GLOBAL ENVIRONMENT FACILITY
PROPOSAL FOR PROJECT DEVELOPMENT FUNDS (PDF)
BLOCK B GRANT

Country:	Islamic Republic of Iran
Focal Area:	Climate Change
Project:	Renewable Energy Project
Financing Plan (Provisional):	GEF: US$ 9 million Bilateral: US$ 23 million GOI: US$ 5 million
Requesting Agency:	Joint World Bank/UNDP
PDF Block B Fund Requested:	US$ 350,000
Co-funding:	GOI: US$ 160,000 Trust Funds: US$ 130,000
Block A Grant Awarded:	Yes - To finance a renewable energy reconnaissance mission. The PDF Block A Grant resulted in identification of the barriers to renewable energy development in Iran as well as identification of technology applications with a high potential for economically and commercially viable development.
Convention Ratified:	July 16, 1996

Sector Background

1. Iran possesses renewable energy resources which have been characterized as "world class" by international and local renewable energy experts[1]. Annual average wind speeds in the Manjil region (located approximately 100 km northwest of Tehran) have been recorded at 11 - 12 m/s at 40 meters for the past 3 years. This compares to annual average wind speeds of 8 - 9 m/s at Huitingxile, Inner Mongolia, China; 7 - 9 m/s in Tehachapi, California; 7 - 8 m/s in the UK; and less than 7 m/s at wind farm sites in Tamil Nadu. In addition, Iran possesses considerable hydroelectric resources. The

[1] Consultant work supported by the GEF under a $25,000 PDF - Block A Grant.

hydropower potential of the Karun and Karkheh rivers alone amounts to approximately 20,000 MW.

2. Potential uses of Iran's vast renewable energy resources include electricity-generating technologies for grid-connected and off-grid applications. Although Iran's power sector has access to vast petroleum and natural gas reserves, the Government of Iran's (GOI's) Second Five-Year Economic, Social, and Cultural Development Plan includes energy policies aimed at: (a) diversifying and increasing the use of natural gas and renewable energy resources so as to maintain Iran's share of sales in the world petroleum markets; (b) preserving the country's natural gas reserves, as well as studying and planning for the export of natural gas with a view to diversifying the country's sources of foreign exchange revenues; and (c) adjusting energy prices to reflect parameters such as social justice and environmental impact. Increased development of grid-connected renewable energy technology applications would contribute to each of these policy objectives.

3. In addition to the grid-connected renewable energy market, the GOI's Ministry of Jahad Sazandegi (MJS) estimates that there are approximately 370,000 households in nomadic settings and small villages (i.e., villages with less than 20 households) without access to electricity. Provision of electricity services is not expected in the foreseeable future. However, there is significant potential for replacing kerosene/battery use in rural areas with isolated grids based on small- and mini-hydro power plants. MJS has a great deal of experience with the technology, including development of multiple schemes and further identification of over 250 potential sites. In addition, MJS has the significant presence in rural areas required to deliver and support such investments. In this context, it should be noted that the barriers to mini-hydro are, to an extent, similar to those to broader rural energy markets, including off-grid solar photovoltaic (PV) markets. However, MJS has considerably more experience as well as an active program with village hydro schemes, and has given priority to developing mini-hydro systems rather than PV projects.

4. Preliminary analysis indicates that renewable energy technology applications in Iran are near economic (EIRR = 8% for grid connected wind farms). These findings are consistent with and supported by more detailed economic analysis of grid-connected wind farms and off-grid small hydro systems in similar settings. Despite the excellent wind and hydro resources, supportive policies, and potential markets, several barriers are inhibiting the development of renewable energy projects in Iran.

- There is a lack of clear institutional responsibilities for the development of renewable energy projects, including a well-defined role for the domestic and international private sector. For example, there is considerable overlap of responsibilities for research and development of wind farm projects and small-hydro schemes among the Ministry of Energy, Center for Renewable Energy Research and Application, and the Ministry of Jahad. The responsibilities of

above) will subsequently be carried out during GEF Project implementation (see paras. 8 - 10).

6. Two technology applications have been selected as the initial focus of the GEF Project: (a) grid-connected wind farms, and (b) off-grid small hydro systems. The selection of these technology applications is based on a preliminary assessment conducted by the World Bank in October 1997 with GEF support from a PDF - Block A Grant. The technology applications were selected for analysis with the assistance of the GOI and represent the most appropriate choices for GEF support, as described in Operational Program 6. The technologies also represent applications which have been commercialized in other countries. The economic and commercial viability of the two technology applications will be continually assessed during preparation of the Project. The Project will include only those applications for which development is determined or foreseen to be technically, economically, and financially viable.

7. *Removal of Institutional and Policy Barriers.* Technical assistance will be provided during implementation of the GEF Project to assist in the removal of institutional and policy barriers listed in paragraph 4. It will help the GOI to review existing institutional responsibilities and project development frameworks for power sector projects, including power plant development and rural electrification efforts. Community stakeholder input would be sought and factored into such decisions. Options for extending these responsibilities and development frameworks to renewable energy projects will be evaluated with the GOI. In particular, the desire to include a significant role for the private sector will be emphasized. The most attractive institutional arrangements and project development frameworks will be utilized for specific investment projects to be developed under the Project (and in parallel to the execution of the barrier removal measures; see paragraph 8 below). The local experience gained by developing such investment projects within a commercial framework will remove the barriers to renewable energy development associated with the lack of experience in developing such projects. Lastly, for the grid-connected wind farm technology application, documentation supporting project development (e.g., BOT contracts, power purchase agreements, bidding documents, etc.) under the GOI's selected institutional arrangements will be developed and will result in the removal of the related barriers.

8. *Commercial Development of Investment Projects.* An important element of removing barriers to sustainable renewable energy development in Iran is the application and implementation of conducive institutional arrangements, financing plans, and technical approaches to actual investment projects. Such investment projects will clarify and confirm institutional responsibilities and development frameworks, build capabilities and experience, and set precedents for project financing. This aspect of the GEF Project will help to overcome barriers associated with an insufficient capacity to develop renewable energy investment projects in an efficient, commercial, and market-oriented manner. Specific investment projects for each of the selected technology applications will be identified and prepared during project preparation. For the grid-connected wind farm technology application, technical assistance will be provided to help the GOI

the private sector in the development of Iran's renewable energy resources is not transparent.

- Several of the stakeholders likely to be responsible for renewable energy project development have experience in developing conventional power projects in rural areas. However, these institutions lack experience with development of commercial renewable energy projects. For example, the only existing utility-scale renewable energy project in Iran has been developed by a research institute (the Center for Renewable Energy Research and Application) and did not involve the Ministry of Energy (MOE). As a result, the project has achieved minimal commercial success. MOE's involvement in such project is necessary to ensure commercial development and sustainability.
- Transparent project development frameworks, including pricing mechanisms and supporting legal documentation (e.g., power purchase agreements, etc.), are missing. Presently, the means by which non-utility equity and financing is made available to renewable energy projects is not defined. The definition and implementation of project development frameworks, such as BOT and BOOT arrangements, will remove this barrier.
- The institutional barriers exacerbate the shortage of financial resources, including private sector resources, needed to develop capital-intensive renewable energy projects.
- There is limited access to international renewable energy technology advances and technical know-how. Feasibility studies are not performed to international standards. State-of-the art instrumentation and control systems required for efficient operation and management of renewable energy facilities have yet to be introduced.
- Although adequately measured in selected locations, wind and hydro resources have yet to be identified on a national scale, thereby jeopardizing the sustainability of initial renewable energy development efforts. In order to ensure sustainability, it is necessary to identify potential project sites through thorough resource characterization.

Summary Project Objectives and Description

5. The objective of the GEF Project is to accelerate the sustainable development of selected renewable energy technology applications through investment and the provision of technical assistance. The proposed GEF Project will remove the institutional, policy, financial, and technical barriers to broad-scale renewable energy development. The requested PDF Grant will be used to carry out the requisite preparatory work required for the design of the proposed GEF Project, including in-country preparation of the Project and the provision of information required for submitting the proposed GEF Project to the GEF Council. In particular, selected investment projects and barrier removal measures will be prepared and potential investors and lenders will be mobilized. The development of these projects (which will help to remove each of the barriers listed in paragraph 4

identify project sites, carry out detailed resource characterizations, and conduct feasibility studies. For the off-grid option, technical assistance will be provided for conducting market studies, as well as identifying and strengthening delivery mechanisms. GEF funds will be used to finance the incremental costs of the investments of the investments, in parallel to the other barrier removal measures discussed in paragraph 7 above. GEF resources will also be used to broker financing and investment for acceptable investment projects from domestic, regional, and international sources. Investment funds will be sought for developing each of the prepared projects within the GOI's clarified institutional arrangements. Potential sources of financing include bilateral financing institutions (e.g., New Zealand for village hydro; Danida and KfW for wind), the Abu Dhabi Fund for Arab Economic Development, and domestic and foreign private sector investors (including equipment manufacturers) and lenders. The technical assistance activities (see paragraph 7 above), the development of the said investment projects, and the mobilization of such financial resources will help to remove the related barriers.

9. The project will include investment projects for each of the selected technology applications. For grid-connected wind farms, the investment will focus on the installation of approximately 25 MW of wind turbines in the Manjil region. It is likely that the investment project would be developed by a Government-owned joint venture which would sell electricity from the wind farm to the regional utility under a power purchase agreement to be developed during project preparation. The approach used will be a step toward broader private sector participation in development of Iran's wind resources.

10. The project will also include investment for small- and/or mini-hydro schemes to serve the energy needs of villages not expected to be connected to the national grid in the near to medium term. Such projects have been determined to be economic in similar settings (e.g., Indonesia, China, Sri Lanka) and have previously been supported by the GEF. Over 250 potential project sites have been identified by MJS. The project is expected to invest in up to approximately 5 MW of village-based hydro facilities, and build upon the substantial experience and rural presence of the MJS. The sustainability of these efforts needs to be strengthened by improving MJS's ability to identify villages that have the ability and willingness to pay for such services as well as the ability to incorporate cost-recovery mechanisms. These areas will be the focus of this investment component of the proposed Project.

11. *Other Barrier Removal Activities.* In addition to the above activities, the Project will provide funds for carrying out national wind and small-hydro resource assessments. Such information is required to ensure a portfolio of follow-on investment projects (i.e., to ensure sustainability). The Project will also include provision of training to improve the capabilities of the stakeholders to identify, plan, and carry out investment projects (e.g., training in operation and maintenance of grid-connected technologies, after-sales service of off-grid investments, etc.). These activities, including a monitoring and evaluation plan/framework as well as associated indicators, will be defined in detail during project preparation.

12. *Sustainability of the Proposed Project.* The Project focuses on removing the barriers to development of two renewable energy technology applications which have achieved commercial success in developing and industrialized countries: grid-connected wind farms (e.g., commercial in India, Europe, and the United States) and village-hydro systems (e.g., commercial in China). The Project aims to help the GOI prepare project development frameworks which support non-utility and private investment that, in turn, would encourage sustained development of investment projects. Specific investment projects would be prepared and carried out using the selected institutional frameworks, resulting in an increased local capacity to further develop such projects. In order to ensure sustainability (i.e., and ensure that the proposed investments are not "one-off" projects), the specific investment projects will only be developed as barriers are removed. (e.g., as sustainable institutional arrangements are established, as power purchase agreements are developed, etc.). The combined effects of economies of scale, predicted decreases in the unit costs of equipment, and the GOI's continuing efforts to reduce subsidies for conventional energy resources (see paragraph 2) will ensure near-term cost competitiveness. Lastly, training to local institutions and renewable energy resource assessments will be executed to provide the basis for continued development of renewable energy projects.

Description of PDF Activities by Component for (a) GEF-funded, and (b) co-funded:

13. Activities Common to All Components - This preparation activity aims to address the lack of clear institutional responsibilities and project development frameworks that precludes the development of each of the initially-selected technology applications.

- Defining Institutional Responsibilities and Project Development Frameworks: Due, in part, to the lack of renewable energy projects in Iran, there are no clear responsibilities for developing Iran's renewable energy resources. This activity will prepare the sectoral plan which defines the roles of the Center for Renewable Energy Research and Application (CRERA), the Ministry of Energy, the Ministry of Jahad Sazandegi, other government agencies and the non-government sector for development of grid-connected wind power projects as well as off-grid renewable energy projects. These plans will have a direct impact on the proposed GEF Project design. This activity will be funded outside the PDF, through the administrative budget of the GOI and GEF, and will be carried out by GOI and World Bank staff who hold experience with the Iranian power sector.
  - ⇒ Baseline: Delineating the *existing* project development frameworks for renewable energy as well as conventional power projects in Iran. Assessing the GOI's current plans for encouraging private-sector participation in the sector.
  - ⇒ Incremental Activities: Development of project development frameworks for the investment projects to be developed under the proposed GEF Project, including introduction of *new* development frameworks. Frameworks involving a larger role for the private sector in renewables

(e.g., build-own-transfer, build-own-operate-transfer schemes) will be encouraged and explored.

14. *Wind Power Development Component.* GEF-supported activities aim to provide information necessary for the preparation of the proposed GEF Project submission. PDF activities include:

- Contractual Arrangements - This preparation activity will help prepare the proposed GEF Project submission by developing the contractual arrangements for the sale of power from the proposed wind farm to the local electric utility. It is necessary to develop such documents during project preparation to ensure that the project is implemented efficiently and in a timely manner.
  - ⇒ Baseline: None. There are presently no contractual arrangements between buyers and sellers of electricity from wind power projects.
  - ⇒ Incremental activities: At a minimum, a power purchase agreement (PPA) will be developed. Other legal documents may include land conveyance agreements, construction contracts, and operation and maintenance agreements. The documents will be developed for the specific wind power project. Such contracts will clearly document the risks and responsibilities of the buyer and seller of electricity from the wind farm and will permit financing to be mobilized.

- Investment Project Feasibility Study - CRERA has performed pre-feasibility analysis for a 100 MW wind farm at the Manjil site and, to date, has developed 10 MW of the 100 MW site[2]. Despite these efforts, the GOI has not developed technical feasibility studies to the standard required to properly assess the risks and returns of the project as necessary to attract financial support from the GEF, the utility sector, other government institutions, and/or private-sector investment/ financing.
  - ⇒ Baseline: CRERA's pre-feasibility analysis for a 100 MW wind farm at Manjil. Additional technical information collected by CRERA.
  - ⇒ Incremental Activities: International consultants will be hired to review the existing studies for the Manjil site and to provide training to improve the studies to a level which properly assesses the project's risks and returns.

15. *Off-Grid Component.* GEF-supported activities aim to provide information necessary for the preparation of the proposed GEF Project submission. PDF activities include:

---

[2] The 10 MW Manjil wind farm project represents a technical demonstration facility. Due to delays in construction and commissioning, and the lack of payment for electricity currently being provided to the grid, the project can not be considered a commercial project or commercial demonstration. The proposed GEF-supported investment project is necessary to incorporate these commercial considerations into a wind farm project in Iran and to ensure sustainability.

- Identify and Prepare Potential Off-Grid Projects (including delivery mechanisms) - A PDF Block A Grant from the GEF allowed the GOI and Bank staff to realize the gross potential of off-grid renewable energy technology applications in Iran. In particular, it was realized that there is a large potential for replacing kerosene/battery use in rural areas with hydropower-based mini-grids. Additional information is required to identify the most promising target population and delivery mechanisms.
  - ⇒ Baseline: The Ministry of Jahad's existing information on the potential for off-grid village-hydro schemes including hydro-power resource data.
  - ⇒ Incremental Activities: Information regarding demographics, income levels, energy use patterns, energy expenditures, grid connection plans, institutions presently involved in the delivery of energy services to rural households, etc., will be collected and reviewed. Based on this review, the most promising off-grid projects (including target recipients and delivery mechanisms) will be identified for further development.

- Market Survey - In addition to the lack of understanding regarding the circumstances under which small hydropower projects are most economic, there is a further lack of information regarding willingness to pay for energy services, preferred payment pattern, households with *inadequate* grid-based electricity, credit history, etc. This preparation activity will include a participatory approach to incorporate local stakeholder input into the design of this component.
  - ⇒ Baseline: Existing socio-economic data on rural villages.
  - ⇒ Incremental Activities: This activity execute a market survey of a representative segment of the target recipients, with results extrapolated to the larger unelectrified population.

National Level Support (including key stakeholders, and level and nature of consultations)

16. The GOI has included several policy objectives under the Second Five-Year Plan that support development of Iran's renewable energy resources (see para. 2). During the October 1997 Bank mission to Iran, the GOI formed a Renewable Energy Steering Committee to improve coordination among the various Government stakeholders in the Project. Participating agencies include the Ministry of Foreign Affairs, CRERA, MOE, the Ministry of Economic Affairs and Finance, the Planning and Budget Organization (PBO), and the Ministry of Jahad Sazandegi. This proposal for Block B PDF funds as well as overall project matters were reviewed in detail with the Steering Committee during a March 1998 mission to Iran.

Eligibility

17. *Country Eligibility.* The GOI ratified the Framework Conventional on Climate Change on July 16, 1996. The letter from the GOI requesting the proposed Block B Grant was received by the World Bank on March 16, 1998.

18. *Consistency with National Policy.* The proposed Project and preparation activities are consistent with the policies set forth in the GOI's Second Five-Year Economic, Social, and Cultural Development Plan, as detailed in para. 2.

19. *Relevant GEF Operational Program.* The proposed Project is consistent with GEF Operational Program (OP) No. 6 - Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs. In particular, the Project will overcome barriers related to institutional responsibilities and project development frameworks (including associated transaction costs), a lack of financial resources for project development, and the need to improve technical information and skills.

Justification for PDF Grant

20. Given the low starting point for commercial renewable energy development in Iran, considerable project preparation work is envisioned. The project design and preparation activities outlined here are critical to the viability of the Project and broader renewable energy development. To assure the success and timely implementation of the project, it is proposed that some initial steps be taken to start addressing some of the institutional barriers. However, consistent with paragraph 33(b) of the Policy Note on "Project Development and Preparation Facility", PDF funds will only be used to fund project preparation activities. Any barrier removal activities will be funded through non-PDF sources (see budget).

Items to be Financed

21. The Project preparation activities will cost an estimated US$640,000. GEF funding is requested for approximately 55 percent of the total preparation budget (additional preparation funds will be secured from the GOI and bilateral sources). These funds will be used to finance the following activities:

- Preparation of the Wind Power Development Component, including: (a) international and local consultants required to prepare the power purchase agreement and other legal documentation, and (b) international consultants required to assist the GOI in improving its feasibility studies to an international level.
  Preparation of the Off-Grid Component, including: (a) international and local consultants required to identify potential small hydro projects, and (b) international and local consultants required to carry out the market survey.

Cost Tables

Expenses by Project Component (US$ '000)				
Activity	**GEF**	**GOI[3]**	**Others[4]**	**Total**
Activities Common to All Components (see paragraph 13)				
Defining Institutional Responsibilities and Project Development Frameworks	To be funded by the administrative budgets of the GOI and GEF. To be carried out by GOI and Bank staff with experience in the Iranian power sector.			
Preparation of the Wind Power Development Component (see paragraph 14)				
Contractual Arrangements				170
. prep. of power purch. agreement	*30*	*30*		
. prep. of legal documents for project	*70*	*10*	*30*	
Investment Project Feasibility Studies	100			170
. prefeasibility analysis	*60*	*40*		
. review of exist. studies	*40*			
. training	*0*		*30*	
Subtotal	*200*	*80*	*60*	*340*
Preparation of the Off-Grid Component (see paragraph 15)				
Identify and Prepare Potential Off-Grid Projects	75	40	35	150
.data collection and analysis	*20*	*10*		
. review of delivery service institutions	*20*	*10*		
. id promising sites (inc. target recipients and delivery mechanisms)	*35*	*20*	*35*	
Market Survey	75	40	35	150
Subtotal	*150*	*80*	*70*	*300*
Total	350	160	130	640

Budget by Expense Type (US$ '000)				
Expense Category	**GEF**	**GOI[3]**	**Others[4]**	**Total**
International Consultants	280	60	100	440
Domestic Experts	70	80	30	180
Materials, Workshops, and Publications		20		20
Total	350	160	130	640

[3] Dollar equivalent (in Rial).

[4] Includes consultant trust funds to be identified. Possible sources include consultant trust funds from New Zealand (for village hydro), as well as Denmark, Germany, and Spain (for grid-connected wind farms).

Outputs

22. Specific outputs from the PDF will include:

- A decision regarding which technology applications will be included in the Project and whether to split the currently envisaged Project into two Projects.
- Final preparation of the Project, including the wind farm development and off-grid components.
- Work programs and cost estimates for each Project component.
- Estimates of the Project's global environmental benefits and incremental costs.
- Removal of certain barriers related to institutional responsibilities (funded from non-PDF sources).
- Preparation of project development frameworks, contractual arrangements and feasibility analysis for the investment component.
- A Project Brief to be submitted to the GEF Council.

Expected Date of Preparation Completion

23. The preparation activities are expected to be completed within 12 - 18 months of approval of the PDF Block B Grant. It is presently envisaged that preparation missions in July and September 1998 would lead to submission of the GEF Project and Project Concept Documents to the GEF Council in the fall of 1998 for acceptance into the GEF Work Program. The Project would be appraised in spring/summer 1999, and financing for acceptable investment projects would be secured by early calendar year 1999. A final Project Document would be submitted to the GEF Council in the fall 1999.

Special Features

24. The Project will accelerate development of selected renewable energy technology applications by providing technical assistance for, inter alia, preparing investment projects. GEF and World Bank resources will be used to broker the required investment and financing from domestic, regional, and international sources, including public and private sector institutions.

25. Due to the lack of experience with developing commercial renewable energy projects in Iran, the GOI has requested that the World Bank execute the PDF activities in coordination with UNDP. However, the GOI's capabilities to identify, plan, and implement such projects will be strengthened through the PDF activities.

MINISTRY OF FOREIGN AFFAIRES
OF THE ISLAMIC REPUBLIC OF IRAN

IN THE NAME OF GOD

Mr. Inder Sud
Country Director, Middle East Dept.
World Bank
1818 H Street NW
Washington DC 20433
United States of America

Date: 16 MARCH 98

GLOBAL ENVIRONMENT FACILITY

REQUEST FOR PDF B GRANT FOR THE UNDP's

RENEWABLE ENERGY PROGRAMME

As you are aware, the Iranian Government plans to implement the Renewable Energy Projects whose objective is to assist in developing energy renewable sources in the Islamic Republic of Iran. We believe that this project is of global importance and very vital to us.

I am therefore now writing to request for PDF block B grant funding, amounting to about US$ 320,000 to enable us carry out preparatory activities related to the implementation of the above mentioned renewable project. In this context we request that the World Bank execute this PDF B concerning preparation activities as well as mobilizing additional consultant trust funds.

Pirooz Hossieni
Director General for
International Economic and Specialized affairs

Pirooz Hossieni

Mr. R. Mendonca, MNSID
Sr. Power Engineer
Mrs. K. Ellott, ENVGC
Regional Coordinator
World Bank

CC. Mr. Sholenberg
Resident Representative of UNDP