination of rehabilitation of existing generation, transmission, and distribution facilities; creation of new generation capacity; implementation of demand-side management measures, including tariff adjustments and energy efficiency improvements; electricity imports; and efforts to shift heating needs from electricity to gas or coal. [4]

5. Stage 2. Feasibility Study

(i) Propose and carry out physical tests on candidate rehabilitation and uprating projects, such as insulation tests, oil analysis, or any other relevant tests that the consultant will find necessary to better assess the plants' current condition and the potential for future uprating.

(ii) Provide technical, economic, and financial justification for the proposed Project, with other specialists' inputs.

(iii) Prepare with other team members a policy matrix for energy development, taking into account sector reforms, transparency and financial stability, energy efficiency, tariff issues, and other factors.

(iv) Review the current operating procedures of Barki Tajik Joint Stock Company (BT) regarding the regulation of the water flow on the Vakhsh River, load shedding, and operation and maintenance procedures and propose measures, including training and investments (if any), to optimize generation from the Vakhsh cascade and better operate the system. Develop terms of reference for the hiring of consultants.

(v) Prepare the detailed cost estimates, including unit cost and quantities for the different subproject components, indicating separately foreign direct and indirect costs and local costs. Show taxes and duties separately for each cost item and estimate physical contingencies, as well as price escalation and interest during construction.

(vi) Propose suitable contract packaging, taking into account foreign and local funds, in accordance with Asian Development Bank (ADB) guidelines on procurement and present base cost for each package. Special attention will be paid to the size of the procurement packaging, to attract foreign bidders and increase competition.

(vii) Prepare a project implementation schedule, taking into account the requirements of different modes of procurement, and indicate the project critical path, timing for recruitment of the implementation consultant, preparation of tender documents, bidding and bid evaluation, award of contracts, and implementation until commissioning.

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[3] The assessment of Nurek HPP is undertaken separately, under Kreditanstalt für Wiederaufbau-financed TA.

[4] The consultant will refer to the following report: European Commission. 2004. *Joint Environmental Project II: Sustainable Heating Options for Non-Industrial Consumers of Heat in Tajikistan.* Brussels.

(viii) Review the technical and other aspects of the implementation arrangements, such as the technical and financial capabilities of BT to act as the Project's Executing Agency.

(ix) Prepare the terms of reference for the implementation consultant and cost estimates of the consulting services, which have to be part of the overall project cost.

(x) Provide a 2-day seminar for BT staff members on ADB guidelines and procedures for procurement and disbursement.

6. Economic analysis.: A total of 1.5 months of international consultant services and 7.0 person-months of domestic consultant services will be required.

7. **Stage 1. Sector Review and Least-Cost Development Plan**

(i) Review and revise (as necessary), in consultation with the technical analysis team, the previous load forecast, and prepare low, most likely, and high demand growth scenarios for the southern grid until 2015, taking into account a range of tariff level scenarios and changes in patterns of consumption. Income and price elasticity of demand will have to be specified and defended. Load forecasts will be by consumer class, voltage level, season, and time of day, to identify system peaks.

(ii) Assess the potential for demand-side management (DSM), primarily through better metering, billing, and bill collection and economically efficient pricing.

(iii) Prioritize subprojects identified by the technical team, as well as DSM measures, to identify a least-cost solution for reducing the winter supply deficit in southern Tajikistan.

(iv) Review the Government's current and future tariff policies, and recommend an appropriate tariff for full cost recovery and economic efficiency, taking into account an analysis of cost by time of day, season, and voltage level.[5] Special attention will be paid to the tariff paid by TADAZ. Based on international experiences, propose an innovative tariff framework that will take into account affordability and a social safety net. Recommend measures that will improve BT's financial position, in coordination with the advisory TA consultant on the unbundling of BT and implementation of energy law,[6] the Kreditanstalt für Wiederaufbau consultant for Nurek HPP, and the World Bank consultant for the Energy Losses Reduction Project,[7] and prepare an action plan for the implementation of tariff reforms.

8. **Stage 2. Feasibility Study**

(i) Carry out, in accordance with ADB's *Guidelines for Economic Analysis of Projects*, an economic and distributional evaluation of the Project by comparing with and without project cases for different load growth scenarios. This will include a calculation of economic internal rate of return, taking into account economic costs and benefits.

(ii) Identify risks and undertake appropriate risk and sensitivity analyses with respect to the economic internal rate of return, in accordance with ADB's *Handbook for Integrating Risk Analysis in the Economic Analysis of the Projects*.

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[5] The consultant should refer to the *ERD Technical Notes* No. 9 and No. 10 for more background.

[6] ADB. 2000. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Republic of Tajikistan for the Power Rehabilitation Project.* Manila.

[7] World Bank. 2005. *Proposed Energy Losses Reduction Project*. Washington, DC. This undertaking is valued at $23 million and should be approved in June 2005.

(iii) Identify stakeholders, and conduct a distributional analysis of net project benefits, in accordance with ADB's *Handbook for Integrating Poverty Impact Assessment in the Economic Analysis of the Projects*. Compute the Project's poverty impact ratio and cost-effectiveness in reducing poverty. Undertake an appropriate risk and sensitivity analysis with respect to the poverty impact ratio.

(iv) Establish and develop a database and project performance management system with adequate and time-bound indicators and relevant baseline data for monitoring and evaluation.

(v) Prepare, in accordance with ADB's standards, a project framework that clearly identifies the Project's goals, objectives, inputs required, delivery and output, targets or benchmarks, monitoring mechanisms, assumptions and potential risks.

9. The financial analysis will be conducted under stage 2. A total of 1.5 person-months of international consultant services and 5.0 person-months of domestic consultant services will be required.

(i) Carry out, in accordance with ADB's *Guidelines for the Financial Governance and Management of Investment Projects Financed by the Asian Development Bank*, an in-depth financial analysis of the proposed Project, including a calculation of the financial internal rate of return and weighted average cost of capital, taking into account all the financial costs and benefits of the proposed Project, and conduct relevant sensitivity analysis on the financial results.

(ii) Prepare a financing plan for the Project, including ADB, Kreditanstalt für Wiederaufbau, and other cofinancing entity lending and appropriate counterpart funds for local expenditures.

(iii) Have BT contribute counterpart funds. With low collection rates and a high level of outstanding receivables, BT's efforts to raise the required counterpart funds must be supported. Prepare a cash flow projection with detailed breakdown of the source of the proposed equity contribution from BT (e.g., settlement of outstanding Tajik Aluminum Smelter (TADAZ) debt or large customer debt and government equity injection, etc.).

(iv) Identify specific sources and projections of revenue from the Project, which will ensure financial viability. Take into account reduction in costs (e.g., decreased import costs and lower technical losses).

(v) Analyze the financial performance of BT for the last 5 years, and prepare financial projections for the next 10 years. Present the income statements, balance sheets, and cash flows in ADB formats.

(vi) Assess compliance with ADB's financial covenants and determine appropriate financial ratios to be proposed for BT.

(vii) Conduct a detailed analysis of the accounts receivable and collection efficiency by customer category and determine measures to improve collection.

(viii) Develop an appropriate automatic adjustment mechanism formula, in coordination with BT.

(ix) Determine the institutional strengthening and capacity-building requirements of BT and its subsidiaries, and develop terms of reference for hiring of consultants.

(x) Assess compliance to the energy sector action plan, and recommend corrective measures.

10. The environmental analysis will be conducted under stage 2. A total of 0.75 person-months of international consultant services and 5.00 person-months of domestic consultant services will be required.

(i) Assess and compare the environmental impacts for each option available for supplying power to Tajikistan's southern grid. For the selected option, undertake an initial environmental examination, in accordance with *ADB's Environmental Assessment Guidelines (2003)*, and present the findings in an initial environmental examination report. This report should include a brief assessment of the various options and detail why the preferred option was selected. The report should also discuss potential direct and indirect impacts and undertake detailed assessment of any of the project components, as required. A summary initial environmental examination should be prepared.
(ii) Recommend appropriate environmental mitigation measures for identified significant impacts, and recommend monitoring plans to address these impacts.
(iii) Ensure that the cost of implementing recommended mitigation measures and environmental management and monitoring plans, and any strengthening measures, are included in the proposed Project's cost.
(iv) Prepare the project performance and monitoring and evaluation arrangements, including adequate time-bound indicators and relevant baseline data, for monitoring and evaluating the implementation of recommendations under the summary initial environmental examination.

11. The social analysis will be conducted under stage 2. A total of 0.75 person-months of international consultant services and 5.00 person-months of domestic consultant services will be required.

(i) Identify and prepare a socioeconomic profile of project-affected communities, in accordance with *ADB's Policy on Involuntary Resettlement and Handbook on Resettlement*, in terms of household size, demographic trends, income sources and levels, occupation and socioeconomic conditions, and gender and local ethnic minority profiles and other types of social organization.
(ii) Determine if the Project will have any adverse impacts on indigenous peoples and/or ethnic minorities. If necessary, prepare an indigenous development plan, in accordance with *ADB's Policy on Indigenous Peoples*.
(iii) As part of the field survey, confirm that the implementation of the project line will not require any land acquisition. If the Project is likely to involve resettlement, prepare a short or full resettlement plan and its summary with the full participation of stakeholders and executing and implementing agencies.
(iv) Conduct field surveys and prepare a socioeconomic and poverty profile of primary project beneficiaries, in accordance with *ADB's Handbook on Poverty and Social Analysis and Handbook for Integrating Poverty Impact in Economic Analysis of Projects*, including analysis on gender and health risk in southern Tajikistan.
(v) Determine, based on initial findings, if the Project can be classified as a core poverty intervention, and provide a rational for its classification or nonclassification in the inception report.
(vi) Analyze the interlinkage with increased power demand and implications for sector change and employment generation for the poor.
(vii) Prepare a summary poverty and social analysis, according to ADB format, if necessary.

C. Implementation Arrangements

12. BT will be the Executing Agency for the TA and provide counterpart staff and free office space and office furniture to the consultants.