REQUEST FOR CEO ENDORSEMENT/APPROVAL
PROJECT TYPE: FULL-SIZED PROJECT
THE GEF TRUST FUND

Submission Date: 19 April 2011
Re-submission Date: 26 October 2011

PART I: PROJECT INFORMATION

GEFSEC PROJECT ID: 4160 **Project Duration:** 4 years
GEF AGENCY PROJECT ID: 4324
COUNTRY(IES): Tajikistan
PROJECT TITLE: Technology Transfer and Market Development for Small Hydropower in Tajikistan
GEF AGENCY(IES): UNDP
OTHER EXECUTING PARTNER(S): Ministry of Energy and Industry
GEF FOCAL AREA(s): Climate Change
GEF-4 STRATEGIC PROGRAM(s): CC-SP3-RE
NAME OF PARENT PROGRAM/UMBRELLA PROJECT: N/A

Expected Calendar (mm/dd/yy)	
Milestones	**Dates**
Work Program (for FSPs only)	June 2010
CEO Endorsement	Dec 2011
Agency Approval date	March 2012
Implementation Start	March 2012
Mid-term Evaluation	March 2014
Project Closing Date	March 2016

A. PROJECT FRAMEWORK (Expand table as necessary)

Project Objective: To significantly accelerate the development of small-scale hydropower (SHP) by removing barriers through enabling legal and regulatory framework, capacity building and developing sustainable delivery models, thus substantially avoiding the use of conventional biomass and fossil fuels for power and other energy needs.

Project Components	**Inv., TA, STA**	**Expected Outcomes**	**Expected Outputs**	**GEF Financing**		**Co-Financing**		**Total ($)**
				($) a	%	($) b	%	c=a+ b
1. Policy and regulatory framework for SHP [1)].	TA	Adapted and enhanced legislative and regulatory framework for small-scale hydropower development in the country.	1.1 Formulated, approved and enforced implementing rules and regulations (IRRs) of the new Law for RES that will facilitate actions geared towards the enhancement of the market environment for SHP 1.2 Central and local government institutions with enhanced capacities to develop and coordinate SHP (and other RES) projects	50,000	11	400,000	89	450,000
2. Strengthening the technology support and delivery system through technology transfer	TA/Inv	Enhanced technical and planning know-how and developed market chain for SHP in Tajikistan	2.1 Guidebook on technical and policy aspects of SHP project development 2.2 Local SHP manufacturers capable of providing turn-key integrated RES solutions and O&M services 2.3 Vocational training program for technicians involved in SHP design/construction and O&M 2.4 Local manufacturers capable of producing combined electric and biomass-fired heating and cooking devices for rural households	750,000, inluding 300,000 Inv	80	190,000, including 100,000 Inv	20	940,000
3. SHP demonstration	TA/Inv	Improved confidence on the technical and economic viability of	3.1 Technical studies, political commitments and institutional framework secured for pilot SHP projects 3.2 Fully operational community-	1,015,000 inluding 700,000 Inv	16	5,275,000 including 2,685,000 Inv	84	6,290,000

		integrated SHP-based rural development model	based SHP 3.3 SHP operations sustained					
4. National Scaling-up Programme of Renewable Energy-based Integrated Rural Development	TA	National Scaling-up Programme of Renewable Energy-based Integrated Rural Development	4.1 Reports on the impacts of the various outputs of, and lessons learnt from, the project and GHG emission impact assessment 4.2. Conference on renewable-energy based integrated rural development 4.3 Approved and funded proposal for national scaling up of the SHP demos/pilots	35,000	11	285,000	89	320,000
6. Project Management (PM)				150,000	33	300,000	67	450,000
Total Project Costs				2,000,000		6,450,000		8,450,000

[1)] Please refer to Part IV for an explanation of differences in this Component with the text of the PIF.

B. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT (expand the table line items as necessary)

Name of Co-financier (source)	Classification	Type	Project	%*
Ministry of Energy and Industry	Government	Cash	1,090,000	16.9
Ministry of Energy and Industry	Government	In-kind	410,000	6.4
UNDP (TRAC; core resources)	Multilateral Agency	Cash	500,000	7.8
UNDP (RE Project)	Multilateral Agency	Cash	815,000	12.6
UNDP (TAPRI)	Multilateral Agency	Cash	1,100,000	17.1
UNDP (Communities Programme)	Multilateral Agency	Cash	2,335,000	36.2
Communities	Other	In-kind	100,000	1.6
LLc Energoremont	Private sector	In-kind	100,000	1.6
Total Co-financing			6,450,000	100.0

More details on co-financing are given in Annex E and excel document provided separately

In addition, cca 630,000 US$ of co-financing from private sector is expected to be mobilized by the end of Year 1 of project implementation as a result of competitive selection and Call for Expression of Interest among local companies to act as recipients of UNDP-GEF TA and technology transfer. For details, please see description of Outcome 2 in the UNDP-GEF Project Document, pp. 17-18.

C. FINANCING PLAN SUMMARY FOR THE PROJECT ($)

	Project Preparation (PPG) a	Project B	Total c = a + b	Agency Fee	For comparison: GEF and Co-financing at PIF*)
GEF financing	25,000	2,000,000	2,025,000	202,500	2,000,000
Co-financing	50,000	6,450,000	6,500,000		6,200,000
Total	75,000	8,450,000	8,525,000	202,500	8,200,000

*This amount does not include PPG

D. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Estimated person weeks (GEF only)	GEF amount (USD)	Co-financing (USD)	Project total (USD)
Local consultants*	172.0	95,000	200,000	295,600
International consultants*	10.0	20,000	210,000	220,000
Total	182.0	115,000	410,000	525,000

* Details are provided in Annex C.

E. PROJECT MANAGEMENT BUDGET/COST:

Cost Items	Total Estimated person weeks (GEF component only)	GEF amount ($)	Co-financing ($)	Project total ($)
Local consultants*	240	121,200	196,800	318,000
Office facilities, equipment, vehicles and communications**		18,800	93,200	112,000
Travel***		10,000	10,000	20,000
Total		150,000	300,000	450,000

*See Annex C

** GEF funds for office equipment (computer, printer). Co-financing for office space

***For internal travel in Tajikistan

F. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? Yes ☐ no ☒

G. DESCRIBE THE BUDGETED M & E PLAN:

A Project Board, consisting of representatives of the Ministry of Energy and Industry, UNDP and other stakeholders will provide overall guidance to project execution. Private sector investors interested in participating in joint ventures or as independent power producers and other interested parties will be invited to participate in the meetings of the Project Board, as and when required.

The UNDP Office in Tajikistan will monitor and report on progress in project implementation in accordance with the UNDP Programme Manual and GEF Monitoring and Evaluation (M&E) guidelines, supported by the UNDP-GEF Regional Coordination Unit (RCU) in Bratislava. The PMU will be required to report relevant progress to the National Project Director and UNDP on a quarterly basis. Regular monitoring of the project will occur through this reporting mechanism as well as through site visits, as required. The Project Board will review annual work plans as well as provide strategic advice on the most effective ways and means of implementation. Reporting to GEF will be accomplished through annual Project Implementation Reviews (PIRs).

Progress will be measured against targets set out in the Work Plan and Project Logical Framework. For each of the project components, a detailed monitoring plan will be prepared during project inception. In this connection, a Project Inception workshop will be organized at the start of project activities to review the Logical Framework; specifically detailed indicators, means of verification, assumptions, etc. will be revisited and adapted as necessary, including measures to track any major project risks and taking into consideration the situation prevailing in the country. These indicators will draw upon all sources of information, including those of other donors active in the energy/renewable energy/small hydropower field in the country. Appropriate and specific performance benchmarks will be established prior to project implementation to effectively monitor project progress and to make crucial management decisions.

Additionally, the project will be the subject of an independent mid-term evaluation midway through project implementation and a final evaluation at project completion. The independent evaluations will review the relevance, timeliness and impact of project inputs and discuss lessons learned for use in improving the quality of future development interventions with similar activities that could be undertaken in collaboration with other development partners to the project. The results of the final evaluation, incorporating the lessons learned, will be disseminated

both within and outside Tajikistan. All reports will be posted on the project website (supported with GEF and UNDP funding, see Output 4.2).

The costs for Monitoring and Evaluation are estimated at USD 75,000 (Table 1 below). This budget allocation includes activities related to preparing quarterly progress reports, undertaking Project Implementation Reviews, Annual Project Reviews and independent mid-term and final evaluations, and organizing/participating in Project Board Meetings, as required. More details are provided in section 13 of the UNDP Project Document

Table 1: Monitoring and Evaluation Work Plan* and Estimated Associated Budget.

Type of M&E activity	Responsible Party(ies)	Estimated Budget ($) (Excluding Project Team staff time)	Time-frame
Inception Workshop (IW); end-of-project workshop	- Project Manager - Chief Technical Adviser - UNDP Country Office (CO) - UNDP/GEF RCU	USD 10,000	Within first two months of project start-up.
Inception Report	- Project Team - UNDP CO	None	Immediately following IW.
Measurement of Means of Verification for Project Purpose Indicators	- Project Manager will oversee the commissioning of specific studies and institutions, and delegate responsibilities to relevant team members	USD 4,000 (Note: To be finalized during inception phase and at Inception Workshop).	Start, mid and end of project
Measurement of Means of Verification for Project Progress and Performance (measured on an annual basis)	- Oversight by part-time Chief Technical Adviser and Project Manager - Measurements by regional field officers and local IAs	USD 4,000 (Note: To be determined as part of the Annual Work Plan's preparation).	Annually prior to APR/PIR and to the definition of annual work plans
Annual Project Report / Project Implementation Review (APR/PIR)	- Project Team - UNDP CO - UNDP/GEF RCU	None	Annually
Project Board Meetings	- Project Manager - UNDP CO	None	Following Project IW and subsequently at least every six months
Periodic progress reports	- Project Team	None	To be determined by Project Team and UNDP CO
Technical reports, as per project activities	- Project team - Consultants, as needed	Cost to be covered by consultancy budget	To be determined by Project Team and UNDP CO
Mid-term Evaluation	- Project team - UNDP CO - UNDP/GEF RCU - External Consultants (i.e. evaluation team)	USD 16,000	At the mid-point of project implementation.
Project Terminal Report	- Project Team - UNDP CO	None	At least one month before the end of the project
Independent Final Evaluation	- Project Team, - UNDP CO - UNDP/GEF RCU - External Consultants (i.e. evaluation team)	USD 16,000	At the end of project implementation
Project results and impact study	- Project Team - UNDP/GEF RCU	USD 20,000	Yearly

Type of M&E activity	Responsible Party(ies)	**Estimated Budget ($)** (Excluding Project Team staff time)	Time-frame
Audit	- UNDP CO - Project team	USD 5,000	Yearly
TOTAL COST of M&E (output 4.1) Excluding project team staff time and UNDP staff and travel expenses.		USD 75,000	

PART II: PROJECT JUSTIFICATION:

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

Problem statement

1. After the breakdown of the Soviet Union and subsequent civil war in Tajikistan in the early 1990s, grid extension has come to a virtual standstill. Moreover, in the absence of proper maintenance and repair works on the generation, transmission and distribution facilities, the condition of the existing grid has in many rural areas deteriorated to the point where electricity supply is either not possible at all, or only with low quality and frequent outages. At the same time rural dwellers (over 70% of the population) have moved to more remote locations and previously uninhabited valleys without grid supply in the search for additional farmland.

2. Tajikistan has great hydropower potential, and has focused on attracting investment for large-scale hydropower projects, such as the Nurek and Sangtuda-1 (670 MW) hydroelectric power stations. More hydropower projects are at the development stage, such as the Rogun power plant (3,400 MW). However, as these large power plants are oriented to power exports and large industrial estates, these form only a partial solution for rural energy supply. Today over 95% of Tajikistan's power generation capacity is based on large hydro power plants, with strong seasonal variations in power production, the lowest occurring during the winter (October – April/May) season when the demand is at the highest.

3. The electricity grid of Tajikistan is currently divided into a northern and southern network, with both networks connected to Central Asian Network. This divided system has led to inconsistent power supply especially to remote areas. During the winter period, the problem is linked with the seasonal disruption of the electricity supply (due to deficits in the electricity production of large hydropower plants). Furthermore, the problem is exacerbated by the condition of the power supply systems in Tajikistan, characterized by voltage instability, service interruptions, poor dispatch and communication systems, low cost recovery and high losses. As a result, while the vast majority of the villages are connected to the grid, electricity is only supplied for 2 to 6 hours per day during the winter months (1 to 3 hours in the morning and evening each). In summer, power supply is generally more reliable. However, a significant number of remote, non-connected rural communities remain without any electricity supply throughout the year.

4. Fossil fuel resources are relatively limited and poorly developed in Tajikistan. Although coal reserves are abundant in certain mountainous areas, they are hardly utilized due to a lack of access roads and high development costs. As such, the country relies on imported fossil fuels, and this reliance on importations has a negative bearing on the energy security of Tajikistan. Besides bad roads, a limiting factor is the high costs of imported fuels, which rural residents and public institutions in most cases are unable to afford.

5. Access to reliable energy continues to be one of the critical development issues facing Tajikistan. Almost every winter, as a result of Tajikistan's dependence on unreliable electricity imports, the country is faced with an energy crisis, where rural areas have access to only a few hours of electricity per day. The latest such crisis unfolded in March 2011 as this project has just been finalized for submission[1]. LPG (liquefied petroleum gas) stoves and diesel generators serve the energy needs of a tiny minority of the rural rich. It is estimated that over 1 million people, out of Tajikistan's population of 7.1 million, live primarily in rural areas, and have little or no access to an adequate energy supply.

6. An unreliable electricity supply constrains income-generating activities and has severe environmental consequences. The situation described above has forced the rural population to at least partially substitute for the lack of access to modern electricity by exploiting alternative local energy resources for cooking, lighting, and

[1] In March-April 2011, only district administrative centers have electricity for one and a half hours per day, while rural areas do not have electricity at all. Electricity rationing was imposed on the capital city of Dushanbe as well; electricity supply to residential customers in the city is now cut off from 11:00 pm to 5:00 am.

commercial use (i.e. to meet its basic energy needs, including deriving a livelihood). These energy sources include primarily traditional biomass (fuel wood, dung, cotton-plant seeds, and shrubs) and occasionally - fossil fuels (diesel oil and coal) as illustrated in Figure 1.

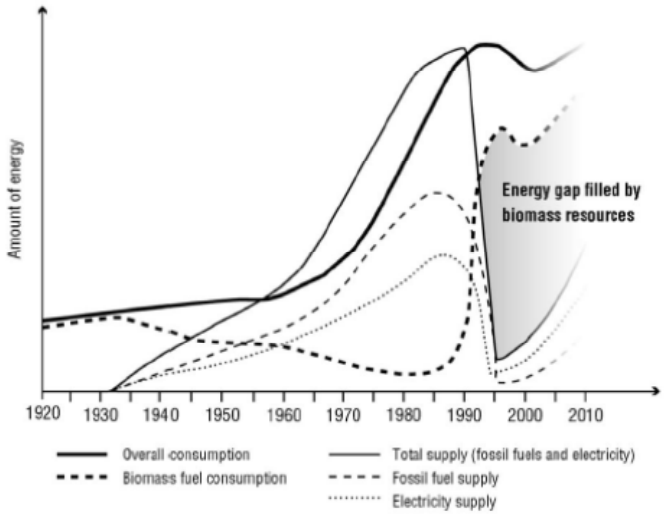


FIGURE 1 MODEL OF ENERGY SUPPLY AND DEMAND IN TAJIKISTAN SINCE 1920S[2]

7. From the environmental perspective, this situation has been disastrous since the unsustainable felling of highly valuable mountain forests has contributed to a loss of forest cover, biodiversity and of GHG emissions. According to recent studies in selected location 70 to 80% of the forest cover has been lost during the last 20 years mainly due to the high demand for energy[3]. The deforestation and forest degradation has also resulted in soil erosion leading to a deterioration of natural resources and an increase in vulnerability of the rural population to natural disasters such as landslides during heavy rainfall. The situation has been worsened by the use of primitive and inefficient cook stoves with an efficiency estimated at no more than 10-30%. Moreover, the burning of fuel wood, compressed dung and, when available, hard coal in low-efficiency stoves has contributed to the deterioration of indoor air quality leading to a higher incidence of health risks. The lack of heating in social institutions such as schools and hospitals has created additional health risks for children and other vulnerable groups, especially during winter. Finally, the opportunities for the development of new sources of income (e.g. processing of agricultural products) and the improvement of living conditions have remained practically non-existent in the absence of a reliable and secure energy supply.

8. The socio-economic and environmental impacts described earlier are most severe for rural communities in Tajikistan, because they are already among the poorest in the world. A pre-condition for lifting these communities out of poverty is therefore the access to a reliable and secure supply of electricity. For Tajikistan, which import fossil fuels and incur high-transportation costs due their land-locked position and mountainous terrain, scaling up centralized heating systems based on fossil fuels or reliance on grid power is costly. Given the country's vast small water resources, development of small-scale hydropower (SHP) is a favorable and least cost solution, particularly for remote settlements (where the cost of conventional power supplies is particularly high). Experience with SHP construction in Tajikistan shows that the real specific cost of SHP construction does not presently exceed 1100-1200 US$/kW[4]. Additional benefits of SHP development include improving the security of power supply and stimulating local economic and job creation. In community-owned and managed SHP projects local population has a greater control over energy use and distribution. Local governments, entrepreneurs and community members can

[2] T. Hoeck, R. Droux, T. Breu, H. Hurni, and D. Maselli, "Rural energy consumption and land degradation in a post-Soviet setting - an example from the west Pamir mountains in Tajikistan," *Energy for Sustainable Development*, vol. XI, 2007.

3 Same as above

[4] "Long-term program for small electric power station construction for 2009 – 2020" as approved by the Government Regulations #73 of the Republic of Tajikistan, February 2, 2009.

pool resources to implement locally-relevant projects without having to depend on support from central governments. All in all, a number of recent academic and policy studies[5] conclude that SHP currently represents the fastest, most economical and environmentally benign option to provide modern energy services to rural and remote communities in Tajikistan.

9. Traditionally, there has been quite some experience in using small-scale hydro power in Tajikistan during the Soviet period: a total of 69 small hydro plants (with a total capacity of 32 MW) were built between 1940 and 1978. Interest in SHP since then declined, no provisions were made for plants maintenance and repair, and as a result most of these plants have been decommissioned, leaving only five in operation (with a total capacity of 13.87 MW), all in the mountainous Badahsan region of Pamir. In the recent past a number of SHP projects have been realized in Tajikistan:

    - From 1994 to 1999, Barki Tajik installed 7 small-scale hydropower stations with capacities of between 70 to 630 kW.
    - Over the same period, 12 SHPs plants with capacities of between 30 to 100 kW were constructed in GBAO with financial support of Aga Khan Foundation. Reportedly, most of these plants are not operational anymore due to technical failures.
    - In 2003-2006, under the USAID funded Community Action Investment Project (CAIP) four SHP plants with capacities of between 15 to 20 kW have been constructed.
    - Under the SIDA funded Poverty Reduction Program 3 SHP plants with capacities of between 20 to 30 kW have been installed in 2004.
    - Within the scope of the ADB project Development of Community Based Micro-Hydropower Supply in Rural Areas, 2 SHP plants with capacities of between 100 to 200 kW have been installed in 2007.

10. Nonetheless, all these projects have lacked a comprehensive approach to remove underlying barriers to sustainable development of renewable sources of energy such as hydro. Most of hydro power technology transferred to Tajikistan has been in the form of turnkey plants to the state sector, financed through international aid and/or loans. Due to lack of technical maintenance and sustainable institutional and economic model for their operation, most of these SHPs are sadly enough no longer operational or in a state of disrepair in many cases. This has put into question the relevance of centrally planned investments and/or turnkey technology transfer, and to look for better technology delivery models.

11. Consequently, *to date none of the above initiatives has resulted in any replication of the individual SHP projects implemented.* It can thus be concluded that a number of **key barriers** to small hydro power development in Tajikistan will remain in the future without GEF intervention. These barriers are discussed in more detail in Section F of Part II.

12. This context has been recognized by the Government of Tajikistan, who is addressing the issues within the framework of the national poverty reduction strategy, as well as its efforts to mitigate negative local and global environmental impacts arising from the current situation. The Government signed an agreement with the UNDP for promoting the use of renewable energy sources to support rural development. Consequently, a number of prioritized measures and projects have been proposed for implementation to promote the use of renewable sources of energy, including sustainable use of fuel wood, small-scale hydro power, biogas and solar technologies as reflected in the *Intermediate Strategy for Rural Renewable Energy Sources and Energy Efficiency in Tajikistan (Strategy);* the Strategy developed with UNDP support is currently in the stage of adoption by the Government. It has three main objectives:

    - **Poverty reduction** by improving access to electricity and stimulating integrated rural development;

[5] See for instance: T. Hoeck, R. Droux, T. Breu, H. Hurni, and D. Maselli, "Rural energy consumption and land degradation in a post-Soviet setting - an example from the west Pamir mountains in Tajikistan," Energy for Sustainable Development, vol. XI, 2007; "Concept for Fuel and Energy Sector Development of the Republic of Tajikistan in 2003-2015" approved by the Resolution Government of Tajikistan #318 dated 3 August 2002; or "Sustainable Energy Model for Rural Communities. Best Practice Model for Central Asia" World Bank 2010.

- Provision of an impetus for **economic development** by devising support mechanisms for rural renewable energy projects;
- Building **environmental resilience** by using renewable energy sources and decreasing the loss of vegetation cover.

13. The Strategy focuses on community based micro to small HPPs (up to 1000kW of installed power), privately or community owned and operated, which will operate off-grid during winters, supply local communities at mutually agreeable terms and conditions, and in the cases where it is feasible, work on-grid during summers and sell all of the produced electricity to the grid. Lessons learned from past initiatives show that centrally planned investments and/or turnkey technology transfer may not be the most adequate delivery model for the long-term sustainability of SHP in Tajikistan. Thefore, the Strategy calls for adoption of an enhanced delivery model with the following features which this UNDP-GEF project will seek to promote:

- Developing adequate regulatory framework which will provide for (under Component 1):
  - Technical regulations and conditions for connection to the grid of SHP
  - Methodology for calculating costs for electricity from SHP
  - Contracting modalities for buying back electricity from SHP (on-grid) and providing electricity to rural customers (off-grid)
  - Establishment of a RE and EE Fund (Renewable Energy and Energy Efficiency) to support the development of community-based SHP and covering price difference for electricity from these SHPs
- The financial susatinability of SHPs will rest on their construction and operation based on a 'cost recovery model'. The project will assist in the creation of conducive national policy environment by setting attractive and competitive business terms and conditions, such as incentive-based feed-in tariff agreements, which give developers long-term stability and provide for sufficient investment return; and allow communities- systems based to have excess power supplied to the grid, by means of standard procedures for Power Purchase Agreements (PPAs) (Component 1);
- Strengthening capacity of national and local government to implement, coordinate specific actions and monitor results on renewable energy (including SHP) and linking these firmly with other development priorities (such as poverty reduction, rural development and employment and natural resources management) (Components 1 and 3);
- Another building block of the alternative delivery model concerns the crafting of an indigenous technology supply chain to support the development, operation and maintenance of SHPs. This implies increasing the capacity of national workshops and industries to install, construct, manufacture and repair selected parts of SHP systems as an integral part of technology transfer from countries like China, India or Nepal that have wide experience in SHP (Component 2);
- Standardizing several typical SHP designs and developing capacity of local manufacturing and service companies (Component 2);
- Since SHPs are targeted mainly at rural and remote communities, it is crucial to involve authorities at the sub-national level in the design, commissioning and operation of hydro projects. The project will tailor capacity building activities for local authorities in these areas. This will also contribute for the ownership in the installation, operation and maintenance of SHPs to rest at the local level (Component 3);
- Another critical aspect of devolving ownership of projects at the local level is to get the buy-in of project beneficiaries. This project proposes to involve local communities in the management of watersheds so that the integrity of water courses, and hence performance of SHPs, are maintained over time (Component 3);
- ´Learning by doing´ i.e. is implementation of a number of pilot projects within selected communities, and with full community participation. This will allow the development of an integrated rural development model with provision of electricity from SHP as the driver, and then to integrate clean water, irrigation, food, employment, education and health issues. Upon verification of the model, to propose a scaled-up approach from a pilot community to a national program that will address issues of rural poverty reduction and national economic development (Component 4).

Project components and intended outcomes

14. The proposed project will include four components, each targeting specific barriers and stakeholders. *See Section 4 of the UNDP-GEF Project Document and Annex A for a full listing of intended project outcomes, outputs and activities.*

15. **Component 1:** This component is aimed at addressing the institutional and regulatory barriers to the accelerated development of SHP in Tajikistan. The expected outcome from the delivery of the envisioned outputs from this component is an **adapted and enhanced legislative and regulatory framework for small-scale hydropower development in the country**.

16. Component 2: This component will address the technical and market barriers to the widespread implementation of SHP technology. An **enhanced technical and planning know-how and developed market chain for SHP** in Tajikistan is the expected outcome from this component.

17. **Component 3:** SHP Demonstrations -. This component will address capacity, technology, institutional and informational barriers to SHP development as they manifest at local/community-based level. The expected outcome from this component is the **improved confidence of communities in the technical and economic viability of SHP technology in supporting socio-economic development**.

18. **Component 4:** Monitoring and evaluation, replication and dissemination – This project component will systematically capture, analyze, assess, and report on project achievements and thus prepare foundation for National Scaling-up Programme of Renewable Energy-based Integrated Rural Development. The expected outcome from this component is a **successfully implemented UNDP-GEF project that achieved its targets**.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS:

19. The project objective is in line with the priorities of the Government of Tajikistan and UNDP's existing programming goals. The Government of Tajikistan is planning to rehabilitate the existing energy system so that it can satisfy both the domestic energy needs and the external market, followed by a next phase of market reforms that will facilitate increased interest from domestic and foreign investors. Part of the reforms includes financial rehabilitation by means of introducing payment discipline and increasing the power tariffs to about USD 0.02-0.025 per kilowatt-hour (kWh) in the short term. A next phase of stabilization and development sees the modernization and construction of all energy installations, including power distribution and raising tariffs to USD 0.05 per kWh to alleviate the poor financing that has hampered power sector development in the past. As part of the reforms, the Government is also putting larger emphasis on the development of renewable energy resources (RES), in particular SHP.

20. The use of SHP for electricity generation in Tajikistan is recognized as a national interest and a means to achieve poverty reduction and economic development goals by ensuring reliable access to electricity for all citizens. This is confirmed in several policy documents adopted by the Government:

- ⇨ "Comprehensive target program for widespread use of RES, such as the energy of small rivers, sun, wind, biomass, energy, underground water sources" (approved by the Government of Tajikistan on Feb. 2, 2007 № 41);
- ⇨ "Long-term program for building small hydro power plants for the period 2009-2020 years "(approved by the Government of Tajikistan on February 2, 2009 № 73),
- ⇨ "National Environmental Program of the Republic of Tajikistan for 2009-2010 "(approved by the Government of RT from October 31, 2009 № 602).

21. Amendments to the Law on Energy were made in 2007, stating that electricity from SHP plants should be taken over by natural monopolies (electric power utilities) at the price determined by the authorized organization for the regulation of natural monopoly activities.

22. The *Law of the Republic of Tajikistan on the Use of Renewable Energy Resources* (RES) of 2010 (hereinafter referred to as Law on RES) regulates the legal relations that occur between the public authorities, individuals and legal persons in the area of priority and effective use of renewable sources of energy, and defines legal and economic grounds for improving power saving level, reduction of manmade impact on environment and climate, conservation and preservation of non-renewable sources of energy for future generations. The proposed GEF project squarely complements *the Law on the use of Renewable Energy Resources.*

23. After the preparation and submission of the country's First National Communication to the UNFCCC, a *Technology Needs Assessment (TNA)* was performed. The report, *First National Communications, Phase 2* (2003) refers to the potential of small hydropower electricity production in Tajikistan as being over 18 billion kWh a year. A construction of 20 small hydropower plants (HPPs) is possible in the Kalai-Humb, Vanch, and Rushan districts (Western Pamir). There are also significant potentials for small hydropower development in Central Tajikistan, where over 100 small and mini hydropower plants can be constructed. It further mentioned that "To apply technologies of constructing small and mini-HPPs, the necessary production and scientific base is available in Tajikistan. Also, there is an experience of constructing and mounting these installations. However, new effective technologies, the production base development, specialists training, and service infrastructure are still needed. The cost of power generation by small and mini-HPPs can vary greatly and the recently developed models are based on technologies and equipment provided by neighboring and far-away foreign countries". TNA emphasizes that "when local small HPP production is developed, the specific expenditure for their installation and exploitation will be reduced by 20-30%" which will make small hydro power more affordable. Demonstrating the experience and providing the population with information on small HPPs is of great importance for small hydropower development. TNA further concludes that the construction of small HPPs (500-2500 kW) and mini-HPPs (up to 100 kW) is among most urgent governmental objectives as far as renewable energy development and GHG emission reduction is concerned.

24. Furthermore, the *Second National Communication of the Republic of Tajikistan under the United Nations Framework Convention on Climate Change* (2008) mentions that "since Tajikistan has a huge potential for development of small hydropower, there is a possibility to attract investments for development of renewable energy. It is estimated that if existing technical potential for small hydropower, i.e., 18 billion kWh/yr (representing roughly 2,000 MW of capacity), would be utilized in Tajikistan, it can lead to reduction of 5-6 million tons of CO_2 emissions per year. Additional socio-economic benefits are increased employment opportunities for local population and better access to energy, especially in rural areas".

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

25. The project will result in partial substitution of the current unsustainable use of conventional biomass (fuel wood) in the watershed areas of the small-scale hydropower (SHP) sites and of fossil fuels (diesel and coal) in grid-connected electricity generators by facilitating the implementation of SHPs with their operation and maintenance on a cost recovery basis. The project thus is consistent with GEF-4 Strategic Priority "To promote on-grid renewable energy", as it will directly contribute to the wider use of small hydro resources for power generation by relieving the pressure on the main grid during winter months when grid power supply is constrained. In line with GEF requirements, "the emphasis will be upon developing policies and regulatory frameworks that provide limited incremental support to strategically important investments", such as investment in new power generation capacity in Tajikistan allowing the rural communities of the country to cope with its acute energy crisis in an environmentally and climate-friendly way. Further, the "host country willingness to adopt favorable policies and to follow through on the initiatives" was demonstrated by the Government of Tajikistan when Regulation #73 on the Long-term Program for Small Electric Power Station Construction for 2009 – 2020 was approved in 2009 and the RES Law adopted in 2010. The proposed project will assist the Government to realize the provisions of the Regulation, as well as supporting the objectives of the new Law. Tajikistan ratified the UN Framework Convention on Climate Change in January 1998. GEF Operational Focal Point is the State Committee on Environmental Protection.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES.

26. The nature of the project is policy development, capacity building and establishing an environment that is conducive to facilitation of investment in SHP in rural communities. The project objective will be attained through technical assistance and facilitating third parties' or donor investment in new SHP projects. No loan or revolving-fund mechanisms are considered appropriate for this purpose, as the Government plans to set up a National RE and EE Fund. Therefore, grant-type funding is considered as the most adequate to enable successful delivery of the project outcomes and this includes technical assistance to help operate the RE and EE Fund.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

27. Currently there is no project in the country addressing the root causes for and barriers to the development of SHP and local development in an integral and comprehensive approach as envisaged for the proposed project. In 2010, UNDP and the Government agreed to launch an initiative to promote community-based SHPs. UNDP has made funding available through its regular (TRAC) resources, while also funding support from GEF was applied for. A project document was formulated *Promotion of Renewable and Sustainable Energy Use for Development of Rural Communities in Tajikistan* with available budget of USD 1.2 million. Although due to internal procedures a separate project document needs to be formulated for GEF (which is this one), it has to be understood that both projects form basically *one* SHP promotion initiative with two main streams of donor financing, one from UNDP through GEF and one from UNDP itself, with co-financing from Government and beneficiary communities. In addition, the on-going UNDP *Communities Program* and *Tajikistan Afghanistan Poverty Reduction Initiative (TAPRI)* will provide co-financing support and assist in implementation services on the ground in communities were the SHPs are planned. Further, this project will seek to learn from the experiences of a similar GEF-funded projects in the region, such as the UNDP/GEF Small Hydropower project in Kyrgyzstan.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

Baseline

28. Despite the high electrification rate (90%), actual access to electricity (and energy) is considerably low and unreliable. The situation is exacerbated by unpredictable climatic conditions, such as those that occurred in 2008 when the extremely harsh winter hastened further damage to the power system, which resulted in the increased number of planned and unplanned electricity cut-offs. **It is important to note that the rural population, accounting for 73% of the total population, used only 8.58% of the total electricity consumed in Tajikistan in 2008** (see Table 2).

TABLE 2 CONSUMPTION OF ELECTRICITY IN TAJIKISTAN IN URBAN AND RURAL AREAS*

Year / Particulars	2006		2007		2008	
	kWh	%	kWh	%	kWh	%
Urban	1,841,137,710	13.49	1,786,097,913	12.79	1,744,547,432	13.94
Rural	**1,473,058,684**	**10.79**	**1,258,152,836**	**9.01**	**1,073,692,712**	**8.58**
Total population	3,314,196,394	24.28	3,044,250,749	21.80	2,818,240,144	22.52
Total consumed	13,651,676,973		13,966,707,650		12,514,921,593	

*Source: Barki Tojik sales department

29. It is estimated that over 1 million Tajikistanis, primarily those in rural areas, have little or no access to grid power, particularly during the winter, when it is common to have spells of more than 6 weeks without any electricity, while the rest of Tajik rural residents (around 4.5 million) have on average only 2-6 hours of power supply a day in winter period, which is insufficient to meet even basic energy needs, such as heating, cooking and lighting (let alone provide for any productive activities). Consequently, local population has switched *en mass* to consumption of biomass and other locally available resources to satisfy their basic energy needs, which leads to increasing CO2 emissions and loss of valuable carbon stock.

30. One limited solution to the unreliable and often nonexistent access to the grid is presented in the form of small, micro and mini hydropower plants (SHP plants). Despite the growing support for SHP as evidenced by recent

relevant legislation, there remain several barriers to the actual implementation of SHP plants. Barriers for the utilization of SHP in Tajikistan can be divided into three groups:

31. Legal and institutional barriers:
    - Incomplete legislative and regulatory framework to support SHP use;
    - Incompatibility of energy and environmental policies, i.e. environmental protection legislation does not promote development of cleaner energy supply options;
    - Unclear division of the roles and responsibilities of national authorities in the promotion of SHP, and poor coordination between the main stakeholders; and,
    - Dearth of governing capacities at all levels (national and local).

32. Financial barriers:
    - Lack of domestic and foreign investment capital: Tajik companies that are interested in the development of SHP have limited financial resources and insufficient access to finance SHP investment projects. The participation of foreign capital is constrained due to the unstable business climate and unfavorable economic conditions, as well as the lack of appropriate legal and regulatory frameworks and effective enforcement of legislation requirements;
    - Lack of long-term credits on favorable terms: Commercial banks are reluctant to lend because the return of long-term investments is risky, especially when there are no state guarantees (a tariff system) that all electricity produced will be sold at the appropriate price, which assures the reasonable pay back of investments. In addition, financial institutions have no experience in financial analysis for investments in SHP. Foreign long-term loans are expensive due to the high risk perception held by foreign commercial banks;
    - Costs for preparing investment projects must be incurred before funding for the project to be assured, without a guarantee of actually obtaining the necessary funds for a particular project. The lack of projects with proven feasibility and profitability increases the costs associated with their preparation;
    - Special equipment for SHP utilization is costly and mostly imported – high costs remain due to an absence of sufficient demand;
    - Lack of state support financing mechanisms that are necessary to mitigate commercial risks related to SHP; and,
    - SHP electricity production is still uncompetitive in the electricity market and requires state support in the form of guaranteed electricity buy-back prices determined by regulation (tariff system).

33. Information/knowledge/expertise barriers:
    - Lack of information to the general public on SHP technologies and their potential use;
    - Lack of information to the general public on the benefits of SHP (financial, social and environmental);
    - Lack of reliable information that would be useful for potential investors regarding the locations with high and exploitable SHP potentials;
    - Insufficient number of specialists to implement SHP projects, especially in remote rural areas;
    - Inadequate capacities and capabilities of domestic industries to provide equipment and services related to SHP; and,
    - Existing manufactures and service providers are fragmented and narrowly specialized and unable to provide turnkey integrated SHP solutions.

34. More details on barriers and project activities to address these options are provided in Section 2 of UNDP-GEF Project Document.

35. Under a business-as-usual (BAU) scenario, wherein the identified barriers will persist, the following can be expected with regard to rural energy consumption and associated CO2 emissions Tajikistan by 2025 (i.e. end of 10 years post-project period)

Population with insufficient access to grid power to meet basic energy needs (lighting, cooking and heating)	5,000,000

Annual consumption of fuel wood[6] [m^3/capita]	1,0
Total estimated consumption of fuel wood [m^3]	5,000,000
CO_2 emissions from fuel wood consumption [tCO_2]*	7,850,000

*Following conversion factor is used 1.57tCO2/m^3 calculated based on the following:
- 1.0 metric tonne wood = 1.4 cubic meters (solid wood, not stacked). Source: Bioenergy Conversion Factors
- Fuel wood CO2 conversion factor: 112 tCO2 / TJ. Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, p. 16
- Fuel wood Heating value: 0.02 TJ / tonne of fuel. Source: IPCC

GEF alternative

36. As a consequence of the abovementioned barriers, the local SHP market and the supply chain are not developed. GEF-supported intervention is needed on both sides:
    - Supply side, i.e. upgrading capacity of SHP manufactures and service providers;
    - Demand side, i.e. enabling communities to implement and operate cost effective SHP projects;

37. One of the main impeding factors for penetration of SHP solutions is immature state of the market for SHP energy in Tajikistan and under-developed supply chain. The project will address these in Components 2 and 3 as a critical factor towards a successful market transformation. In order to transform the SHP market, project will need to act continuously across all the major groups of market participants dynamically adjusting mix of tools necessary to overcome specific barriers as they emerge. Therefore, an integrated, cyclic and dynamic approach will be adopted (see Figure 3) where the project will aim to achieve early successful implementation of selected pilot projects that will be used to promote the SHP, the concept of energy turnkey services and to provide impulses for market transformation.

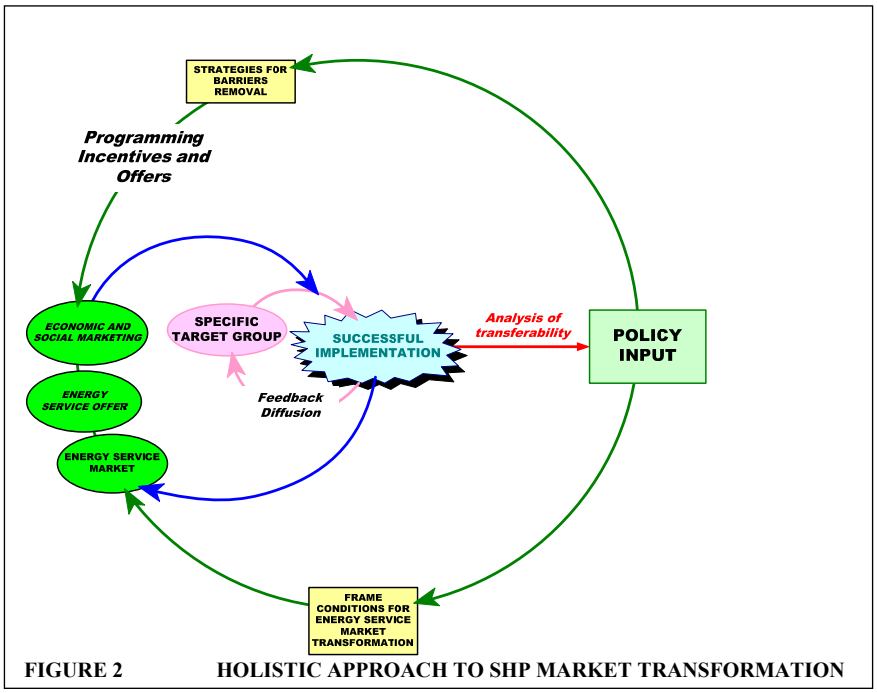


FIGURE 2 HOLISTIC APPROACH TO SHP MARKET TRANSFORMATION

[6] Fuel wood is regarded as non-renewable biomass in the context of Tajikistan. It is estimated that, in the past 120 years, Tajikistan's forests have been reduced by 75 percent—from 150,000 km2 to 37,000 km2. Officials believe that the rate of deforestation has accelerated dramatically in the past 10 years due to shortage of energy supplies in rural and remote areas. In some areas of Tajikistan

38. The foundations on which the implementation strategy will be built are the newly adopted Law on RES, and an amendment on the Law of energy from 2007, which stipulates that excess electricity from RES sources has to be bought by Barki Tajik, National Energy Monopoly. The cornerstones of the implementation strategy are as follows:

- Developing adequate regulatory framework which will provide:
  - Technical regulations and conditions for connection to the grid of SHP
  - Methodology for calculating costs for electricity from SHP
  - Contracting modalities for buying back electricity from SHP (on-grid) and providing electricity to rural customers (off-grid)
  - Establishment of a RES and EE fund for support of development of community based SHP and covering price difference for electricity from these SHPs
- Developing local manufacturing, engineering, operation and maintenance capabilities related to RES and EE;
- Developing capacity of local manufacturing and service companies with an aim to deliver at least 50% of the value of a SHP as local goods and services, and the remaining 50% being from import; and,
- Strengthening capacity of national and local government to implement, coordinate specific actions and monitor results RES and related policies (poverty reduction for instance)
- Development and piloting an integrated rural development model with provision of electricity from mini hydro as the driver, and integrating clean water, irrigation, food, employment, education and health issues. The project will demonstrate model effectiveness through identification and implementation of a number of pilot projects within selected communities, and with full community participation. Upon verification of the model, the project will support development of a scaled-up approach from a pilot community to a national program that will address issues of rural poverty reduction and national economic development.

39. Under an Alternative scenario, wherein the identified barriers are removed, the following can be expected with regard to rural energy consumption and associated CO2 emissions Tajikistan by 2025:

Population with insufficient access to grid power to meet basic energy needs (lighting, cooking and heating)	4,000,000
Annual consumption of fuel wood[7] [m^3/capita]	1,0
Total estimated consumption of fuel wood [m^3]	4,000,000
CO_2 emissions from fuel wood consumption [tCO_2]	6,280,000

40. It can be concluded that in the absence of the proposed project, only limited, scattered and largely uncoordinated activities related to SHP development would be undertaken, thereby causing unnecessary wastage of scarce financial resources. Also, it is likely that without GEF support, SHP development will be left to bilateral donor agencies, which will remain limited in scope of their activities. Therefore, in order to develop a sustainable SHP model, including a functioning equipment supply chain, support for overcoming barriers describe above is essential.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:

[7] Fuel wood is regarded as non-renewable biomass in the context of Tajikistan. According to Tajikistan Forestry Agency (2006) community cutting of forest (both for energy and construction use) is considered among the main threats to Tajikistan's forest ecosystems. Valuable juniper, walnut, birch and pistachio forests have shrunk by 20 to 25%, and tree cutting has led to an outbreak of weeds, alien and quarantine plant species, erosion, landslides and the impoverishment of winter pastures. Altogether, annual forest destruction is estimated to be 1.5-3 times more than the natural increment and forests renewal in particular regions of Tajikistan.

Risk	Risk Rating	Mitigation Measures
Widespread poverty and lack of sustainable source of income resulting in low ability to pay for energy supply services	Moderate	- UNDP co-financed activities (see Output 3.4) will support establishment of income-generating businesses in the areas where pilot projects are to be located in order to ensure solid client base for pilot SHPs and maximize consumers' ability to pay - Optimization and standardization of system design to lower down SHPs costs will be conducted under Activity 1.3.2 - Provision of grant funding to co-finance the implementation of SHP pilot projects until life-cycle cost of the systems have decreased to a level affordable for rural communities or incomes have increased. After this project completion, National RES-EE Fund is envisaged to support investments in community-owned SHPs via provision of dedicated subsidies and incentive-based tariff (see Annex E to UNDP-GEF ProDoc for details)
Investors (community-owned, public or private sector) do not get sufficient return on investments, while Government support is not forthcoming	Moderate	- Work with four UNDP-supported micro-loan funds to include support for SHP investment in their scope of operation (see Activity 3.2.5) - Proper incentives for investors as envisaged to be delivered under Output 1.1.)
Slower than expected implementation of the pilot SHP projects	Moderate	- Involvement of suitable experts to ensure sound design for the pilot SHP projects - Close supervision of the implementation of the SHP plants (see Activity 3.3.2) - Incentives for timely (or penalties for late) provision of previously committed local (in-kind) contributions to project implementation
Slower than expected development of a national market for SHP systems and thus higher than expected costs of such systems	Substantial	- Capacity building and technical assistance to facilitate development of supply chains (all activities under Component 2, the key component of this project, are designed to mitigate this risk)
Slower than expected improvement of the institutional framework for SHP development	Low	- The Project Board will closely coordinate with relevant Government institutions to support timely implementation of commitments. RES Law has been signed and Regulations are being developed. Establishment of RES-EE Fund, in particular, has been supported by all line Ministers and the President
Insufficient quality of locally produced equipment leading to early break-down of the renewable energy systems and dwindling consumer confidence in the technology	Moderate	- Capacity building measures for local equipment manufacturers and service providers under Component 2 - Regulatory measures to set and enforce quality standards under Component 1
Lack of interest in renewable energy systems on the part of local stakeholders (communities, beneficiaries) due to perceived inferiority compared to grid supply	Low	- Awareness campaigns on the potentials and limitations of SHP systems (Activity 4.1.2) - Information campaigns on the Government's plan to improve grid energy supply in rural areas

H. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:

41. About 10 SHP plants will be in operation by the end of the project and another 17 will be in advance stage of preparation, supported by the project in the component 3. Together this will imply direct CO2 emission reduction of 244 kilo tons of CO2 (ktCO2) over the 20-year lifetime of a SHP (including both direct and post-project direct

emission reductions). Indirect emission reduction as a longer-term impact of the project´s capacity is estimated to range between 733,000 t CO2 and 2.48 million tCO2. As a measure of the project's cost-effectiveness, with the expected direct and direct post project CO2 emission reductions, the unit abatement cost is US$ 8.19/ton CO2, which is cost-effective as compared with observed carbon market prices (i.e., around 10-14 €/tCO2). This is fully consistent with the findings of the Tajikistan National Communication to UNFCCC and Technology Needs Assessment (TNA) which identified investment in SHP as the least cost option to reduce GHG emissions in the country as compared with other alternatives, such as promoting other RES options (solar, wind) or GHG reduction measures in industrial sector (cement, aluminum and chemical industry).

FIGURE 3 PROJECT GHG EMISSION REDUCTIONS AND COST-EFFECTIVENESS

CO2 Emission Reduction Category	Emission Reduction (ktCO2)	Unit Abatement Cost (GEF US$/tCO2)
Direct (project)	90	8.2
Direct (post-project)	154	
Indirect (bottom-up	733	2.73
Indirect (top-down)	2,217	0.90

42. Note: The combination of direct and direct post CO2 emission reduction results in an UAC of US$ 8.20/ton. Details on the emission calculation and assumptions are provided in Annex H.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

A. PROJECT IMPLEMENTATION ARRANGEMENT:

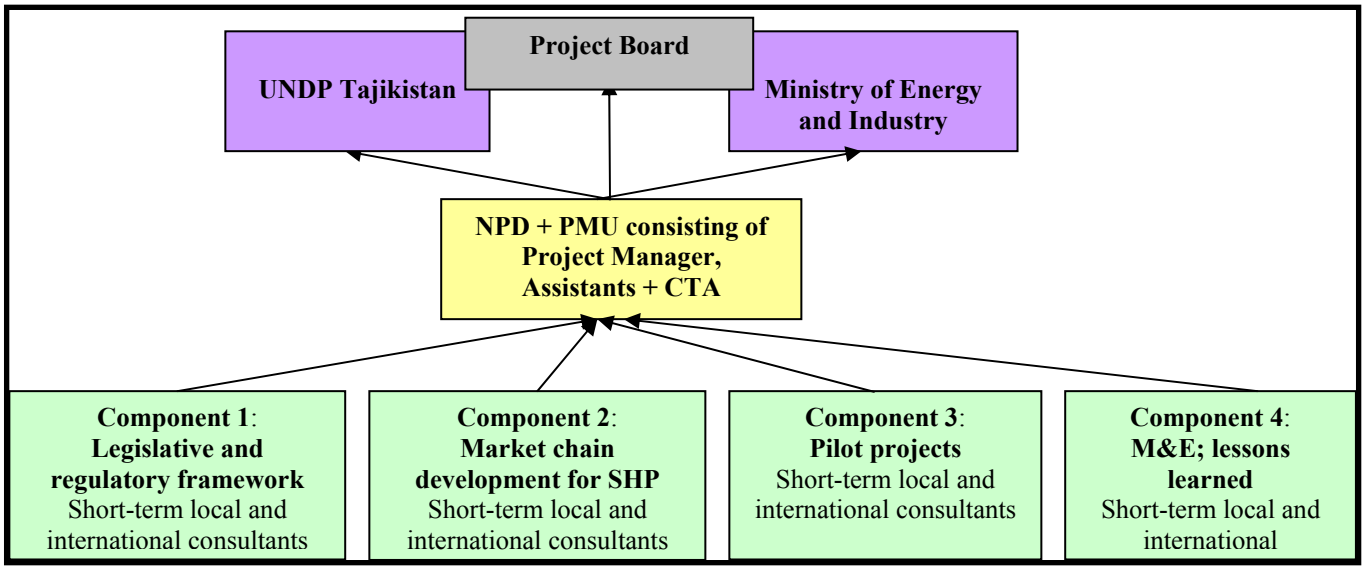
43. The project will be implemented through the Direct Implementation Modality under the umbrella of UNDP's Energy and Environment Programme in close coordination with the Ministry of Energy and Industry and other government entities. The Ministry will appoint a National Project Director who will be the main Focal Point of the government contact with the project. A Project Manager (PM) will be hired to manage the activities on a day-to-day basis. The PM will be responsible for overall project coordination and implementation, consolidation of work plans and project papers, preparation of quarterly progress reports, reporting to the project supervisory bodies, and supervising the work of the project experts and other project staff. The PM will also closely coordinate project activities with relevant Government and other institutions and hold regular consultations with project stakeholders.

44. The PM will benefit from the focused inputs of a part-time non-resident Chief Technical Adviser (CTA) whose main task will be to provide expert advisory services and technical assistance to the PM and other project experts, as and when required. In addition:

- Financial and Administrative Officer of the E&E Programme will devote some of its time to manage project's administrative and financial resources as well as provide administrative support to PM.
- National and international consultancy services will be called in for specific tasks under the various project components. These services, either of individual consultants or under sub-contacts with consulting companies, will be procured in accordance with applicable UNDP guidelines.
- Finally, the UNDP CO will provide specific support services for proper project implementation, as required, through its Administrative, Programme and Finance Units.

45. **The Project Board (PB)** is responsible for providing strategic guidance and making management decisions for the project, in particular when guidance is required by the Project Manager. The PB plays a critical role in project monitoring and evaluations by quality assuring these processes and products, and using evaluations for performance improvement, accountability and learning. It ensures that required resources are committed and arbitrates on any conflicts within the project or negotiates a solution to any problems with external bodies. In addition, it approves the appointment and responsibilities of the Project Manager and any delegation of its Project Assurance responsibilities. Based on the approved Annual Work Plan, the PB can also consider and approve the quarterly plans (if applicable) and also approve any essential deviations from the original plans.

46. In order to ensure UNDP's ultimate accountability for the project results, PB decisions will be made in accordance to standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In case consensus cannot be reached within the PB, the final decision shall rest with the UNDP Project Manager. Potential members of the PB are reviewed and recommended for approval during the PAC meeting. Provisional list of potential PB members include: Ministry of Energy and Industry, Ministry of Economic Development and Trade, Barqi Tajik, and Ministry of Environmental Protection. Representatives of local stakeholders can be included in the Board as appropriate.



PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF:

1. The project concept and design during the PIF formulation were based on the best information available at that point in time regarding the barriers to a market-oriented approach for small hydropower development. However, during implementation of the PPG exercise, it became clear that while the project design was still sound, the original project components needed to be adjusted. Please refer to Annex 1. For example, project contribution to component 1 (called "policy, planning and decision-making" in the PIF) has been reduced, because the Government has already introduced legislation on the promotion of renewable sources of energy, so the project will focus on the needed regulations in the framework of this law.

PART V: AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.

Agency Coordinator, Agency name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Yannick Glemarec UNDP-GEF Executive Coordinator		October 26, 2011	Marina Olshanskaya Regional Technical Advisor Climate Change Mitigation	+421 2 59 337 285	marina.olshanskaya@undp.org

LIST OF ANNEXES

Annex 1 Rationale for Changes in PIF Outputs/Activities in the ProDoc

Expected Outputs		Rationale for Changes in PIF Outputs/Activities in the ProDoc
GEF-Approved PIF	**Project Document**	
COMPONENT 1: POLICY & REGULATORY FRAMEWORKS FOR SHP		
1.1 National SHP standards developed and testing laboratory established and functional 1.2 Capacity built within the Ministry of Industry and Energy to coordinate SHP 1.3 Legislative and regulatory framework established, including incentives and concessionary terms for the development as well as proper tariff setting and standardization for SHP GEF: 250,000 US$ Co-financing: 869,000 US$	1.1 Formulated, approved and enforced implementing rules and regulations (IRRs) of the new Law for RES that will facilitate actions geared towards the enhancement of the market environment for SHP 1.2 Institutional capacities in place at central and local level to implement and coordinate RES policies GEF: 50,000 US$ Co-financing: 400,000 US$	No major changes as compared to approved PIF Output 1.1: National SHP standards and other standardized solutions (i.e. methodology for SHP evaluation, engineering design, etc) will be delivered under *Output 2.1 "Guidebook on SHP development"*. Output 1.2: No changes Output 1.3: This output has been revised, because the Government has already introduced legislation on the promotion of renewable sources of energy, so the project will focus on the needed regulations in the framework of this law – see *Output 1.1 " Formulated, approved and enforced implementing rules and regulations (IRRs) of the new Law for RES that will facilitate actions geared towards the enhancement of the market environment for SHP"* Co-financing for the achievement of Outcome 1 " Adapted and enhanced legislative and regulatory framework for small-scale hydropower development in the country" has been reduced as it was mainly meant to support the preparation and lobbying for required legislative package on RES, which has already been developed and approved by the Parliament in 2010
COMPONENT 2: STRENGTHENING TECHNOLOGY SUPPORT & DELIVERY SYSTEM		
2.1 Technology needs assessment implemented and Industry Guide developed 2.2 Regional SHP workshop for technology providers and technology recipients conducted 2.3: Training provided for local organizations, primarily private firms and NGOs for assessment, feasibility analysis and business planning to deliver, install, service and repair SHP systems, as well as to build their capacity for business planning, live cycle costing 2.4: The capacity of national	2.1 Guidebook on technical and policy aspects of SHP project development (to be used in all trainings to be delivered by the project) 2.2 Local SHP manufacturers capable of providing turn-key integrated RES solutions and O&M services 2.3 Vocational training program for technicians involved in SHP design/construction and O&M 2.4 Local manufacturers capable of producing combined electric and biomass-fired heating and cooking devices for	This component has been slightly revised to put more emphasis on technology transfer and development both for SHP projects, as well as on energy efficient heating appriances. Output 2.1 "technology needs assessment and industry guide" is now *Output 2.1 "* Guidebook on technical and policy aspects of SHP project development" . The Guide will also include recommendations on modular turbine packages for application in Tajikistan adopted based on internatrional best practices Output 2.2 and Output 2.3 were merged into *Output 2.2 " Local workshops and manufacturers with enhanced technological capabilities to install, construct, manufacture and repair SHP system equipment and components*" which will incorporate training and other capacity enhancement activities for local manufacturers. Output 2.3 "Vocational training program" for local technicians on SHP operation and maintenance was added to address barrier related to the shortage of qualified local personnel for SHP O&M

workshops and industries to install, construct, manufacture and repair selected parts of SHP systems is developed or enhanced by means of technology transfer from selected countries 2.5 Standardised modular turbine packages for application in Tajikistan designed GEF: 600,000 US$ Co-financing: 869,000 US$	rural households GEF: 750,000 US$ Co-financing: 190,000 US$	Output 2.4 was added in response to GEFSec comments on the need to address the issue of inefficient heating appliances Output 2.5 "Standardized modular turbine packages for application in Tajikistan designed" will be delivered under Output 2.1 as part of a comprehensive Industry Guide for SHP projects Co-financing for the achievement of Outcome 2 "Enhanced technical and planning know-how and developed market chain for SHP" has been reduced: this is the reflection of the situation with a very poor state of SHP technology and delivery systems in Tajikistan.
COMPONENT 3: SHP DEMONSTRATION		
3.1: SHP assessment and site selection completed 3.2: Awareness raised of stakeholders and capacity built (O&M, administration of SHP) 3.3: Local economic development and sustainable resources management in its watershed area 3.4 10-15 SHP projects completed, demonstrating the viability of different technologies (micro, small), delivery, operation and financing models GEF: 950,000 US$ Co-financing: 869,000 US$	3.1 Technical studies, political commitments and institutional framework secured for pilot SHP projects 3.2 Fully operational community-based SHP 3.3 Pilot SHP sustained via facilitation of PPA, targeted support to productive power end-users and preparation of sustainable resource management plans in pilot locations GEF: 1,015,000 US$ Co-financing: 5,275,000 US$	No major changes as compared to approved PIF, just a few changes in the definition and composition of Outputs (i.e. hydrological assessment has been added to Output 3.1). Co-financing for this Outcome has been significantly increased as a reflection of its importance for the demonstration of integrated SHP-based rural development model. A number of donors have pledged additional resources to the initiative via UNDP-implemented Community Development Programme. UNDP itself has fully mainstreamed the proposed GEF project in its core programme on poverty alleviation and community development with allocation of additional core funding to support SHP demonstration.
COMPONENT 4: DISSEMINATION & REPLICATION		
4.1: Monitoring and Evaluation 4.2: Lessons learnt, experiences and best	4.1 Lessons learnt, experiences and best practices related to the development of SHP are compiled and disseminated	No major changes in outputs as compared to approved PIF. Output 4.1 was removed due to overlap with Project Management component. Output 4.2 Conference on integrated renewable-energy based rural development was added to

practices related to the development of SHP are compiled and disseminated 4.3: Replication plan for construction of new SHPs for up to 10 MW GEF: 50,000 US$ Co-financing: -	(including GHG emission assessment); 4.2 Conference on integrated renewable-energy based rural development 4.3 Approved and funded proposal for national scaling up of the SHP demos/pilots GEF: 35,000 US$ Co-financing: 285,000 US$	facilitate replication and dissemination of project results. Co-financing has been increased to adequately support envisaged to dissemination and replication activities, including preparation and adoption of the Scale-Up Program and organization of the regional Conference.
OTHERS		
Project Management GEF: 150,000 US$ Co-financing: 300,000 US$ Overall Budget: GEF: 2,000,000 $ Co-financing: 6,200,000 $	Project Management GEF: 150,000 US$ Co-financing: 300,000 US$ Overall Budget: GEF: 2,000,000 $ Co-financing: 6,200,000 $	No changes as compared to approved PIF

ANNEX A: PROJECT RESULTS FRAMEWORK

Strategy	Indicator	Baseline	Targets	Means of Verification	Risks and Assumptions
Goal: Reduction of GHG emissions from energy use by rural and remote communities	Avoided GHG emissions from rural communities' energy use by end of project (EOP), ktCO2 Avoided GHG emissions from rural communities' energy use by end of project influence period, 10 years (EOPIP), ktCO2	0 0	90 ktCO2 244 ktCO2	Project Annual reports; GHG emissions monitoring and verification reports, final evaluation	No change in positive Government policies concerning SHP development and utilization
Objective: Significantly accelerate the development of small-scale hydropower (SHP) by removing barriers through enabling legal and regulatory framework, capacity building and developing sustainable delivery models, thus substantially avoiding the use of conventional biomass and fossil fuels for power and other energy needs.	• No. of new small hydropower projects under implementation by EOP • Minimum No. of fully operational SHPs by EOP • Cumulative electricity generation from newly installed SHPs by EOP, MWh/yr • Cumulative electricity generation from newly installed SHPs by EOPIP, MWh/yr • Adoption of policy frameworks, allowing SHP-based generators preferable access to the grid and tariff [8]	• 1 • 0[9] • 0 • 0 • 1	• 27[10] • 10 • 4,860 • 13,118 • 4	Individual SHP project reports, Performance reports of operational SHPs; Project's annual reports, GHG monitoring and verification reports. Project final evaluation report.	Continued commitment of project partners, including Government agencies and investors/developers
Outcomes					
Outcome 1: Adapted and enhanced legislative and regulatory framework for small-scale hydropower	• **Adopted and enforced regulation operationalizing RES Law**	**No regulations in support of RES Law**	**Rules and regulations adopted by end of Year 1**	**Published documents. Government decrees/laws. Project progress**	**Commitment of the various Government institutions to adopt and capacities to enforce required**

[8] Indicator will be assessed based on the following ranking:
0 = No regulations are in place – may have been discussed;
1 = Bylaws and IRRs have been discussed and formally proposed;
2 = Bylaws and IRRs have been formally proposed but not adopted;
3 = Bylaws and IRRs have been formally adopted, but have no enforcement mechanism; and
4 = Bylaws and IRRs are adopted, have enforcement mechanism

[9] Many SHP constructed in the past are malfunctioning; none connected to the grid and few investments in SHP take place, except for by isolated donor-funded projects

[10] The projects are in various stages of development (assessment , feasibility, construction, operation)

development in the country.				**reports**	**bylaws are in place; Low turn-over of trained government staff**
Output 1.1: Formulated, approved and enforced implementing rules and regulations (IRRs) of the new Law for RES that will facilitate actions geared towards the enhancement of the market environment for SHP	• Simplified procedures and principles for the licensing and construction of SHP facilities • Technical regulation to enabler connection of SHP plants to the electric power grid • Procedures on monitoring and verifying electricity production from SHP • National RE/EE Fund • Tariff methodology for RES electricity and standard PPA	• RES Law includes a number of provisions to facilitate investment in grid-connected RE projects, but they are not operationa lized	• Procedures adopted and enforced by end of Year 1 • Technical regulation adopted and enforced by end of Year 1 • Procedures adopted and applied by end of Year 1 • National RE/EE Fund set-up and is operational by end of Year 1 • Methodology for RES electricity and standard PPA developed and adopted by end of Year 1	• Published IRRs • Project report documenting the status of IRRs enforcement • Project report on the status of operations of RE and EE Fund • Same as above • Same as above	Commitment of the various Government institutions to adopt and capacities to enforce required bylaws are in place
Output 1.2: Central and local government institutions with enhanced capacities to develop and coordinate SHP projects.	• # staff members from relevant central and local government institutions trained in developing and coordinating SHP projects • Inter-ministerial Task Force to coordinate SHP policies development and implementation at central level	• 0 • 0	• 30 staff members trained by the end of Year 2 • Inter-ministerial Task Force to coordinate SHP policies development and implementation at central level established and is operational by the end of Year 2	• Training reports • Official documents establishing Task Force and minutes of its regular meetings	Low turn-over of trained central and municipal staff is ensured
Outcome 2: Enhanced technical and planning know-how and developed market chain for SHP in Tajikistan	• **% of the total SHP installed cost provided by locally made goods and services**	• **5-10%**	• **50% by the end of Year 3**	• **Project report on SHP market chain development**	**Potential market chain actors are interested in SHP projects** **Demand for SHP is on the rise as a result of establishing favorable policy framework**
Output 2.1: Guidebook on technical and policy aspects of SHP project development (to be used in all trainings to be	• Guidebook on SHP project development	• 0	• Guidebook on SHP project development prepared and disseminated by the end of Year 1	• Published capacity needs assessment • Training reports	• Commitment of partners to release staff for training program is in place • Commitment of

delivered by the project)				• Same as above • Same as above • Same as above	universities and technical school to introduce new curricula is in place
Output 2.2: Local workshops and manufacturers with enhanced capacities to install, construct, manufacture and repair SHP system equipment and components	• Technology transfer and capacity development plan prepared for selected local manufacturers • Number of local SHP manufacturers capable of providing turn-key integrated RES solutions and O&M services	• 0 • 0	• 2 technology transfer and capacity development plan prepared by the end of Year 1 • At least 2 by the end of Year 2	• Project report on SHP market chain development	• Interest of potential SHP market chain actors in provided capacity building and technology transfer is insured
Output 2.3: Vocational training program for technicians involved in SHP design/construction and O&M	• # of technicians annually undertaking vocational training on SHP	• 0	• 20 technicians annually undertaking vocational training on SHP starting from Year 2	• Training report	• Interest of local education institutions
Output 2.4: Local manufacturers capable of producing combined electric and biomass-fired heating and cooking devices for rural households	• # of local craft workshops capable of manufacturing and assemblage of simple electric heating and cooking devices	• 0	• At least 5 local craft workshops by the end of Year 3	• Project report	•
Outcome 3: Improved confidence on the technical and economic viability of integrated SHP-based rural development model	• No. of SHP demos/pilots incorporating aspects of productive uses and livelihood support for host communities • Cumulative electricity generation from newly installed SHPs by EOP, MWh/yr • Cumulative electricity generation from newly installed SHPs by EOPIP, MWh/yr	• 0 • 0 • 0	• At least 10 community-owned SHP projects operate on a sustainable basis and at least 17 additional are under construction by the end of Year 4 • 4,860 • 13,118	Reports on pilot SHPs operations	Availability of local people with sufficient technical education and managerial experience Participation of local level government

Output 3.1: Technical studies, political commitments and institutional framework secured for pilot SHP projects	• Update hydrological data • Feasibility studies • No. of integrated district development plans (IDDPs) • No. of local entities capable to manage SHP plants • No. of engineering designs and all permissions • No. of SHP projects in the pipe-line	• 0 • 0 • 0 • 0 • 0 • 0	• Updated data for 2 sites by end of Year 1, 3 sites - by end of Year 2, 5 sites - by end of Year 3 • FS for 2 sites by end of Year 1, 3 sites - by end of Year 2, 5 sites - by end of Year 3 • IDDP for 2 districts by end of Year 1, 3 districts - by end of Year 2, 5 districts - by end of Year 3 • 2 local entities by end of Year 1, 3 local entities - by end of Year 2, 5 locaL entities - by end of Year 3 • Designs ready and permissions secured for 2 projects by end of Year 1, for extra 3 projects - by end of Year 2, and for 5 more projects - by end of Year 3 • At least 17 further SHP projects identified and construction started (without direct project support)	Report on implementation of pilot SHP projects Integrated District Development Plans	Same as above
Output 3.2: Operational SHP demos/pilots in selected communities , demonstrating the viability of the technology and O&M&M models	• No. of commissioned demo/pilot SHP plants by EOP • No. of operational demo/pilot SHP plants by EOP • *Average* annual operating performance of operational demo/pilot SHP plants by EOP o Capacity, kW o Load factor, % o Net annual electricity production, MWh/yr o On-grid price, US$	• 0 • 0 • 0	• 10 • 10 • 92 • 60% • 486 • 0.03	Report on implementation of pilot SHP projects	Same as above
Output 3.3: Pilot SHP operations sustained	• No. of PPAs signed for purchase of power from pilot SHP plants by EOP • No. of energy efficient appliances supplied and EE upgrades conducted	• 0 • 0	• At least 200 by the end of Year 3 • At least 200 EE appliances and 10 EE upgrades by end	Report on implementation of pilot SHP projects	Same as above

	• No. of local business supported in pilot localities • No. of integrated river-basin management plans developed and adopted by authorities	• 0 • 0	of Year 4 • 100 by the end of Year 4 • 10		
Outcome 4: National Scaling-up Programme of Renewable Energy-based Integrated Rural Development	• Adopted and financed National Scaling-up Program	N/a	• Adopted and financed National Scaling-up Program by the end of Year 4	• Officially approved and published national scaling up plan	• Data on project impacts and results properly documented and made available to consultants
Output 4.1: Project results asessed, analyzed and compiled into comprehensive national report	• Project results and Lessons learnt report • No. of recipients of lessons learnt report by EOP • Total GHG emission reductions achieved by EOP, ktCO2 • Total GHG emission reductions achieved by EOPIP, ktCO2	• N/a	• Project results and Lessons learnt report prepared by end of Year 4 • 300 • 90 • 244	• Project results and Lessons learnt report • Project report on GHG emission reduction monitoring	
Output 4.2: Conference on integrated rewable-energy based rural development organized	• Conference on integrated rewable-energy based rural development	• N/a	• Conference on integrated rewable-energy based rural development organized by the end of Year 4	• Conference report	Data on project impacts and results properly documented and made available to consultants
Output 4.3 Approved and funded proposal for national scaling up of the SHP demos/pilots	• Annual amount of governmental incentives allocated to support investment in new SHP plants under the scale-up plan by EOP, US$		• 3,500,000 US$	• Officially approved and published national scaling up plan	Government commitment to promote SHP development and utilization is sustained

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF)

STAP comments (May 2010)

1. GHG emissions and Baseline energy scenario: The project objective is about substitution of biomass and fossil fuel for power and other energy needs for hydropower. However, over 95% of Tajikistan's power generation is based on Large Hydro Power Systems. Thus in the baseline scenario, apparently no GHG emissions are occurring, since all the electricity comes from renewable hydrological resources and no estimate is given of GHG emissions from other sources. In this case, what are net GHG benefits in this project?

UNDP response:
Indeed, estimating the expected emission reduction is less straightforward as the formula may suggest:

- Power generation in Tajikistan is predominantly based on large hydropower, but with huge power shortages in winter time. Power deficit (over 4 billion kWh/yr) and energy needs of rural population are being primarily covered via the use of imported fossil fuels and unsustainable forest cutting resulting in rising GHG emissions as reflected, for instance, in the National Communication to UNFCCC. Therefore in the baseline scenario quite substantial GHG emissions occur as a result of fire wood consumption, as well as other solid fuels. Specifically, Rural Energy Survey conducted by UNDP during the project preparatory phase revealed the following facts:
    - The analyses of energy consumption patterns in the targeted Jamoats – Khonakoi Kuhi (Hisor D-ct), Sabo (Shahrinav D-ct), Rabot (Tursunzoda town) and Romit (Vahdat town) had shown that people mainly use wood and dung bricks for their household needs (see Table 1 below). In spite of the fact that the majority of rural localities under research are a part of common energy system, the electricity in winter time is available only 2-4 hours a day and even less, there are many cases of electricity supply breaks.
    - In the villages under the survey the heating of the houses starts in autumn and lasts all winter for about 4-6 months. Each household has a stove. For heating they normally use entire wood (or the tree trunk) of wild species of trees (willow, poplar, acacia, hawthorn, juniper, maple, June berry, nut tree, almond, elm).
    - Population mainly uses wood and dung bricks for cooking, making bread and boiling water. The fire wood consists of wild species of trees and bushes taken by households mainly from the nearest forest that surround the village, including the territory of protected areas.
    - Dung bricks are used in every household. It is made of manure from the cattle of their own or the raw material is brought home from the pastures to prepare dung bricks. Also, some households, buy the dung bricks for winter period.
    - Coal and gas (LNG) is purchased and used by rare well-off HHs as additional energy resources. The population of villages, situated close to the forest, do not buy coal as they mainly use wood.
    - Liquefied energy sources (kerosene, solar oil) are very rarely purchased and utilized by the population. Kerosene is normally used as lightning for the kerosene lamps and as a quick way to fire up the stove.

TABLE 1. THE ANNUAL CONSUMPTION OF WOOD AND WASTES BY THE AVERAGE HOUSEHOLD IN TARGETED LOCALITIES

Locality	Wood (m^3)	Dung bricks (units)
Nilu village	5.52	1, 140
Ardjinak village (Top & Lower)	9.37	4,156
Navobod village	13.7	7,172.5

Pushtimiyona village	8.15	4,558
Shirkent village	20.83	5,678
Kyrgyz-kishlok village	14.26	9,736
Yavroz village	22.00	6,554
Tavishi Poyon village	22.46	10,200
Langar locality	11.86	5,580
Average by a household	**14.2**	**6,086**
Average per capita (average rural Tajik household has 10 members)	**1.42**	**608.6**

- Under a business-as-usual (BAU) scenario, wherein the identified situation will persist, the following can be expected with regard to rural energy consumption and associated CO_2 emissions Tajikistan by 2025 (i.e. end of 10 years post-project period).

Table 2: GHG emissions in the BAU

Population with insufficient access to grid power to meet basic energy needs (lighting, cooking and heating)	5,000,000
Annual consumption of fuel wood[11] [m^3/capita]	1,0
Total estimated consumption of fuel wood [m^3]	5,000,000
CO_2 emissions from fuel wood consumption [tCO_2]*	7,850,000

*Following conversion factor is used 1.57tCO2/m^3 calculated based on the following:
- 1.0 metric tonne wood = 1.4 cubic meters (solid wood, not stacked). Source: Bioenergy Conversion Factors
- Fuel wood CO2 conversion factor: 112 tCO2 / TJ. Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, p. 16
- Fuel wood Heating value: 0.02 TJ / tonne of fuel. Source: IPCC

- SHPs work on-grid during summer time. In this case, the grid could have provided the power to the communities connected, but there is no shortage. In fact, the SHP may sell its power to the grid. In this case, one hydropower source replaces another (most power generated in the grid is based on large-scale hydro), so we have assumed that net emission reduction is zero in this case;
- SHPs work off-grid during the winter time, when grid supply is absent or unreliable and the SHP has to provide the community. In this case the SHP provides for lighting and heating in households, some productive uses and social services (e.g., schools and clinics) replacing power produced by diesel-based generators, as well as consumption of wood fuels for cooking and heating. In the off-grid mode, one can assume that SHPs replace wood fuels, which is used for cooking and heating. On the other hand, one can argue that if power would not be provided by a new SHP, than to reach a required level of *sustainable demand*, this would either have to be provided by a diesel-fuelled mini-grid or by boosting the production capacity of the national grid by adding fossil fuel based generation capacity (diesel or fuel oil). In the calculation we have assumed that replacement of diesel would take place in 50% of the energy production cases (with emission reduction factor of diesel-based generation of 0.8 $kgCO_2$ per kWh[12]) and replacement of wood[13] in the remaining 50% (with emission absorption of growing trees of 1.57 tCO_2 per m^3). More details of the direct (and indirect) emission reduction calculation are given in Annex H.

2. Micro hydro potential mapping: STAP suggests, after a review is conducted of the First and Second National Communications of the Republic of Tajikistan to the UNFCCC, the option of conducting a national level study to identify and locate potential sites for installing SHP units along with potential installed capacity. A micro hydro potential map could be generated for the country. This would help replication of projects in other regions.

[11] Fuel wood is regarded as non-renewable biomass in the context of Tajikistan. It is estimated that, in the past 120 years, Tajikistan's forests have been reduced by 75 percent—from 150,000 km2 to 37,000 km2. Officials believe that the rate of deforestation has accelerated dramatically in the past 10 years due to shortage of energy supplies in rural and remote areas. In some areas of Tajikistan

[12] 0.8 tCO_2 per MWh (tonne of CO_2 per thousand kWh)

[13] The conservative assumption is that 0.5 m^3 of wood per person per year (or 2.1 kg per person per day) can be saved (from deforestation) by using electric cooking stoves. It is assumed also that wood would still be used for space heating.

UNDP response:
The Government of Tajikistan has already identified a list of potential SHP sites (provided in Annex H). Recognizing that old Soviet-era data can't be fully relied upon, the project will re-assess hydrological data for pre-selected 27 sites (Activity 3.1.1). This will be done in conjunction with provision of on-the-job training on and procurement of required hardware and software hydrological data assessment to the staff of relevant governmental entities (HydroMet) so that required national capacities are built.

3. Seasonality of SHP systems: In most locations, water resources for SHP systems may be inadequate to provide power supply all year round. How will the risk of seasonality of water and power supply be addressed? Will there be a back-up system based on other sources of energy and what will be cost implications? This information should be provided in the project document.

UNDP response:
Power supply in winter time is indeed influenced by low water supply and this especially affects the large hydro facilities. The seasonality of water supply also affects SHP as well, but less so as these are not situated in a few places but are all over Tajikistan, in principle. Thus, SHP allows some flexibility by alleviating the pressure on the main grid.

4. Grid connected or off-grid: The project although focusing on remote rural communities should explore the economic rationale for grid-connected as well as off-grid systems and adopt an appropriate strategy. Off-grid systems would also depend on the sustained demand for electricity near the location of power generation. STAP recommends conducting such an analysis during project preparation.

UNDP response:
The distinction between on-grid and off-grid SHP is blurred in Tajikistan. Some SHPs will be off-grid, being too far from the main grid. Others will be grid-connected, but will be operated on-grid during summer time (and able to sell power to the main grid), but off-grid during winter time. In general, selling to the grid allows for a higher load utilization factor in comparison with off-grid applications and thus positively affects the economics of the plant.

World Bank comments (August 2009)

1. It is proposed that grant resources will be used to prepare a PD for the Tajikistan Technology Transfer for Small-Hydropower project, to be implemented with co-financing provided by the international/multinational donor communities working in the country. However, most of the activities in the PIF proposal are described in general terms, and proposed actions seem to be presented in isolation to one another. For example, the item on policy, planning and decision-making that is proposed to address (a) the legal and regulatory framework for technology transfer and North-South and South-South cooperation established; (b) National SHP standards developed and testing laboratory established and functional; (c) Capacity built within the Ministry of Industry and Energy to coordinate SHP; (d): Legislative and regulatory framework established, including incentives and concessionary terms for the development as well as proper tariff setting and standardization for SHP on providing support at the national level. Since a current urgent need of Tajikistan is to address improving energy security, if this pilot project initiative first takes into account the status of development of several hydropower generation plants initiated during Soviet times, and which is currently being supported by foreign investment in the PD. For example, (a) the issue and status of Sangtuda I, completed in July 2009 by the Russian Federation, is expected to increase electricity supply in the winter; (b) Chinese-supported construction of the 500-kV North-South transmission that is expected to enable the transfer of power generated in the south to the more industrialized and agriculturally productive Sogd region in the north; (c) the proposed investments for improving interconnection with regional markets under the Regional Power Trade Interconnections project; and (d) the Government initiated installation of additional transmission lines to alleviate congestion in the southern part of the Central Asian Power System with investments from the various external donors in the energy sector. During preparation, we would recommend assessing/determining a workable approach for integrating and coordinating with all the institutions that would be involved in reducing the potential threats from energy crisis in the future, and to the environment at large.

UNDP response:
The issue of institutional coordination will be especially addressed in output 1.2 ´Increased awareness among and enhanced capacity of central and local government institutions to develop and coordinate SHP´.

Some points for consideration:

2. The project concept seems to draw from the Technical Assistance Information Exchange Instrument of the UNDP. This approach could raise some concern given that the country still has the legacy of soviet-style top-down management, with centralized decision-making from the President's office and little or no delegation of powers to the local authorities. Governance, delegation of power on administrative decision making and concomitant financial accountability are rarely on the priority list at the central leadership level.

UNDP response:
Projects that are limited in size and duration, such as the proposed GEF-supported initiative, do not pretend to be able to change a political culture that has grown over decades. However, the project will try to expand the horizon in the thinking of policy makers and implementers by having knowledge exchange with other countries (as part of Component 2 of the project) and by explicitly supporting decision-makers at lower levels of Government as well as in the communities themselves (e.g., in outputs 1.2 and 3.2)

3. Lack of support for public awareness could pose a challenge to the success of the proposed PFI initiative as a whole unless a nationwide information dissemination campaign is instituted. We would recommend including this program as a separate sub-component in the project, so that the proposed investment supporting the development of the SHP activities program is not dissipated among Bi-T's many activities.

UNDP response:
Awareness creation will take place at central and lower levels of government, in the SHP supply chain as well as in the beneficiary communities, notably as part of the activities of outputs 1.2, 2.1, 2.2, 3.2 and 3.4. Experiences gained and lessons learned will be disseminated to a wider public as part of output 4.2.

4. The main objective of the proposed project is to significantly accelerate the development of small-scale hydropower (SHP) by removing barriers through technology transfer and developing sustainable delivery models. While these details are explained, a more detailed explanation could be provided of the type of barriers for the TT of HSP in Tajikistan that would be tackled in the proposed project.

UNDP response:
The barriers and options for barrier removal, supported by the GEF project, are detailed in Section F of Part II of this CEO Endorsement/Approval Request.

5. Private sector investment for SHP would provide benefits, such as increased use efficiency and access to energy at a competitive cost. Weak governance, low transparency, and poor service quality in banks lower public confidence and limit deposits, thus raising the cost of funding. The legal framework needs strengthening and the capacity to implement and enforce applicable laws is weak. Legal and institutional arrangements for secured lending are particularly problematic, preventing the use of a wide range of potential collateral to secure loans. The availability of diverse technical products and services catering to specific needs is limited, especially in rural areas. The project team may want to examine these aspects to offer recommendations as to how to better protect property rights for private investors and goods and supply imports, removing barriers for the rapid development and expansion of the private sector SHPs in Tajikistan.

UNDP response:
Regarding funding, the Government is planning to set up a RE and EE Fund that could (partly) fund the investment cost of SHP, while the tariff structure should allow covering O&M&M as well as future overhaul cost. Regarding local management, community-based organizations (CBOs) will manage and strengthening their capacity is a focus of the project (in particular outputs 2.1 and 3.2) for which the experiences (and trust) gained in target communities in UNDP´s Communities Program (part of the project´s co-financing) are an essential knowledge input.

6. Since these SHPs would be highly localized and resulting risks / hazards / impacts will be in clearly delineated areas, potential environmentally-related risks and impacts should be examined during project preparation. Also, many of the potential environmental problems arise from conflicting demands on land (e.g., pasture vs. erosion control, logging vs. landslide protection) or the necessity to use land, which by its nature is unstable or hazardous (settlements and infrastructure) in the fragile mountainous areas of Tajikistan. Thus, an environmental assessment would benefit from establishing a geographical context and depicting risks / impacts, their magnitudes, frequencies and interrelationships in appropriate location maps. This would enable the introduction of a spatial planning analysis to better manage land and water use with respect to SHPs vis-à-vis environmental concerns and especially natural hazards. We understand there is an ongoing project in Tajikistan which has such aspects, the approach and experiences of which could be reflected in the proposed environmental assessment.

UNDP response:
We totally agree and the issue will be addressed in outputs 3.1 (Preparation of SHP sites) and 3.4 (Local development and sustainable resource management), in close cooperation with UNDP´s Communities Programme.

7. Tajikistan is one of the 10 countries selected for the Pilot Program for Climate Resilience (PPCR), since Tajikistan will be impacted more than average by the effects of climatic fluctuations. What immediately comes to mind is the influence of changed precipitation, retention, snow-melt and run-off patterns in the mountainous regions, which feed rivers that subsequently will be used for not only the proposed SHP for energy production, but also irrigation of orchards and farm lands. Moreover, meteorological conditions are known to be directly linked to the frequency and magnitude of some types of natural disasters (floods, mudflows, landslides, avalanches). As such, the estimation and if possible modeling of climate change impact on HSPs in the proposed pilot locations would be an important exercise to consider during project preparation.

UNDP response:
Specifically because of Tajikistan's inclusion in the scope of the Pilot Programme for Climate Resilience (PPCR) which envisages climate change modeling work and assessment of climate change impact on hydro power potential (under ADB-implemented component), it was decided that there is no need to duplicate this activity, but rather use PPCR findings to inform the design and selection of locations for pilot projects.

ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT USING GEF RESOURCES

Assignments	$/ person week	Estimated person weeks	Tasks to be performed
Project management – local staff			
Project Manager (co-financed by UNDP)	700	84.0	Over-all Project Management (see TOR attached to UNDP-GEF Project Document for full description of tasks)
Officer, Admin & Finance	400	156.0	Officer for financial and administrative issue (see TOR attached to UNDP-GEF Project Document for full description of tasks)
TOTAL		**240.0**	

Local Consultants			
Institutional energy expert (Outcome 1)	500	32.0	Undertake discussions with the various Government Ministries/Agencies to streamline permission process Guide SHP applicants (private, NGOs, local authorities through a simplified set of rules to register, obtain licenses and advice on PPAs with Barki Tajik Assist in drafting Guidebook on SHP development Formulate a capacity development programme to train the Ministry's RE Unit staff on implementation of community-based SHP and linkages with other policies (e.g. rural development, resource management, poverty reduction) Participate in the implementation of the capacity development programme.
SHP design and standardization (Outcome 2)	500	40.0	Support international consultants in developing a set of guidelines and technical solutions suitable for the Tajikistan situation, including modular designs. Discuss this set of guidelines and technical standards with the Government and supply chain stakeholders Advice on supporting functional maintenance Support the drafting of the Guidebook on SSHP development Participate in the implementation of the capacity development programme for manufacturers Support development of engineering service capabilities and provide technical advice in upgrading of facilities
Local capacity building and training (Outcome 3)	600	90.0	Formulate capacity development programme to train local technicians to undertake civil and electro-mechanical repairs (O&M), to expand workshops (for manufacturing and repairs) and in-country engineering capacity as well as for managers and administrator staff to assess finance options and do feasibility analysis Assess training facilities already existing within the country and make recommendations for strengthening them to undertake repairs on civil and electro-mechanical equipment at power stations. Prepare inter-active training modules for technicians and for managerial-administrative staff Participate in the implementation of the capacity development programme. Facilitate SHP project identification and preparation Formulate terms of reference for undertaking full feasibility and design studies at the identified SHP sites. Participate in the implementation of the capacity development programme. Develop and testing of integrated model for community-based model for O&M&M of SSHP (managed by community-based organizations, CBOs),
Prepare and publish	500	10.0	Prepare report on project experience/best practices and lessons

materials on project experience/best practices and lessons learned (outcome 4).			learned. Disseminate project overall results, experiences and lessons learned at the national level. Organize a national level conference to present the lessons learned and project impacts to stakeholders.
TOTAL		**172**	

International Consultants			
GHG emissions estimation	2.000	10	Short-term consultant to develop methodology and estimate GHG emission baseline and project-related reductions
TOTAL		**10.0**	

ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

A. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN.

The PPG objective was fully achieved. The proposed activities were implemented successfully and they allowed for sufficient data collection and outreach to key stakeholders. As a result, the project design has been refined and enhanced to ensure that it both reflects the most complete possible current information on existing legal and regulatory framework, barriers and capacity gaps to enable on-grid and off-grid SHP generation, greenhouse gas emissions and that it best meets the needs of the project beneficiaries and reflects the input of all relevant experts and officials.

B. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:

The findings of the PPG stage led to minor adjustments in project strategy in order to fully address all the barriers that could affect smooth implementation of the project and to provide for a logical sequence of activities that would be required under each individual project component. Apart from that, no other concerns that could negatively affect implementation of the full-size projects were noted.

C. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW:

Project Preparation Activities Approved	Implementation Status	GEF Amount ($)				Co-financing ($)
		Amount Approved	Amount Spent To date	Amount Committed	Uncommitted Amount*	
Conduct assessment on the type and scope of SHP projects that should be undertaken and most suitable geographic locations	Completed	10,000	3,000	7,000	0	12,000
Identify players and stakeholders in the field of SHP, assess their capacity and propose modules for capacity building and technology transfer	Completed	5,000	1,081	3,919	0	10,000
Analyse current energy policy, legislation and regulation and market conditions for SHP development as well as ownership models of SHP	Completed	10,000	3,000	7,000	0	13,000
Finalising the Project Document and accompanying GEF CEO Endorsement Request	On-going	0	0	0	0	15,000
Total		25,000	7,081	17,919	0	50,000

* Any uncommitted amounts should be returned to the GEF Trust Fund. This is not a physical transfer of money, but achieved through reporting and netting out from disbursement request to Trustee. Please indicate expected date of refund transaction to Trustee.

ANNEX E: OVERVIEW OF GEF AND UNDP FUNDING AND OTHER CO-FINANCING PER PROJECT PER OUTPUTS AND ACTIVITIES

Please consult excel document "Barriers-Activities-Budget" on the breakdown of GEF and co-financing per output and activities

Notes on co-financing from UNDP:

UNDP's contribution to the proposed GEF-co-financed project will total 4,750,000 US$ comprising of UNDP's core resources (TRAC) and those of other donors channeled via UNDP-implemented projects as described below. This means that the activities of the UNDP projects being referred to, are included in this proposed project; i.e., outputs of the UNDP project are also considered as outputs of this proposed GEF project.

1. The UNDP project "Promotion of Renewable and Sustainable Energy Use for Development of Rural Communities in Tajikistan (2009-2013)" has been conceptualized as an initial phase of a larger multi-year programme, with an overall goal to initiate the scaling up of activities in support of the MDGs with a particular focus on improving access to energy in rural regions. Its conceptualization and implementation falls within the frame of the Poverty Reduction Strategy (PRS) and National Development Strategy (NDS) for Tajikistan. The project aims to achieve the following:

   a) To develop an integrated rural development model with provision of electricity from mini hydro (possible other renewable) as the driver, and then to integrate clean water, irrigation, food, employment, education and health issues;
   b) To strengthen governance capacity to implement poverty reduction polices;
   c) To test and demonstrate the model effectiveness through identification and implementation of a number of pilot projects within a selected community, and with full community participation;
   d) Upon verification of the model, to propose a scaled-up approach from a pilot community to a national program that will address issues of rural poverty reduction and national economic development.

   Within the project, UNDP together with Ministry of Economic Development (MEDT) has initiated preparation of an Intermediate strategy for renewable energy sources and energy efficiency in Tajikistan and establishment of the Renewable Energy and Energy Efficiency Fund, which is expected to be finished in 2011. The following Outputs and Activities of the proposed GEF project will be co-financed via this UNDP-funded project: Output 1.1, Output 1.2, Output 3.3 and Output 4.2.

2. Second, it is envisaged that the GEF-supported project will be closely coordinated with UNDP's Communities Programme (CP) in Tajikistan. The CP is a multi-year and multi-million US$ initiative, on-going since 1996. The programme has 5 area offices in Sughd, Khatlon, and the Rasht and Zeravshan Valleys. The major aim of the Communities Programme (CP) is to help local communities in different regions to formulate and address their needs and priorities through making decisions, building civic awareness, mobilizing local resources, establishing local capacities, and fostering sense of ownership. UNDP's CP supports a wide network of community based organizations, such as the 116 Jamoat Resource and Advocacy Centers (JRCs), 19 District Development Councils (DDCs), 59 Business Advisory Centers (BACs), 21 Dehkan Farm Associations (DFAs), and 6 Micro Loan Funds (MLFs). CP and the entire supporting infrastructure that goes with it will be utilized by UNDP to develop, test and then up-scale the proposed integrated rural development models based on provision of SHP-based energy.

3. Co-financing will be also provided through the Rural Growth Programme (RGP), implemented by UNDP's Communities Programme. Its aim is to enhance more inclusive economic development in rural areas of Tajikistan in support of NDS and PRS. The purpose of the RGP is to improve the local environment for economic growth, income generation and employment creation in Sughd region, northern Tajikistan. The Programme aims to foster an environment for rural economic development through the following components:

a) Improving capacities of local governance actors (government, private sector and civil society) for local development planning with an emphasis on rural economic growth, including the implementation and monitoring of local development plans in line with NDS and PRS;
b) Facilitating access for producers/farmers and MSMEs to appropriate, professional, and sustainable business and technical advisory/extension services, including inter alia, on sustainable energy access options;
c) Supporting organized member focused business associations and their apex institutions in developing adequate and responsive services and advocacy support for its members;
d) Strengthening selected district vocational training institutions to meet regional and international market demands for better qualified labor and safe migration;
e) Facilitating access for producers/farmers, poor, women, and MSMEs to a variety of financial products and services available from Micro Finance Institutions.

Estimated costs of Communities Programme co-financing, including from RGP, for implementation of pilot SHP projects under Component 3 is 2,335,000 US$ to be delivered over the three year period in 2011-2013. Specifically, the following Outputs and Activities of the proposed GEF project will be co-financed: Output 3.1, Output 3.2, Output 3.3.

4. Another UNDP project which will serve as a source of co-financing is the "Tajikistan Afghanistan Poverty Reduction Initiative" (TAPRI), also implemented under the umbrella of the Communities Programme, with support from the Government of Japan. The main objective of this project is to alleviate poverty through improvement of cross-border cooperation and promotion of sustainable economic and social development and improved livelihoods in specifically targeted Tajik and Afghan borderlands communities. Part of the project will be targeted at the installation of SHP-based power plants as a tool for poverty alleviation and development of business and social infrastructure in the selected border areas. Estimated costs of TAPRI financing for pilot SHPs are 1,100,000 US$ in Year 1 and 2.

5. Finally, UNDP will allocate additional 500,000 US$ from its core resources to co-finance Project Management costs of the proposed project.

ANNEX F: ACRONYMS

ADB	Asian Development Bank
CAIR	Community Action Investment Project
CDP	Community Development Programme
CP	Country Programme
CP	Communities Programme (UNDP project)
CPAP	Country Programme Action Plan
CO_2	carbon dioxide
EE	energy efficiency
FSP	Full-Size Project
GBAO	Gorniy Badakshan Autonomous Oblast
GHG	Greenhouse gas emissions
GDP	Gross Domestic Product
GoRT	Government of the Republic of Tajikistan
HPP	hydropower plant
JCPS	Joint Country Partnership Strategy
kW	kilowatt
IPP	Independent Power Producer
MDG	Millennium Development Goals
MHP	mini (and micro) hydropower
MSDSP	Mountain Society Development and Support Programme
MoIE	Ministry of Industry and Energy
MoU	Memorandum of Understanding
MW	megawatt
O&M	operation and maintenance
O&M&M	operation, maintenance and management
PMU	Project Management Unit
PPA	Power Purchase Agreement
RE	renewable energy
RES	renewable energy sources
SDC	Swiss Agency for Development and Cooperation
SME	small and medium enterprises
SIDA	Swedish International Development Agency
SHP	small hydropower
tCO_2	tonne of carbon dioxide
$ktCO_2$	kiloton of carbon dioxide
UNFCCC	United Nations Framework Convention on Climate Change
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USD	United States dollar

Annex G: List of by-laws as envisaged by the Law on the Use of Renewable Energy Sources

№	List of regulatory acts	Type of act
1	Wind energy. Terms and definitions.	National standards of RT (category of alternative energy):
2	Small hydro power. Terms and definitions	National standards of RT (category of alternative energy):
3	Solar energy. Terms and definitions	National standards of RT (category of alternative energy):
4	Solar energy. Solar collector. General technical conditions. Testing methods	National standards of RT (category of alternative energy):
5	Solar photovoltaic modules. Types and basic parameters	National standards of RT (category of alternative energy):
6	Informing of consumers about energy efficiency of municipal and domestic productions. General requirements. General provisions	National standards of RT (category of alternative energy):
7	Energy efficiency. Structure of components. General provisions	National standards of RT (category of energy conservation):
8	The rules of conducting inspection certification of electrical equipment and electric power	Statutory act
9	Instructions on connection order (connection) of facilities for using of renewable sources of energy to general power network.	Board resolution of the Ministry of energy and industry of RT
10	Instruction on communication with the system operator and energy RES producer	Board resolution of the Ministry of energy and industry of RT
11	Power and capacity purchase agreement	«Model contract», by Order of Antimonopoly agency of RT under the Government of RT
12	Regulations on tariff calculation for electricity produced by RES	By Act of Antimonopoly agency of RT under the Government of RT
13	Regulations on the rules of safety engineering and operation of renewable sources of energy on a territory of RT	Board resolution of the Ministry of energy and industry of RT
14	Regulation on the order of definition of economic effect and amount of incentives for using of renewable recourses of energy and releasing them to environment	Board resolution of the Ministry of energy and industry of RT
15	Regulation on Cadastres of renewable recourses of energy on a territory of RT	Board resolution of the Ministry of energy and industry of RT
16	Regulation on Catalogues of renewable recourses of energy on a territory of RT (p.9)	Board resolution of the Ministry of energy and industry of RT
17	Draft «Decrees of Government of RT «About introduction of amendments and additions to the Regulation of the Ministry of Energy and Industry of RT»	Draft Resolution of Government of RT
18	An order of obtaining a permit for facilities and installation of RES (hydro power facilities, solar equipment).	Board resolution of the Ministry of energy and industry of RT
19	A draft Decree of the Government of RT «On introduction of amendments and additions to the Law of RT "About power system"	Draft Resolution of Government of RT
20	A draft decree of the Government of RT «On introduction of amendments and additions to Water Code of RT»	Draft Resolution of Government of RT
21	Studying of existing legal acts on the matter of establishment of Foundation for support of development of RES and preparation of appropriate proposals	Proposals on the matter of establishment of Foundation for support of development of RES

Annex H: GHG Emission Reduction Calculation

Direct emission reduction

UNDP will support the Government of Tajikistan in development and of about 27 SHP plants. The Government has identified the following sites, which are given in Table 3 below, together with the expected installed capacity and energy savings*. About 10 SHP plants will be in operation by the end of the project and another 17 will be in advance stage of preparation, supported by the project in the component 3.

TABLE 3: SHP DEMONSTRATION SITES

SHP	Installed capacity (in kW)	Annual energy production (in MWh)	Location	Load utilization (%)	Investment costs, US$
SOGD OBLAST					
1 "Zerobod"	70	307	Aini district	50%	70,000
2 "Shavatki Bolo"	50	307	Aini district	70%	50,000
3 "Arnokhun"	200	1,226	Gorno-Matcha district	70%	200,000
4 "Ghuzn"	80	491	Gorno-Matcha district	70%	80,000
5 "Basmanda"	70	153	Ganchi district	25%	70,000
6 "Sharora-2"	30	66	Asht district	25%	30,000
7 "Shahriston-1"	210	460	Shahristan district	25%	210,000
8 "Negnot"	80	175	Pendjikent town	25%	80,000
KHATLON OBLAST					
9 "Obi Rushan"	15	92	Khovaling district	70%	15,000
10 "Surhob"	60	368	Parkhar district	70%	60,000
11 "Michurin"	30	184	Vose district	70%	30,000
12 "Armughon"	165	1,012	Dangara district	70%	165,000
13 "Peshtova-1"	55	337	Baldjuvon district	70%	55,000
14 "Tole"	65	399	Muminabad district	70%	65,000
15 "Lulikutal"	80	491	Kulyab town	70%	80,000
16 "Yakkatut"	280	1,717	A. Djomi district	70%	280,000
DISTRICTS (RAYONS)					
17 "Khakimi-2"	60	184	Nurabad district	35%	60,000
18 "Kabutiyon"	30	184	Nurabad district	70%	30,000
19 "Ulfatobod"	30	92	Nurabad district	35%	30,000
20 "Djafr"	100	613	Rasht district	70%	100,000
21 "Djilondi"	70	215	Djirgital district	35%	70,000
22 "Almosi"	100	613	Gissar district	70%	100,000
23 "Aini"	80	491	Varzob district	70%	80,000
24 "Fucherch"	80	491	Varzob district	70%	80,000
25 "Sorvo"	150	920	Vahdat town	70%	150,000
26 "Lodjurgh"	80	491	Tavildara district	70%	80,000
27 "Djavoni"	170	1,042	Rogun town	70%	170,000
Total	2,490	13,118			2,490,000
Average	92	486		59%	

*) As approved by Government regulation No. 73 of 2 February 2009.

The GEF Manual on CO_2 emission reduction suggest than that the **direct emission reduction** can be calculated as follows:

*CO_2 direct = E * L * C; where*

- *C – CO_2 emission factor:*
- *L – average useful lifetime of equipment, which for SHP is taken as 20 years*
- *E – annual energy of fossil or wood fuels replaced by SHP*

However, estimating the expected emission reduction is less straightforward as the formula may suggest:

- SHPs work on-grid during summer time. In this case, the grid could have provided the power to the communities connected, but there is no shortage. In fact, the SHP may sell its power to the grid. In this case, one hydropower source replaces another (most power generated in the grid is based on large-scale hydro), so we have assumed that net emission reduction is zero in this case;
- SHPs work off-grid during the winter time, when grid supply is absent or unreliable and the SHP has to provide the community. In this case the SHP provides for lighting and appliances in households, some productive uses and social services (e.g., schools and clinics) as well as replacing part of wood fuels for cooking.

The average operation mode of an SHP (on-grid or off-grid) would be as follows:

	Load utilization	Operation (hours p.a.)	Days of operation
off-peak	35%	1226	146
on-peak	75%	3942	219
average	59%		

In the off-grid mode, one can assume that SHPs replace unsustainably harvested wood fuels, which is used for cooking and heating. On the other hand, one can argue that if power would not be provided by a new SHP, then to reach a required level of sustainable demand, this would either have to be provided by a diesel-fuelled mini-grid or by boosting the production capacity of the national grid by adding fossil fuel based generation capacity (diesel or fuel oil). In the calculation we have assumed that replacement of diesel would take place in 50% of the energy production cases (with emission factor of diesel-based generation of about 0.8 $kgCO_2$ per kWh[14]) and replacement of wood[15] in the remaining 50% (with emission absorption of growing trees of 1.57 tCO_2 per m^3).

The direct project and post-project emission reduction (due to the installation of 27 SHPs (with an average capacity of 92 kW) can then be calculated as follows:

Annual off-grid energy production: 3,053,736 kWh (during 146 days)		Emission reduction
	Factor used	(tCO2/yr)
50% diesel	0.8 kgCO2/kWh	2,443
50% wood	1.57 tCO2/m3	6,516
	TOTAL	8,958

Assuming a lifetime of the SHP plants of 20 years, the cumulative emission reduction is *244,325 tCO_2*.

Indirect emission reduction – bottom-up

Using the GEF bottom-up methodology[16], indirect emission reductions attributable to the project are estimated at 732,974 *tCO_2* equivalents over the average lifetime of the SHP of 20 years. The GEF bottom-up approach implies a further replication of the investments in SHP to other communities in Tajikistan and is calculated per following formula:

CO_2 indirect BU = CO_2 direct * RF, where
CO_2 direct = estimate for total direct emission reductions
RF = replication factor

[14] 0.8 tCO_2 per MWh (tonne of CO_2 per thousand kWh)

[15] The assumption is that 0.5 m^3 of wood per person per year (or 2.1 kg per person per day) can be saved (from deforestation) by using electric cooking stoves. It is assumed also that wood would still be used for space heating.

[16] The reader is referred to the *Manual for Calculating GHG Benefits of GEF projects: Energy Efficiency and Renewable Energy Projects,* GEF/C.33/Inf.18, April 2008

For RF the value of '3'has been chosen, which seems reasonable given the importance of the GEF project in setting up a national technology delivery and support structure, something other projects have failed to support.

Indirect emission reduction – top down

An upper limit of indirect emission reduction can be estimated by looking at the technical and economic market potential for small hydropower. The Government has established a Long-term Program for Small Hydro-power stations construction for the period 2009- 2020 with a tentative list of possible SHP sites.

If all SHP would have been implemented by 2024, the annual energy production due to the total installed capacity in mini and small-sized SHP would be 102 MW that would generate 595,034 MWh annually. Assuming the same methodology for emission reduction calculation as in the case of the ´direct emission reduction´, annual CO_2 emission avoided would be 554,126 tCO_2 annually and 5.5 million tCO_2 over the 10-year post-project influence period.

CO_2 indirect TD = CO_2 direct * CF, where

CO_2 indirect = estimate for total indirect emission reductions

CF = causality factor

Of course, this potential cannot be fully attributed to the GEF intervention. Uptake of SHP technologies will take place due to ongoing (and future) national efforts and other donor-funded initiatives. We propose to apply conservatively a 'causality factor' of 40%.

Thus, an upper limit to indirect emission reduction impacts can be calculated as *2.2 million tCO_2*

	SHP	Installed capacity (in kW)	Annual energy production (in MWh)	Location
	Medium-sized SHP, Short-term construction program			
1	"Marzich"	4,305	26,398	Aini
2	"Shash-boloi"	185	1,134	Nurabad
3	"Sangikar"	1,006	6,169	Rasht
4	"Fathobod"	283	1,735	Tajikabad
5	"Pitovkul"	1,106	6,782	Jirgital
6	"Horma"	334	2,048	Baljuvan
7	"Toch"	305	1,870	Shahrinav
8	"Shirkent-3"	576	3,532	Tursun-zade
9	"Kuhiston"	500	3,066	Матча
10	"Cheptura"	500	3,066	Shahrinav
11	"Tutak"	650	3,986	Rasht
12	"Pushti bog"	200	1,226	Baljuvan
13	"Dijik"	260	797	Aini
14	"Khovaling"	100	613	Khovaling
15	"Bohtar"	1,280	7,849	Bohtar
16	"Kulyab"	220	482	Kulyab
17	"Surhteppa-1"	330	2,024	Jalolidin Rumi
18	"Darg"	250	986	Aini
19	"Arnohun"	200	1,226	Kuhistoni Mastchoh
20	"Sabzazor"	250	1,533	Ismoili Somoni
22	"Pastrud"	1,500	9,198	Aini
23	"Nushori bolo"	710	4,354	Tajikabad
24	"Gulomon"	650	3,986	Tajikabad
25	"Yazgulom-1"	1,900	11,651	Vanch
26	"Yazgulom-2"	1,900	11,651	Vanch
27	"Ok-su-1"	1,200	7,358	Murgab
28	"Ok-su-2"	1,300	7,972	Murgab
29	"Lakon"	2,500	15,330	Isfara
30	"Takob"	750	4,599	Varzob
31	"Mehnatobod"	100	613	Vose
32	"10-solagii istiklol	545	3,342	Vahdat
33	"Sitorai surh-1"	150	920	Vahdat
34	"Sitorai surh-2"	100	613	Vahdat
35	"Hitoi"	3,000	18,396	Jabbor Rasulov
36	"Argumon"	165	1,012	Dangara
37	"Peshtova-2"	320	1,962	Baljuvan
38	"Surhak-1"	150	920	Muminabad
39	"Shohon"	235	1,441	Shurobod
40	"Dashtijum"	280	1,717	Shurobod
41	"Shabboda"	200	1,226	Farhor
42	"Kamolobod"	190	1,165	Vose
43	"Pahtakor"	330	2,024	Jilikul
44	"Yakkatut"	280	1,717	Abdurahman Jami
45	"Sebzor"	10,000	61,320	Roshkala
46	"Chuyangaron-1"	1,000	6,132	Vahdat
	Medium-term construction programme			
	Medium-sized SHPs			
1	"Nurobahsh"	5,000	30,660	Dangara
2	"Saripul"	200	1,226	Rasht
3	"Muchiharf"	500	3,066	Nurabad
4	"Hakimi-1"	500	1,533	Nurabad
5	"Chilikul"	1,360	8,340	Вахш
6	"Nurofar"	100	613	Vahdat
7	"Andigon"	200	1,226	Vahdat
8	"Gurumbok"	300	1,840	Tavildara
9	"Keles"	1,000	6,132	Jirgital
10	"Karagushhona"	1,000	6,132	Rasht

11	"Nazate-Ailok"	2,400	14,717	Rasht
12	"Hoit"	125	767	Rasht
13	"Begi-Siyoh"	350	1,073	Rasht
14	"Katasoi"	3,000	6,570	Istravshan
15	"Sharora"	350	767	Asht
16	"Chonbaht"	320	1,962	Khovaling
17	"Piyon"	300	1,840	Aini
18	"Nozdrobod"	150	920	Vahdat
19	"Almosi"	100	613	Gissar
20	"Chuyangaron"	1,360	8,340	Vahdat
21	"Shirgovad"	500	3,066	Vanch
22	"Vanch"	1,000	6,132	Vanch
23	"Shahriston-1"	210	460	Shahristan
24	"Yasman"	100	307	Rasht
25	"Duoba"	200	613	Rasht
26	"Potibed"	250	1,533	Aini
27	"Fatmovud"	200	701	Aini
28	"Anzob"	2,000	12,264	Aini
29	"Nur-2"	100	613	Gissar
30	"Hichborak"	100	307	Rasht
31	"Miyonadu"	100	613	Tavildara
32	"Sarhad"	100	613	Farhor
33	"Shirkent-2"	520	3,189	Tursun-zade
34	"Temurmalik"	100	613	Temurmalik
35	"Vorukh"	500	3,066	Isfara
36	"Dashtak"	150	920	Kuhistoni Mastchoh
37	"Gukat"	200	876	Kuhistoni Mastchoh
38	"Chilgazi"	1,080	2,365	Isfara
39	"Lohuti"	280	1,717	Jilikul
40	"Gulbulok"	100	613	Dangara
41	"Surhak-2"	150	920	Muminabad
42	"Dahana 1-5"	1,600	9,811	Kulyab
43	"Tokappa"	125	767	Kulyab
44	"Toskala"	165	1,012	Vose
45	"Shobika 1-2"	320	1,962	Vose
46	"Sitorai Surh"	760	4,660	Jalolidin Rumi
47	"Surhteppa-2"	1,250	7,665	Jalolidin Rumi
48	"Shurobod-1"	375	2,300	Abdurahman Jami
49	"Shurobod-2"	120	736	Abdurahman Jami
	Mini SHP			
50	"Arbobi-2"	60	368	Vahdat
51	"Lichak"	80	491	Vahdat
52	"Shavatki-bolo"	50	307	Aini
53	"humdon"	70	215	Nurabad
54	"Hakimi-2"	60	184	Nurabad
55	"Yahak Yust"	40	123	Nurabad
56	"Layron"	50	307	Tavildara
57	"Lochurg"	80	491	Tavildara
58	"Bomgura"	75	460	Vahdat
59	"Chilondi"	70	215	Jirgital
60	"Chashmasor"	70	429	Faizabad
61	"Shariston-2"	40	88	Shahristan
62	"Tutkul"	65	399	Jalolidin Rumi
63	"Pingon"	50	307	Rasht
64	"Duoba"	70	153	Aini
65	"Guzn"	80	491	Kuhistoni Mastchoh

66	"Hujaho-2"	70	153	Ganch
67	"Chui nav"	60	131	Ganch
68	"Asht"	50	110	Asht
69	"Mulokoni"	60	368	Baljuvan
70	"Sulton-Uvays"	80	491	Khovaling
	Long-term construction program			
	Medium-sized SHP			
1	"Yazgulom 3"	1,900	11,651	Vanch
2	"Yazgulom 4"	1,900	11,651	Vanch
3	"Yazgulom 5"	1,900	11,651	Vanch
4	"Sorvo"	150	920	Vahdat
5	"Paldorak-1"	250	1,533	Kuhistoni Mastchoh
6	"Rukshif-1"	200	1,226	Kuhistoni Mastchoh
7	"Samchon"	500	3,066	Kuhistoni Mastchoh
8	"Padask"	880	5,396	Kuhistoni Mastchoh
9	"Iskich"	500	3,066	Gissar
10	"Faizobod"	465	2,851	Abdurahman Jami
11	"Javoni"	170	1,042	Rogun
12	"Guli surh"	100	613	Rogun
13	"Lugur"	350	2,146	Rogun
14	"Shingilich"	130	399	Rasht
15	"Runob"	250	767	Rasht
16	"Hidiriyon"	250	1,533	Rasht
17	"Chafr"	100	613	Rasht
18	"Kalanak"	120	736	Rasht
19	"Sipoling"	120	368	Rasht
20	"Voidara"	100	307	Nurobod
21	"Sangvor"	100	613	Tavildara
22	"Charsem"	10,000	61,320	Shugnan
23	"Namasgut"	1,500	9,198	Ishkashim
24	"Roshorv"	600	3,679	Rushan
25	"Yamchun"	140	858	Ishkashim
26	"Bichharv"	140	858	Vanch
27	"Kishtaki nav"	196	429	Penjikent
28	"Padrud"	1,134	6,954	Penjikent
29	"Kurgovad"	1,500	9,198	Darvaz
30	"Leninobod"	145	889	Jilikul
31	"Dukak"	300	1,840	Nurabad
32	"Lairun"	150	460	Nurabad
	Mini SHPS			
33	"Shodmoni"	60	368	Nurabad
34	"Langar"	30	184	Nurabad
35	"Saidon"	30	184	Nurabad
36	"Kabutiyon"	30	184	Nurabad
37	"Ulfatobod"	30	184	Nurabad
38	"Hasandara"	60	368	Nurabad
39	"Sari pulak"	30	184	Nurabad
40	"Chavchi"	60	368	Nurabad
41	"Girdob"	40	245	Nurabad
42	"Langar"	60	368	Tavildara
43	"Roga"	30	184	Tavildara
44	"Margzor"	40	245	Rogun
45	"Neknot"	80	491	Penjikent
46	"Puli Girdob"	45	276	Penjikent
47	"Huchaho-2"	60	263	Ganch
48	"Obch-1"	40	88	Ganch
49	"Basmanda-2"	80	175	Ganch
50	"Guliston"	50	175	Muminabad
51	"Shahrinav"	30	105	Muminabad
52	"Kaskun"	50	153	Nurabad
53	"Valgon"	40	245	Kuhistoni Mastchoh
	TOTAL	**102,110**	**595,034**	