REQUEST FOR CEO ENDORSEMENT/APPROVAL

PROJECT TYPE: Full-sized Project
THE GEF TRUST FUND

Re-Submission Date: October 26th, 2011

PART I: PROJECT INFORMATION

GEFSEC PROJECT ID: 4132
GEF AGENCY PROJECT ID: ME-X1011
COUNTRY(IES): Mexico
PROJECT TITLE: Promotion and Development of Local Wind Technologies in Mexico
GEF AGENCY(IES): IDB
OTHER EXECUTING PARTNER(S): Electrical Research Institute (IIE)
GEF FOCAL AREA(S): Climate Change
GEF-4 STRATEGIC PROGRAM(S): CC-SP3
NAME OF PARENT PROGRAM/UMBRELLA PROJECT: Strategic Program on Technology Transfer

Expected Calendar (mm/dd/yy)	
Milestones	**Dates**
Work Program (for FSPs only)	Sep 2009
Agency Approval date	Dec 2011
Implementation Start	Mar 2012
Mid-term Evaluation (if planned)	Mar 2013
Project Closing Date	Mar 2015

A. PROJECT FRAMEWORK

Project Objective: The general objective of the project is to include Mexico as a key player in the world's wind energy market, expanding its wind generation capacity by enabling local development and implementation of wind turbines technologies particularly for distributed generation. The specific objectives are to: i) consolidate the human capacities and skills required for the design of state of the art wind turbines for distributed generation; ii) structure a value chain for the production of goods and services at the national level in the wind energy sector and consolidate the capabilities for manufacturing and assembling wind turbines for distributed generation; iii) consolidate the technical capabilities for the operation, testing and certification of wind turbines for distributed generation with a high component of national technology; and iv) support the development of a 1.2 MW Class 1A wind turbine for distributed generation and provide capacity building to promote wind power application through distributed generation by Small Power Producers (SPPs).

Project Components	**Indicate whether Investment, TA, or STA**	**Expected Outcomes**	**Expected Outputs**	**Indicative GEF Financing**		**Indicative Co-Financing**		Total ($)
				($) a (000)	**%**	**($) b** (000)	**%**	c =a + b
1. Design and Specification of Wind Turbine Components	TA	1. A certified wind turbine prototype for Distributed generation (DG) that satisfies wind resource and market conditions in Mexico and neighboring regions with similar strong winds.	- Complete detailed design of all the components (mechanical, electrical and civil works) and the subsystems of the wind turbine prototype - Blueprints for manufacturing and assembly of wind turbine components and technical specifications of all subcomponents to be integrated are	0	0%	3,850	100%	3,850

			completed.					
		2. Local capacity for wind turbine design developed and strengthened,	- Prototype designs validated by recognized peer reviewers					
			- Operational manuals for the installation, operation, maintenance and safety certifications for 1.2 MW class 1A wind turbine, is developed					
			- Local capacities for wind turbine installation, operation and maintenance in the public and private sector through "on the job" training mechanism, are developed.					
2. Procurement, Manufacturing and Assembly of the Wind Turbine Components	Inv	1. Increased national capacity and competitiveness for technological development and manufacturing of 1.2 MW wind turbines.	Procurement of the commercial components required for the integration of all the subsystems of the wind turbine, is completed.	2,600	30%	6,000	70%	8,600
			- Verification of the blueprint parameters in comparison to the assembled prototype is completed.					
		2. One wind turbine prototype with a high component of national technology and manufacturing assembled.						
			- Engineering and manufacturing of all the components (electrical, electronic, mechanical and civil works), are completed					

			- Different subsystems assembled and tested - Detailed documentation/ guidance of the manufacturing process of all the components, are prepared					
3. Erection, Start Up and Operational Testing of the Wind Turbine	Inv	1. Locally developed and tested 1.2 MW Class IA wind turbine prototype for wind energy generation with replicability potential in Mexico and LAC. 2. Strengthening of installation and testing capacity in the Regional Wind Technology Centre (CERTE).	· Installation of the prototype and the required monitoring instrumentation, is completed - Operational testing of the prototype in Class I winds, is completed; - Review of the installation, operation, maintenance and safety manuals developed for the wind turbine, are completed	1,425	29%	3,500	71%	4,925
4. Capacity Building and institutional strengthening to promote a wind power market through distributed generation by SPPs.	TA	1. Wind Power market for SPPs is strengthened through financial mechanism designed to promote Distributed Generation (DG) wind power applications, operational guidelines and training courses	-Financial mechanism to promote DG for wind applications, is designed	725	3%	20,000	97%	20,725

		2. 100 (one hundred) potential SPPs developers have been educated and informed on DG for wind power applications and wind power projects implementation.	- Guidelines and operational manuals for wind power application for SPPs, are completed					
			-4 Training courses in the CERTE to improve installation, operation and maintenance skills for DG wind power applications are implemented.					
			- 2 Workshops organized to present findings of the project, are implemented.					
5. Project management				250	50%	250	50%	500
Total project costs				**5,000**	**13%**	**33,600**	**87%**	**38,600**

[1] List the $ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component.
[2] TA = Technical Assistance; STA = Scientific & Technical Analysis.

B. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT

Sources of Co-financing	Type of Co-financing		Project
Government Contribution SENER-CONACYT[1]	Cash (70%)	in-Kind (30%)	9,600,000
NAFIN-IDB(CCLIP)[2]	Loan		20,000,000
Private Sector (Ruhrpumpen)[3]	In-Kind (100%)		4,000,000
Total Co-financing			33,600,000

* Percentage of each co-financier's contribution at CEO endorsement to total co-financing.

C. FINANCING PLAN SUMMARY FOR THE PROJECT ($)

	Previous Project Preparation Amount (a)[4]	Project (b)	Total c = a + b	Agency Fee
GEF		5,000,000	5,000,000	500,000
Co-financing		33,600,000	33,600,000	
Total		38,600,000	38,600,000	500,000

D. GEF RESOURCES REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES)[1]

GEF Agency	Focal Area	Country Name/ Global	(in $)		
			Project (a)	Agency Fee (b)[2]	Total c=a+b
IDB	GEF Transfer of Technology Funds	Global	3,000,000		3,000,000
IDB	GEF RAF Funds for Climate Change	Mexico	2,000,000	500,000	2,500,000
Total GEF Resources			5,000,000	500,000	5,500,000

[1] No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

[2] Relates to the project and any previous project preparation funding that have been provided and for which no Agency fee has been requested from Trustee.

E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	***Estimated person weeks***	***GEF amount($)***	***Co-financing ($)***	***Project total ($)***
Local consultants* (fees, no travel included)	576	345,600	0	345,600
International consultants* (fees, no travel included)	36	90,000	0	90,000
Total	612	435,600	0	435,600

* Details to be provided in Annex C.

[1] The SENER-CONACYT contribution was approved on November 19th, 2009 with reference DATNI/D300/656/09.

[2] Due to the innovative nature of the project and its alignment with two of the main pillars of the National Development Plan of the Federal Government, i.e. Competitiveness and Environmental Sustainability and the project's potential contribution to the expansion of wind power development in Mexico, Nacional Financiera (NAFIN), a local financial entity, would agree to help finance the replication of the prototype in its commercial phase; once it has been certified by an accredited certification test organization. It is worth mentioning that NAFIN could use the resources under the Conditional Credit Line for Investment Projects (CCLIP) granted by the IDB for these types of projects.

[3] Ruhrpumpen in-kind contribution is reflected in the manufacturing, assembling and installation of the1.2MW prototype.

[4] Include project preparation funds that were previously approved but exclude PPGs that are waiting for approval.

F. PROJECT MANAGEMENT BUDGET/COST

Cost Items	*Total Estimated person weeks/months*	*GEF amount ($)*	*Co-financing ($)*	*Project total ($)*
Project Management and coordination				
Local consultants	384	228,000	127,200	355,200
Travels				
a) Local consultants		22,000	12,800	34,800
Office facilities, equipment, vehicles and communications				
Others**		0	110,000	24,800
Total		**250,000**	**250,000**	**500,000**

* Details to be provided in Annex C. ** For others, it has to clearly specify what type of expenses here in a footnote.

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? yes ☐ no **X**

(If non-grant instruments are used, provide in Annex E an indicative calendar of expected reflows to your agency and to the GEF Trust Fund).

H. DESCRIBE THE BUDGETED M &E PLAN:

The Monitoring and Evaluation (M&E) of the outputs and outcomes presented in the Project Results Framework (Annex A), as well as, the monitoring of the day-to-day activities of the project will be supported through the development of an integrated M&E plan. This M&E plan will be presented and finalized at the Project´s Inception Meeting after reaching a consensus on the fine-tuning of indicators, sources of verification and the final definition of the project team M&E responsibilities.

The M&E plan will be coordinated by the Electrical Research Institute (IIE, acronym in Spanish). The IIE will monitor the progress in achieving outputs and outcomes based on the Results Framework. Within the first 6 months of execution of the project, the IIE will ensure the consolidation of the baseline information for all indicators in the Results Framework.

The IIE, in collaboration with the IDB will prepare an annual Project Implementation Review (PIR) and quarterly reports in accordance with GEF requirements to be submitted to the GEF Secretariat including progress in achieving global environmental benefits, and the sustainability and replicability of project results. The cost for monitoring within this project is considered part of the project management activities.

A mid-term evaluation (MTE), contracted by the IDB, will be carried out when 50% of the GEF resources have been disbursed or 24 months after the project contract goes into effect, whichever comes first. This review will determine if the project strategy is performing according to the established objectives, or if adjustments are necessary. The findings and conclusions of the evaluation will be presented and consulted with key stakeholders and beneficiaries in a mid-term evaluation workshop.

In case adjustments are needed in the project implementation strategy, an Action Plan (AP) will be agreed between the IDB and the IIE, establishing responsibilities and dates for completion of corrective actions. The implementation of the AP will be monitored by the IDB. In addition, a final evaluation contracted and paid by the IDB will determine, among others, the extent to which the project objectives have been reached in terms of the Project contribution towards the development of a wind technology industry in Mexico, as well as sustainability of project outputs and outcomes and contribution to global environmental benefits.

The results of the evaluations, lessons learned, and good practices will be widely disseminated and shared at the dissemination workshops funded through component 4.

PART II: PROJECT JUSTIFICATION:

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

Mexico is an oil-exporting country rich in fossil fuel resources; however, due to political reasons and scarcity of investment resources, it may not be able to exploit these natural resources at a sufficient rate to ensure future national energy demands. Natural gas production, in particular, has been insufficient to satisfy domestic demand and the power sector has been particularly affected by this situation. The expected rise of natural gas imports combined with the volatility of fossil fuel prices in the international markets, has prompted growing interest from the Energy Secretariat (SENER, acronym in Spanish) and the Federal Electricity Commission (CFE, acronym in Spanish) to develop domestic sources of Renewable Energy (RE) to complement fossil fuels in power production and supply to the grid low-CO_2 emitting energy forms.

The National Inventory of Greenhouse Gas (GHG) Emissions (INEGEI, acronym in Spanish) indicates the following breakdown by sector of GEI emissions in Mexico in 2006: energy/electricity accounting for 21% of total emissions, transportation 20%, manufacturing and construction 8%, fugitive emissions 7%, and industrial processes 9%; land use change and forestry 10%; agriculture 6%; among the main GHG contributions by sector. Therefore any effort to reduce GHG emissions from the energy/electricity, mainly by RE and energy efficiency is a government's priority.

The National Climate Change Strategy (ENACC acronym in Spanish) of Mexico identifies two main areas of mitigation opportunities: (i) energy generation and efficient usage of energy, and (ii) land-use and land-cover change. According to the ENACC, the opportunities for reduction in annual GHG emissions from energy generation and usage from 2007 to 2014 are: (i) energy efficiency (27.9 $MtCO_2e$); (ii) efficiency in generation and distribution of electric power by the CFE (27.7 $MtCO_2e$), such as transmission and distribution of electricity, thermal efficiency of thermoelectric plants that use fuel oil, conversion to natural gas, and the repowering of thermoelectric plants on the Pacific coast, together with modernization of the National Refinery System; (iii) industrial sector (>25 $MtCO_2e$), such as tapping the cogeneration potential of the cement, iron and steel, sugar, and other industries; (v) transportation (3.5 $MtCO_2e$), such as elimination of the old vehicle fleet and promotion of train transportation; and (vi) electricity generation from RE (9 $MtCO_2e$), particularly by tapping Mexico's large wind power potential.

As shown in table 1 below, the electricity sector in Mexico relies heavily on thermal sources[5]. At present, RE has a share of 24.16% of supply in the electric power sector in Mexico. However, most of this contribution comes from traditional sources or established technologies.

Table 1: Publicly owned generation capacity in operation in Mexico up to 2008

Plant Type	Installed Capacity (MW)
Conventional Thermoelectric	12,895
Combined Cycle	15,590
Turbogas	2,509
Coal	2,600
Dual (fuel oil/or coal)	2,100
Internal Combustion	182
Permits	6,972
Sub-total Non-Renewable	**42,848**
Nuclear	1,365
Geothermal	960
Hydro	10,566
Wind (only public projects)	87
Permits	673
Sub-total Alternative	**13,651**
TOTAL	**56,499**

[5] These figures show the public installed capacity in Mexico.

Nevertheless, progress has been achieved in the introduction of the so-called new renewable or non-conventional sources, in spite of the relatively large resource base available. Estimates[6] have indicated that Mexico's most viable wind resources would be sufficient for the installation of 3,000 – 5,000 MW of wind power. These figures are based on rough regional estimates[7], as detailed evaluations of wind resources have yet to be carried out. Other sources[8] indicate that there are many areas in the country with moderate wind resources that could eventually be efficiently tapped using improved wind turbine technologies. Based on the experiences of other countries, it is reasonable to expect that extensive exploration and improved wind speed measurements throughout the country will result in higher estimates of Mexico's wind energy potential. A study carried out by the Electrical Research Institute (IIE, acronym in Spanish) estimated that an installed wind energy capacity of 5,000 MW would generate 30,000 direct and 30,000 indirect jobs (both permanent and temporary), bring in around US$5 billion in private capital investment for plant construction, and avoid the emissions of around 9 Mt of GHG emissions, in the next 10 years.

Mexico's strongest wind energy resource is found in a 3,000 km^2 region known as "La Ventosa" located on the Isthmus of Tehuantepec in the State of Oaxaca. Average annual wind speeds in this region range from 7 to 10 m/s, measured at 30 meters above the ground. It is estimated that up to 2,000 MW of wind power could be commercially tapped in La Ventosa given the favorable characteristics of the region, for example, its topography, existing infrastructure, and the local government interest, in addition to its excellent wind resource. Initial data from CFE's 1.5 MW pilot plant indicate that the average capacity factor for future wind power plants over the whole region could exceed 30%, a rate that exceeds the average capacity factors of the majority of identified wind resource areas around the world. In fact, CFE's 1.6 MW pilot plant, located in one of the best windy sites in the region (La Venta), has operated at a 5.5-year average capacity factor of 38%, which compares favorably to wind power plants located in best windy inland sites in the world.

Wind Projects in Mexico. The first few grid-connected wind generators installed in Mexico date back from the mid 1990's. They include a small wind farm of 1.5 MW, integrated by 7 Vestas wind machines, 225 kW in capacity each, installed in the La Ventosa region, plus one Gamesa 600 kW wind machine installed in the Baja California Peninsula. Both facilities belong to CFE and served for a number of years as pilot/demo installations. The first commercial facility, 83 MW in capacity, was commissioned in 2007 and around 400 MW were commissioned in 2009. According to National Association for Wind Power (AMDEE, acronym in Spanish) by the end of 2010 the total installed wind capacity will be 518 MW and 3,000 MW additional projects will be installed between 2011 and 2014. Most projects in this period will be implemented in La Ventosa region under the legally established modalities of Independent Power Production (IPP) with Power Purchase Agreements (PPA) for the sale of power to CFE only, and Electricity for Self Supply. However, it is expected that with the incentive mechanisms hopeful to derive from the Law to Tap Renewable Energy Resources[9], recently approved by the Congress, the total wind capacity installed in Mexico will continue to grow.

According to Mexico's Special Renewable Energy Program, issued by the Energy Secretariat (SENER, acronym in Spanish) in early 2009, total installed wind farms capacity by the year 2012 will be 2,500 MW. By the end of 2010, 516.5 MW have already been built, as listed in table 2; 400 MW more are under construction by different companies, and 500 MW more have recently been assigned by CFE to different contractors under the modality of Independent Power Producers (La Venta III and Oaxaca I – IV, all close to 100 MW each project). About 1,000 MW more have been permitted to date by the Energy Regulatory Commission (CRE, acronym in Spanish). Project developers are urging CRE to launch a new "Open Season" for approval of close to 2,500 MW in additional permits, which, if conceded, could bring to 5,000 MW the total permitted capacity to be installed in Mexico in the mid-term.

It is recognized by the GoM that probably there will be difficulties in reaching the 2012 goal. Nevertheless, the rate at which wind farm projects are currently being developed in Mexico is a clear signal that the legal and regulatory framework for wind energy has been changing in the last five years in the right direction. A study commissioned in

[6] National Commission for Efficient Use of Energy (CONUEE, acronym in Spanish), the New Energy Sources Unit of the Federal Electricity Commission, and the Unit of Non Conventional Energy Sources of the Electrical Research Institute.
[7] The National Renewable Energy Laboratory (NREL) from USA, has provided a rough estimate of Mexico's wind potential of 10000 MW. More specific estimates by IIE suggest 5000MW of proven wind power potential, plus 10,000MW additional estimated in identified windy sites outside La Ventosa.
[8] National Association for Wind Power (AMDEE, acronym in Spanish).
[9] Law to promote usage of RE, approved in November 2008.

2005 within the previous GEF-UNDP[10] project "Action Plan to Remove Barriers to the Large Scale Implementation of Wind Energy in Mexico" carried out a thorough analysis of the constitutional, legal, regulatory and institutional barriers in Mexico, which limited the increase of wind power capacity in the national energy portfolio. As a result of the study a set of proposals to remove such barriers were identified and later, served to support the development of new regulations, standards and laws that have favored the penetration of wind energy in the national mix by the public and private sector (see Table 2). The improved legal and regulatory framework includes among others changes: a) recognition of generated capacity by wind farms under self-supply of electricity; b) law for the use of RE sources; c) environmental national standard for the installation, operation, commissioning and dismantling of wind farms in Mexico[11]; d) implementation of the small power producer modality for the generation of electricity through RE; e) open season for the development of additional transmission capacity and its interconnection to the national grid; f) updated guideline for the development of RE projects in Mexico with emphasis on wind power[12]. The implementation of the mentioned legislations considers: i) increased participation of RE in the national energy mix in the next 10 years; ii) development of adequate methodologies to evaluate the impact of RE in the generation of electricity; iii) public trust fund to facilitate the implementation of the green fund, the rural electrification fund, and the R&D fund. The updated legislation considers an increased participation of the rural sector in the development of RE projects for electricity generation.

[10] Analysis of the legal, regulatory and institutional framework of the electricity sector affecting the development of wind power in Mexico. Prepared by the Mexican Environmental Academy of Law (AMDA acronym in Spanish); 2005.
[11] A preliminary proposal of the NOM-051 is under revision/discussion by the respective authorities.
[12] The updated guideline was developed by the National Commission for Energy Saving with the support of GEF-UNDP Wind Action Plan.

Table 2. Growing wind power installed and in development capacity in Mexico

Project Name	Location	Commissioning Year	Total Wind Farm Capacity (MW)	Individual Turbine Capacity (MW)	Turbine Brand
La Venta I y II (CFE-Iberdrola)	Oaxaca	2007	83	0.85	Gamesa
Parques Ecológicos (Iberdrola)	Oaxaca	2009	80	0.85	Gamesa
Eurus (CEMEX-ACCIONA)	Oaxaca	2009	250	1.5	Acciona
BII NEE STIPA (CISA-GAMESA	Oaxaca	2009	26	0.85	Gamesa
Electricidad del Valle de México (Electricite de France)	Oaxaca	2009	67.5	2.5	Clipper
La Rumorosa I (Government of Baja California)	Baja California	2009	10	2.0	Gamesa
Projects Under Construction					
Fuerza Eolica del Istmo	Oaxaca	2010-2011	50		
La Venta III	Oaxaca	2010-2011	101		
Oaxaca II, III y IV	Oaxaca	2010- 2011	304.2		
Oaxaca I	Oaxaca	2010-2011	101		
Los Vergeles	Tamaulipas	2010-2011	161		
Projects Under Development					
Vientos del Istmo	Oaxaca	2012-2015	395.9		
Fuerza Eolica del Istmo	Oaxaca	2012-2015	30		
Bii Hioxio	Oaxaca	2012-2015	227.5		
Bii Stinu	Oaxaca	2012-2015	164		
Santo Domingo	Oaxaca	2012-2015	160		
Bii Nee Stipa	Oaxaca	2012-2015	288		
Desarrollo Eolicos Mexicanos	Oaxaca	2012-2015	227.5		
Union Fenosa	Baja California	2012-2015	400		
Sempra	Baja California	2012-2015	1200		
Fuerza Eolica	Baja California	2012-2015	400		
Total Wind projects (2007- 2015)			**4726.6**		

As shown in table 2, the 4,726.6 MW of wind farm projects are at different stages of development in Mexico. Developers of new projects in Mexico and other Latin American countries have expressed their concern about the potential lack of supply of wind turbines in the international markets once the current surplus (created by the stalling of a number of projects around the world, triggered by the recent financial crisis) comes to an end. This could be exacerbated by fast growing wind programs in countries such as the US, Brazil and others.

Distributed generation with wind power applications for Small Power Producers (SPP). This project focuses on designing, testing and manufacturing a 1.2 MW Class IA wind turbine for distributed generation (DG). DG is another approach of power generation, in which developers can actually purchase one or two wind turbines and sell power to the grid, instead of investing in a large wind farm. The focus of the proposed project concerns the DG market, not the large-scale wind generation capacity. The DG approach reduces the amount of energy losses in transmission because the electricity is generated very near where it is used, perhaps even in the same site. This also reduces the size and number of power lines and other supporting infrastructure (substations and so forth) that must be constructed to wheel the electricity over long distances. Typical distributed power sources in a Feed-in Tariff (FIT) scheme have low maintenance, low pollution and high efficiencies, although DG can have high upfront costs. The IIE has been working in the last decade on the promotion of distributed generation (DG). However, in Mexico, policy and regulation for DG, especially for the case of wind power generation, is not fully in place or operative. In addition, there are no financial mechanisms in place or qualified human resources to install, operate and maintain these systems. On the other hand, the recently Law approved by Congress to promote the usage of renewable energy emphasizes the need of sharing larger benefits from the deployment of wind turbines among land owners and other stakeholders, as opposed to those minor benefits derived from the leasing fees paid by project developers in the current model of large wind farms. This constitutes an important thrust for the implementation of smaller projects (few turbines) in the DG modality.

Wind Technology Development: The GEF, through the UNDP and the Government of Mexico (GoM) are co-financing a project entitled "Action Plan for Removing Barriers to the Full-Scale Implementation of Wind Power in

Mexico", to promote and remove major barriers for the inclusion of full scale wind energy in Mexico's energy matrix. Under the conduction of the IIE, this wind power action plan began in January 2004 and is addressing a number of technical issues, including an effort to reduce identified barriers to wind energy and the creation of the Regional Wind Technology Centre (CERTE, acronym in Spanish), which aims to offer the following provisions: (i) support to interested wind turbine manufacturers for the characterization of their products under the local conditions at La Ventosa; (ii) a means to train local technicians for operation and maintenance of a diversified range of wind turbines; (iii) an easily accessible national technology display that facilitates the encounter between wind turbine manufacturers and Mexican industries, thus promoting the identification of possible shared business ventures; (iv) a modern and flexible installation to obtain hard operational data on the interaction of specific types of wind turbines with the electrical system; and (v) a means to understand international standards and certifications (issued abroad) in order to identify additional requirements to fit local conditions.

Up until now, all wind projects commercially carried out in Mexico have been done with imported technology. In this framework, wind turbine reliability is becoming a major concern among wind project developers due to the fact that a growing number of wind farms around the world are experiencing higher than expected down times and higher repair, maintenance and components replacement costs, due to frequent turbine failures.

This is certainly the case of some of the wind farms installed in the region of La Ventosa, Mexico, where premature turbine failures and operational problems are being faced with turbine life times less than 10% of their expected operational time of use. In the case of the La Venta II wind farm, the first large scale wind project in Mexico, the 2009 annual plant capacity factor in its second year of operation hardly reached 35% under typical wind speed conditions at the site. This is a relevant fact since the pre-investment analysis for this project assumed a capacity factor of over 40%, (which could be reached given the good availability of wind at the site) for the project to be economically viable. Technical experts from IIE are at present analyzing the modes and frequency of the La Venta II turbine failures in order to find technical solutions that could improve the operational performance of the project. Incorporation of some of the proprietary innovations being developed by IIE is under consideration to solve some of the problems. The possibility of future repowering of the La Venta II wind farm with larger capacity and more reliable turbines by IIE, could be a possible alternative in the future.

In parallel to the problems of premature ageing observed in the turbines, this import model poses serious questions about the long-term sustainability of the wind farms in terms of the availability of local repair technicians and spare parts; it also points to the not-too-distant opportunity for re-powering wind farms currently built with smaller wind turbines or replacing exiting losses due to premature fatigue during extreme wind operation.

Taken into consideration the lessons learned, this project (the design and construction of 1.2 MW Class 1A wind turbine for distributed generation), is focusing primarily in building and certifying a wind turbine capable of withstanding the strong winds of Mexico, with the objective to satisfy the market of the wind turbines for distributed generation. This means, that end users would be able to purchase small quantities of wind turbines (even just one turbine) and sell power to the grid during a long period of time (typically more than 20 years) without experimenting fractures or material fatigue in the components of the wind turbine.

Wind conditions and the added value of a locally manufactured wind turbine. Prior to 2007 no attempts had been made to locally develop large size wind turbines. Three factors prompted the authorities of IIE to launch an initiative in this direction: (i) the imbalance between demand and supply in the world turbine market considering that today it is virtually impossible to purchase a small quantity of wind turbines (one or two units for DG); (ii) the limited availability of Class IA turbines in the international market for strong wind regions such as La Ventosa; (iii) the conviction that most capacities required for turbine manufacturing are found in Mexico, albeit with varying degrees of competitiveness and (iv) aging and fatigue problems of existing turbines. A number of wind turbines of the 83 MW power plant installed in 2007 are already showing signs of premature fatigue due to the strong wind regime and heavy duty factor at the site. A set of technical problems experienced with wind turbines installed less than two years ago in La Ventosa, apparently due to technology not appropriate for the site, reinforced the necessity of developing state of the art wind turbines suitable to the wind conditions of the Isthmus of Tehuantepec. Additional considerations include the fact that strong winds are also a characteristic of neighboring countries, namely Central American and Caribbean countries, where small local loads and difficult logistics conditions call for distributed generation projects rather than large wind farms. These

markets can hardly be served by the large wind corporations currently harvesting the low hanging fruits in the growing off-shore market and other rapidly growing land-based markets such as in the US.

Reason to choose a design for the 1.2 MW Class IA Wind Turbine. A consortium composed by IIE[13], the Mexican Center for Advanced Technology in Querétaro (CIATEQ[14], acronym in Spanish) and the private company RuhrPumpen S.A.[15] (RP) is leading an effort to develop the first 1.2 MW Class IA wind turbine for DG, locally tested and manufactured (Mexican Wind Power Turbine Project – *Máquina Eólica Mexicana* or MEM project), that suits to the wind resource conditions of the Isthmus of Tehuantepec, Mexico, as well as those of other windy areas in Latin American and Caribbean countries.

Efforts in this direction started in 2007 with the integration of a team of senior specialists in the various disciplines involved in the design of wind turbines, who were intensively trained by foreign experts in the arts and crafts of wind turbine design. Based on the results of an analysis of the then current situation of the world wind turbine market, it was decided to launch the development of a 1.2 MW capacity Class IA wind turbine[16] for the following reasons: (i) wind turbines of larger capacities require industrial infrastructure, such as smelting, forging and numerical control machining, not currently available in Mexico; (ii) the objective markets for the wind machine under development (regions of Mexico, Central America, The Caribbean and other Latin American Countries) show limitations on logistical infrastructure (transportation, cranes etc.) as well as on other infrastructure, such as narrow and winding roads, low bridges, etc., that could make it difficult to install larger wind turbines; and (iii) at the project onset, the world supply market of wind turbines showed a gap in products in the range between 800 MW and 1.5 MW, probably originated by the fact that most manufacturing companies migrated to larger turbines, lured by the growing off-shore markets. This gap is still present, although other players start reacting to it. After 2 years work, basic engineering design is in its final stages of completion and the detail design for manufacturing purposes will start taking place in early 2012. According to the project work program, assembly of the first prototype will be finished in mid 2012 and ready to be shipped for testing and fine tuning at the CERTE in La Ventosa.

The MEM project is the result of an initiative launched by IIE in compliance with its mission of promoting and supporting technological innovation within the Mexican electrical sector. The MEM project aims to: (i) complete the design phase and certification of the 1.2 MW Class I A wind turbine for DG; (ii) manufacture, in collaboration with CIATEQ and RP, all components that can be produced with the available infrastructure in Mexico, complemented by imported parts and components, for the integration of the industrial prototype of the wind turbine; (iii) install the prototype at the CERTE facilities in Oaxaca for testing, evaluation and power curve certification; (iv) integrate the value chain around the local production of wind turbines; and (v) integrate all the technological package of the turbine (blueprints, technical specifications, diagrams etc) to be transferred for industrial production.

Additionally, the IIE wind turbine is being engineered to be "grid friendly" and will incorporate technical means to comply with established grid codes; the capability to feed electricity to the grid with advanced or delayed power factors; the capability to feed in power in the case of grid short-circuit failures; and the capability to remain connected to the grid in case of tension voids, technically known as "Zero Voltage Ride Through Capability". This will be accomplished by proprietary innovations being incorporated in the electrical generator and the control system of the IIE turbine. This is an important element, due to the fact that the Law to tap renewable energy resources, approved by the Mexican Congress, mandates the Energy Regulatory Commission to develop and enforce a national Grid Code to assure the injection of high quality power from grid-tied wind turbines and the security of the electrical system.. Only a small number of countries around the world currently apply grid codes for wind farms; consequently, most wind turbines in the market are not grid friendly in the above sense. However, a clear tendency is observed in most advanced countries to implement grid codes with similar purposes. This will be a major competitive advantage of the IIE wind turbine.

[13] The Electrical Research Institute (IIE, acronym in Spanish) is the national laboratory for electricity in Mexico. It is a 1000+ people facility sited in the city of Cuernavaca, some 80km south of Mexico City. It was created by presidential decree 35 years ago an covers all disciplines related to the electricity business, including turbo machinery, electrical machinery, control systems, instrumentation, mechanical engineering and wind technology, among others.

[14] CIATEQ is a Mexican Public Research Center, specializing in the design and construction of metal devises, such as turbines, gear boxes and other high technology implements. Among other accomplishments, CIATEQ was the basis for the formation of GE's aircraft turbine design center established in the city of Querétaro, Mexico.

[15] RuhrPumpen S.A. is a Mexican multinational company founded in 1980. It has extensive experience in the area of metal mechanic manufacturing and engineering.

[16] Class 1A is the most robust type of wind turbines, capable of withstanding high velocity winds (>7-9m/s) with high capacity factors (over 35%).

IIE has already signed non-disclosure agreements with four wind farm developers (2 from the US, 1 from UK, 1 from Spain) who are interested in using the wind turbine under development at IIE in their projects. A common feature of all four companies is their aim at relatively small, distributed-generation markets in developing countries, which has always been the focus of the IIE project. Therefore once the certification is obtained, the wind farm developers will then purchase the 1.2 MW Class 1A prototype project developed by IIE, The IIE also estimated that 20% of the total possible wind power distributed generation market in Mexico (468 MW) could be satisfied with the MEM project, approximately 94 MW.

Replication/ scale up potential. The consortium has reached a legal agreement on intellectual property rights over the wind turbine, and has signed formal agreements on the tasks and responsibilities of each participant in the consortium. In case of a successful implementation and willingness to scale up the prototype, the agreement between IIE and RP grants preferential rights to RP for setting up a manufacturing facility and marketing the product. The terms and conditions will be mutually defined among consortium members in the case a third party wants to replicate the project, in which the third party would pay an agreed royalty to IIE and RP for the use of the design and certification of the prototype. Local consultants have been hired to develop a preliminary business plan, to be refined once the wind turbine is under construction and a better estimate of the production costs has been developed. Distributed generation projects are the basis for the business plan; i.e. production of the wind turbine will commence at the low end of the scale and will grow as the number of distributed generation projects grow, thus filling the market gap left over by the large corporations. In other words, no attempts are planned to compete with the major manufacturers of wind turbines.

Nacional Financiera (NAFIN, acronym in Spanish), a local financial entity, has agreed to contribute to funding for the replication of prototype MEM in the commercial phase, once it has been certified by an accredited certification test organization.

Under the recently approved Law to Tap Renewable Energy Resources, IIE is establishing agreements with private companies that plan to develop wind projects in areas with Class IA winds, with the participation of the communities that own the land, to apply the MEM turbine. IIE is also in conversations with the National Bank for External Commerce (*Banco Nacional de Comercio Exterior, S.N.C*-.BANCOMEXT) to establish financing mechanisms to facilitate the commercialization and use of the MEM turbine in other countries. BANCOMEXT has designed a financing mechanism for sustainable projects, using credit lines with Multilateral Organizations like the IDB, European Investment Bank (EIB) and the German Development Bank (KFW, acronym in German), making it an ideal partner to scale up the use of the MEM.

To support the MEM project, IIE has secured additional resources from the Fund for Energy Sustainability, created by the Energy Secretariat (SENER, acronym in Spanish) and administered by the National Science and Technology Council (CONACYT, acronym in Spanish). Both SENER and CONACYT require that the project develops a strategy for technology transfer to the private and public sector. IIE is currently working on this strategy to be negotiated with all stakeholders as the project is in progress. However, internal IIE regulations estipulate that the intellectual property rights developed for this project by the participating private sector companies must be respected. The intellectual property Rights developed by IIE (patents, industrial secrets, etc.) can be negotiated with the companies that manufacture the different components.

The proposed GEF project is a follow up of the above mentioned UNDP GEF funded project and has been structured in 4 components to provide the needed support to ensure successful **transfer of technology for wind power applications** to Mexico:

a. **Component I - Design and Specification of Wind Turbine Components (duration 18 months) (Not funded by GEF) :** This component aims to complete the final design of the wind turbine for DG and the corresponding evaluation[17], including the development of local capacity (human resources and know how) on advanced wind turbines. The activities to be carried out are: (i) complete detail design of all the

[17] The wind turbine developed by IIE (MEM) is being designed as to satisfy certification requirements for a Type Certificate, according to the requirements established by the International Electro technical Commission (IEC). The proposed IEC Type Certification procedures involve the following steps: (i) Design Evaluation, (ii) Prototype Test; (iii) Manufacturing Quality; and (iv) Final Evaluation. Evaluation and certification of the wind machine MEM will be carried out according to the international norm IEC 61400-22 Wind Turbine Certification Requirements.

components (mechanical, electrical and civil works) and the subsystems of the wind turbine prototype; ii) develop the blueprints for manufacturing and assembly of wind turbine components and definition of technical specifications of all subcomponents to be integrated in the prototype (iii) validate the designs by recognized peer reviews; and (iv) elaborate the drafts of operational manuals for the installation, operation, maintenance and safety certifications and (v) develop local capacities for wind turbine in the public and private sector through "on the job" training mechanism.

b. **Component II – Procurement, Manufacturing and Assembly of the Components (duration 18 months):** This component, funded by GEF, aims to develop the prototype of the 1.2 MW Class IA wind turbine, with a high component of national technology and manufacturing. The activities to be carried out are: (i) procurement of the commercial components required for the integration of all the subsystems of the wind turbine; (ii) Verification of the blueprint parameters in comparison to the assembled prototype; (iii) engineering and manufacturing of all the components (electrical, electronic, mechanical and civil works); (iv) assembly of the different subsystems and testing; and v) A detailed documentation/ guidance of the manufacturing process of all the components is carried out.

c. **Component III –Erection, Start Up and Operational Testing of the Wind Turbine (duration 18 months):** This component aims to validate and certify the assembled prototype operating in Class IA winds, including all the user manuals. The activities to be carried out are: (i) installation of the prototype and the required monitoring instrumentation in the CERTE; (ii) operational testing of the prototype in Class I winds; and (iii) review of the installation, operation, maintenance and safety manuals developed for the wind turbine.

d. **Component IV – Capacity Building and institutional strengthening to promote wind power market through distributed generation by SPPs**. This component, funded by GEF, will provide capacity building and institutional strengthening to promote DG for SPPs wind power projects. The IIE-UNDP PRODIWE project will focus in the preparation of recommendations for policy and technical regulations for DG wind power applications. This component will be complementary to the latter and will finance: (i) the technical support for the implementation of the financial mechanism designed to promote DG for wind applications by the GoM and provide assistance in any complementary design of financial instruments that could be required to have a sound financial mechanism in place; (ii) the preparation of the final versions of the guidelines and operational manuals for wind power application for SPPs; (iii) design and implementation of training courses in the CERTE, to improve installation, operation and maintenance skills for DG wind power applications; and (iv) a public awareness campaign will be targeting universities and energy related research centers, among other institutions to promote the use of wind power for the development of DG by SPPs. The counterpart for this component (US$ 5 million) will be from the IDB Policy Based Loan (PBL) and the technical assistance provided by the IDB to support the PBL in the areas or renewable energy in the context of climate change mitigation. The counterpart funds will contribute to create the environment and provide the institutional strengthening required support renewable energy in general, including wind power for distributed generation purposes. See footnote 2 of page 3 for further details.

The abovementioned four components will be implemented within the proposed four years as described in the expected calendar of this document.

Expected Global Environmental Benefits to be Delivered

Direct Emissions: The project will contribute to generate Global Environmental Benefits in the form of carbon emission reductions due to the fact that new wind power generation will be installed. The expected direct environmental benefits (avoided CO2 emissions) over a lifetime of 20 years, following GEF's guidelines for the calculation of carbon emissions reduction, using a grid emission factor[18] for Mexico of 0.651 tCO2/MWh and using a capacity factor[19] for wind power generation in Oaxaca - Mexico of 35%, is equal to 47,903 tCO2 in a period of 20 years.

Replication Factor: It is expected that as a consequence of this project the 1.2 MW Class 1A turbine (MEM project) will be cloned or replicated (using the design, construction and certification processes validated in this

[18] Used in CDM projects for Mexico.

[19] According to other (Eurus and La Ventosa) wind farm projects funded by the IDB in that region

project) in into more turbines operating successfully. For the calculation of replication factor, the project team will assume that each turbine cloned or replicated from the original MEM project (this means the turbine successfully constructed and in operation) represents one replication factor. It has been estimated that the market for new wind farm project in Mexico is approximately 5000 MW in 10 years (equivalent to 500MW/year installed the next 10 years). According to the IIE, of that total, 9-10% of that market (468MW) would be wind turbines for distributed generation. The IIE also estimated that 20% of wind distributed generation market (468 MW) could be satisfied with the MEM project. The IIE estimated that potential market for the 1.2MW Class 1A turbine would be 468 MW, equivalent to 390 new turbines. Therefore, based in the previous explanation the replication factor for this project will be estimated in 390 times. Using the bottom up approach, with a replication factor of 390 multiplied by the market share (20%) is equivalent to replication factor of 78 times. The estimated CO2 emissions are 3.74 MtCO2 in 20 years.

The top down approach uses a market estimation, assumed in 500MW, in a period of 10 years. Using a causality factor of 60% the indirect top down emissions are estimated in 13.55 MtCO2 for a lifetime of 20 years. Nevertheless, the project team estimates that the bottom up approach with a replication factor 78 times, is a more accurate estimation.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS: A key objective of Mexico's 2007-2012 National Development Plan (PND) in both the Energy and Environment sector programs recognize climate change as an utmost priority for public policies, in light of its potential impacts on Mexican society and on the natural resource base. Both of the programs mentioned contain specific actions and strategies for reduction of emissions and adaptation measures, and in the energy program, special emphasis is placed on the development of favorable conditions for the generation, transmission and distribution of electricity generated from RE sources in order to reduce GHG emissions in the installations, systems and processes of the energy sector. Mexico's Energy Program underlines the necessity to continue and intensify national efforts to expand the use of RE and the application of energy efficient measures. The program recognizes the wide availability of RE resources in Mexico, as the growing scientific and technological capacity for their assimilation, the necessity to diversify the energy matrix with RE sources to reduce dependency on fossil fuels, and the mitigation of environmental impacts derived from conventional generation. It is important to mention that Mexico has not carried out a technology needs assessment (TNA) as of 2010.

In addition, the IDB, through its Structured and Corporate Finance Department (SCF) has closed one and is about to close the second project to support wind energy development in Mexico, namely:

i. **Eurus Wind Project (ME-L1068):** This 250 MW wind farm in the La Ventosa region of the State of Oaxaca, Mexico is being developed by Acciona Energy Mexico through a special purpose limited liability company, Eurus S.A.P.I. de C.V. at a project cost of approximately US$525 million. The Project is being developed under Mexico's self-supply or "autoabastecimiento" framework and will sell its energy to Cemex Mexico S.A. de C.V. subsidiaries under a 20-year power purchase agreement. The proposed IDB Loan is US$45 million. The Project is located on the Isthmus of Tehuantepec, in the southeast region of the state of Oaxaca. The Project consists of the installation of 167 wind turbines with a nominal capacity of 1.5 MW each, associated control facilities and a 230 kV transmission line from the Project site to the Juchitán II substation; and

ii. **La Ventosa Wind Project (ME-L1076):** The La Mata & La Ventosa Wind Project consists of the installation of 27 wind turbine generators with a nominal capacity of 2.5 MW each (67.5 MW total capacity), associated control and transmission facilities and a 115 kV overhead transmission line from the Project site to the Juchitán II substation. The Project is currently under commissioning and is fully operational as of July 2010. The total cost of the Project is approximately US$198 million. The proposed IDB Loan is for $275 million Mexican pesos.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS: The proposed GEF financing is consistent with the objectives laid out by the Poznan Strategic Program on Technology Transfer. As such, the project will identify the technological bottlenecks for a successful local wind power industry

sources and also help the country to DG using wind power applications. The project will contribute to the replication and dissemination of SPP using the wind turbine designed and constructed by this project. The SPP are recognized by the law as another scheme to generate electricity in Mexico. The proposed project fits under the GEF Climate Change focal area under the Strategic Program 3 "to promote market approaches for RE". The project is innovative for Mexico, the GEF and the world-wide community because it will promote the development of state of the art wind turbines as well as in-country technological capacity building for DG for grid connected wind power applications.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES. The GEF resources being requested for this project will be targeted towards promoting investments in the development of a locally developed wind turbine technology for distributed generation and its corresponding supply chain. The innovative nature of this proposal consists on developing one of the main activities in the wind energy industry value chain, taking advantage of the country's existing technological and infrastructure capacity and promoting the growth of the Mexican industrial structure. The GEF funding will contribute to: (i) support the development of a national wind turbine market by reducing technical and financial barriers that prevent the development of this type of technology in developing countries; (ii) promote a market approach, and encourage the participation of the private sector in the development of a wind turbine for meeting the growing demand for electricity and support productive uses and sustainable socio-economic growth; (iii) support to formulation the necessary policy, regulation and technical skills to promote DG for wind application; and (iv) avoid new GHG emissions through the development of the wind energy projects.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES: The Inter-American Development Bank (IDB) programming strategy for Mexico promotes the support to facilitate and develop energy opportunities based on RE, rational use of energy and improvements of the regulatory framework. In this regard, the IDB is currently assisting the country in its efforts to develop a National Climate Change Policy through a Programmatic Policy-based Loan (PBL) (2186/OC-ME) with the formulation and implementation of a mitigation agenda as one of its main pillars. The approved PBL (US$400 million) with its mitigation component looks to promote the design and implementation of specific sector programs with a high demonstration impact on the reduction of GHG emissions, considering all the elements that can help make them viable from a policy, technical, and economic standpoint. The objective of this mitigation component is to boost participation in (regulated and voluntary) carbon markets and promote access to financial instruments that pursue the reduction of GHG emissions and to promote a sector agenda geared toward mitigating GHG emissions. Also, as part of the PBL, the IDB has prepared a package of Technical Cooperation (TC) projects to support the GoM through: (i) support for Mexican development banks (BANCOMEXT/NAFIN) in feasibility studies for sustainable energy projects; and (ii) support for wind projects through Mexican Development Bank (BANOBRAS, acronym in Spanish). Likewise, the TC projects will help advance the sector agenda by promoting RE and energy efficiency in residential lighting, and the development of the wind and solar photovoltaic sectors for connection to the power grid. This project also builds on the GEF funded "Action Plan for Removing Barriers to the Full-Scale Implementation of Wind Power in Mexico", executed by UNDP, to promote and remove major barriers for the inclusion of full scale wind energy in Mexico's energy matrix.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING : For years, companies of the private and public sector in Mexico have been studying the potential of the development of local wind energy technologies that adapt to the Mexican specific wind conditions and market, as well as to similar wind conditions and markets in neighboring countries to the south and The Caribbean. They have developed technological solutions to face this challenge, but due to the lack of financial resources, the development of a wind turbine prototype and testing has not been possible. Without the proposed GEF project, the development of local wind energy technologies for distributed generation could take more than a decade to crystallize. Given the potential for wind energy generation in Mexico, not having a locally developed and tested wind turbine for distributed generation in the near future will: (i) shift the project sponsors to purchase equipment (not always suited for areas exposed to strong winds) in the international markets; (ii) the technology transfer, capacity building and potential market advantage that the Mexican industry will acquire, will be delayed; and iii) the increase of wind power generation in the national mix will hardly promote the participation of SPP as distributed generation RE supplier, as mentioned in the law for the use of RE sources. This project will provide an additional incentive to promote distributed degeneration with wind power, an attractive possibility to generate clean energy on a smaller scale, which is currently not in the interest of large scale wind developers and manufacturing companies.

GEF support for the proposed project is critical for the following reasons: (i) the financial and technical/operational risks of developing wind turbines and implementing the corresponding value chains are high, especially in a developing country context; (ii) the success of the proposed project is a critical step for developing a local wind turbine that will also promote DG with this technology mainly for SPPs, which will enhance the Mexican industry and competitiveness in the RE power sector. GEF's and the IDB's involvement would leverage technical knowledge, expertise and international best practice to ensure success; (iii) La Ventosa region has a large potential for wind energy development – this project will support the development of wind energy with wind turbines specifically designed for the conditions of the area; and (iv) GEF support will help accelerate the dissemination of the technology, both within Mexico and other countries in the region, and achieve substantial reduction in GHG emissions.

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

Key risks include:

Risks	Likelihood	Mitigation Measures
Lack of political commitment for development and implementation of RE.	Low	This risk is contained as evidenced in the PND which targets to promote RE and reduction of GHG emissions, the Renewable Energy law approved in 2008, the Special Program on Renewable Energy issued by the Mexican Government in August 2009 and the document issued in 2009 by the Federal Government on "Policies and Measures to Foster National Integration of Equipments and Components to Tap Renewable Energy Resources and the Rational Use of Energy".
Lack of human resource talent with the technical expertise to successfully develop the wind turbine.	Medium	This risk is mitigated given that country has technical expertise in civil, mechanical, electronic, control and electrical engineering, which could be tapped for plant design and construction. Technicians from IIE and CIATEQ have been abroad for intensive training on the arts and crafts of wind turbine design for the past 5 years. The project will provide training to improve technical and O&M skills in DG for wind applications, as well as on power curve testing of wind machines.
Lack of national industry expertise to manufacture the components of the wind turbine.	Medium	This risk is mitigated given that a study carried out by the IIE determined that a number of wind turbine components, including towers, generators, gears, conductors, and transformers, could all be manufactured in Mexico using existing infrastructure. Over 200 Mexican companies have been identified as having the capacity for manufacturing parts required for wind turbines and for wind power plants. Through component 4, the project will provide technical assistance to upgrade the capacities, as required, for the manufacture of turbine parts and components. The project will also help upgrade the qualifications of small and medium enterprises to manufacture certified products to be integrated into wind turbines manufactured in Mexico and abroad.

Risks	Likelihood	Mitigation Measures
Local financial market not willing to lend to wind power project.	Low	The local financial institution NAFIN has agreed to finance the project in its commercial phase due to the innovative nature of the project and its alignment with two of the main pillars of the National Development Plan of the Federal Government, i.e. Competitiveness and Environmental Sustainability and project's potential contribution to the expansion of wind power development in Mexico. The establishment of specific fiduciary funds approved under the Law to tap Renewable Energy Resources Law (i.e energy fund called "Green Fund") as a financing mechanism to promote RE projects also helps to mitigate this risk.
Environmental risks	Low	This project, the creation of the prototype, has an EIA approved by the Mexican Environmental Authority (SEMARNAT, acronym in Spanish). Following the Mexican environmental regulations, every wind energy project above 0.5 MW of installed capacity requires an EIA approved by SEMARNAT, which includes noise and social acceptance of the installation of wind turbines. Therefore this risk is properly mitigated.

EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN: The project is considered to be a cost-effective intervention for the GEF due to the CO2 emission reduction potential of increased electricity generation with wind energy. Considering that estimated potential by IIE for distributed generation with wind power is 468MW, IIE has also estimated that at least 20% of that market share will be satisfied by the wind turbine developed under this project (MEM project). Using the GEF bottom-up approach, with a replication factor of 78 units which appears more realistic approach in terms of emissions reduction (see explanation in Part IIA Expected Global Environmental Benefits to be Delivered) the CO2 emission reductions are **3.74 MtCO2 (direct plus indirect bottom up approach)** and the cost effectiveness of this project is **1.34 US$/tCO2**.

This cost is below the cost effectiveness of other GEF financed projects, according to a review of GEF projects20. In this review, ongoing EE and RE projects had a cost between US$ 4/tCO2e and US$ 6/tCO2e for projects under preparation. This means that this project is cost-effective as it is below the expected range of costs of similar GEF projects.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

A. INSTITUTIONAL ARRANGEMENT:

The Electrical Research Institute (IIE) has requested the GEF-IDB support for the development of a 1.2MW wind turbine. The IIE was created by Presidential Decree on December 5st, 1975, and is a decentralized public organization with its own legal identity and patrimony. The main objective of the IIE is to contribute to the technological innovation, scientific research and development of the energy sector.

[20] World Bank,(2004), "*WB-GEF Energy Efficiency Portfolio Review and Practitioners' Handbook"*, World Bank Environment Department, Climate Change Team

The IDB priorities for Mexico call for explicit support to facilitate and develop opportunities based on RE, energy efficiency (EE) and rational use of energy. In this regard, the IDB is currently assisting the Energy Efficient Commission of Mexico (CONUEE, acronym in Spanish) to increase the use of renewable energy sources (RE), and EE for all its potential users[21]. In addition, the IDB is assisting the aforementioned Commission in the elaboration of the Sustainable Energy National Program (PRONASE, acronym in Spanish).

The IDB Country Office in Mexico will provide ongoing performance supervision with backstopping from IDB technical staff in Washington. A Steering Committee will be established to guarantee a strategic overview in the project. It will be composed by a member of each of the following key public entities: SENER, CONACTY, Financial Secretariat, Ruhrpumpen, Environment Secretariat (SEMARNAT, acronym in Spanish), Energy Regulatory Commission (CRE, acronym in Spanish), IIE and the IDB.

B. PROJECT IMPLEMENTATION ARRANGEMENT:

Executing Agency: The Executing Agency (EA) will be the Electrical Research Institute (IEE). The Energy Division of the IDB (INE/ENE) and the IDB Country Office in Mexico will provide technical support to facilitate the execution of the project. The IIE's Non-Conventional Energy Unit (GENC, acronym in Spanish) will be responsible for the execution and management of the project.

Executing mechanism: the Finance Secretariat (FS, Secretaria de Hacienda) (equivalent to a Ministry of Finance) has informed the IDB that since the IIE is considered a decentralized entity, the IIE is eligible to receive funding directly from the IDB without any financial intermediation, such as NAFIN (Nacional Financiera) or BANOBRAS. Therefore resources of the contribution will be disbursed in the form of Advancement of Funds as set forth in the General Conditions based on the Financial Plan of the Project, directly to the IIE. This Project falls under the type of project based on management of risk and performance, therefore the disbursement of funds from IDB to IIE will have to be based on financial needs (for procurement of goods and services mainly) related to the programmed activities and programmed costs stated in the annual plan for disbursements. The EA will have to justify at least 80% of the last disbursement including a projected cash flow in order for the IDB to disburse the next tranche.

Monitoring and Evaluation:

Monitoring: The project will be closely monitored in accordance with the matrix results (see Annex A).

The IDB will be monitoring the project both from Energy Division (ENE) and the IDB Country Office in Mexico, with random visits to PMCU and project site. The PMCU will be responsible for the monitoring process and the preparation of quarterly and annual reports following the GEF and IDB requirements during the project execution period. A Monitoring and Evaluation Plan which will facilitate the process and provide guidance to the PMCU, has been developed,

Consequently, the IDB Country Office in Mexico will provide ongoing performance supervision with backstopping from IDB technical staff in Washington. A Steering Committee will be established to guarantee a strategic overview in the project. It will be composed by a member of each of the following key public entities: SENER, CONACTY, Financial Secretariat, Ruhrpumpen, Environment Secretariat (SEMARNAT, acronym in Spanish), Energy Regulatory Commission (CRE, acronym in Spanish), IIE and the IDB.

Evaluation

A mid-term evaluation will be carried out by the IDB at the end of the second year of implementation, or when 50% of the funds are disbursed, whichever is first. A final, independent evaluation will also be carried out. Both will be financed by IDB. The PMCU will collect the data and information to facilitate the IDB evaluation process.

A final report will be prepared by the GENC-IIE at the end of the project, to be submitted to the IDB and the GEF for evaluation by external reviewers. This report will include all technical and non-technical results, as well as a compendium of the main lessons learned.

[21] (ME-T1023 Residential Use of Renewable Energy and Energy Efficiency in Baja California); (ME-T1069, Sustainable Energy National Program)

The GEF project monitoring structure is shown in figure 2 below.

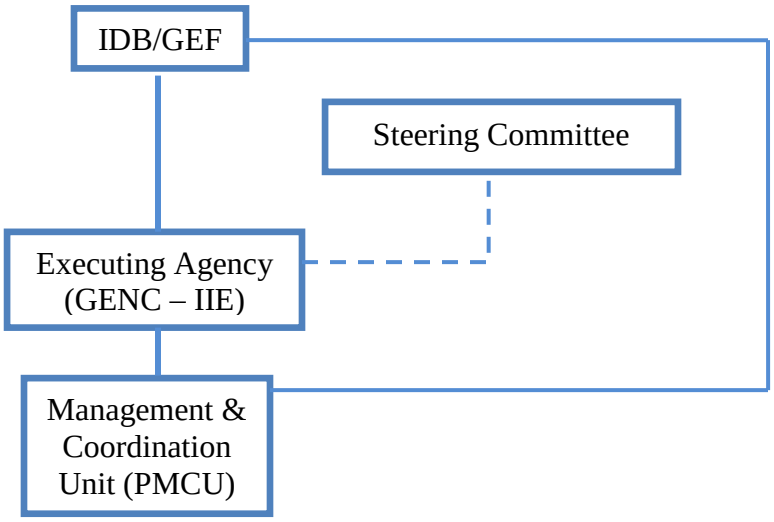

Figure 2: Monitoring mechanism

Procurement: Contracts for works, procurement of goods and services, will be responsibility of the IIE. Procurements will be carried out in accordance with IDB Policies for the Selection and Contracting of Consultants (GN-2350-9) and Policies for the procurement of works and goods (GN-2349-9); with the provisions established in the Program Agreement and the respective procurement plan.

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

The co-financing for this project was increased up to US$ 33,600,000. This total amount considers US$ 250,000 for project management and coordination. As explained in the document, the Electrical Research Institute (IIE) and the Centre for Advanced Technology (CIATEQ) have carried out the full conceptual and part of the basic designs of the 1.2 MW wind turbine prototype. In addition, NAFIN has agreed to allocate US$ 20,000,000 under the Conditional Credit Line for Investment Projects (CCLIP) granted by the IDB, for the replication of the prototype MEM in its commercial phase after certification.

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	Project Contact Person	Telephone	Email Address
Michael Collins IADB-GEF Coordinator		10/26/2011	Christiaan Gischler and Jesus Tejeda	202-6233411 202-6231745	christiaang@iadb.org jesust@iadb.org

ANNEX A: PROJECT RESULTS FRAMEWORK

MEXICO PROMOTION AND DEVELOPMENT OF LOCAL WIND TECHNOLOGIES IN MEXICO (ME-X1011) RESULTS FRAMEWORK & INDICATOR MATRIX		
Project Objective	*The general objective of the project is to include Mexico as a key player in the world's wind energy market, expanding its wind generation capacity by enabling local development and implementation of wind turbine technologies for distributed generation (DG).*	
Outcome Indicators	**Baseline**	**Target level**
	2012	**2015**
Locally developed and tested 1.2 MW Class IA wind turbine prototype for wind energy generation with replicability potential in Mexico and LAC.	No wind turbine prototype has been designed, manufactured or tested locally.	One prototype locally designed, manufactured, tested and in operation is certified

Components/ Outputs	**Baseline 2012**	**2013**	**2014**	**Target level (2015)**
Component I: Turbine Components designed and certified				
- Complete detail design of all the components (mechanical, electrical and civil works) and the subsystems of the wind turbine prototype	50% of the components have been designed	100% of components designed	100% of the required components have been designed	100% components designed
- Blueprints for manufacturing and assembly of wind turbine components and technical specifications of all subcomponents to be integrated completed	50% of Blueprints developed	100 % Blueprints developed	100 % Blueprints developed	100 % Blueprints developed
- Prototype designs validated by recognized peer reviewers	0% of designs reviewed	25% of designs reviewed	50% of designs reviewed	100% of designs reviewed
- Drafts of operational manuals for the installation, operation, maintenance and safety certifications of the turbine developed	No manuals are available (0/4)	Draft of All Manuals have been developed (2/4)	All Operational Manuals developed (4/4)	All Operational Manuals developed (4/4)

Components/ Outputs	Baseline 2012	2013	2014	Target level (2015)
· Develop of local capacities for wind turbine installation, operation and maintenance in the public and private sector through "on the job" training mechanism,	30 scientists and engineers coming from 2 National public institutions and 0 private organizations involved in the wind turbine design	36 scientists and engineers coming from 3 National public institutions and 1 private organizations involved in the wind turbine design	36 scientists and engineers coming from 3 National public institutions and 1 private organizations involved in the wind turbine design	36 scientists and engineers coming from 3 National public institutions and 1 private organizations involved in the wind turbine design
Component II: Wind Turbine Components Procured Manufactured and Assembled				
- Procurement of the commercial components required for the integration of all the subsystems of the wind turbine	No components have been procured (0%)	List of all components and materials to be procured is prepared and agreed.	75% of components are procured	100 % of components have been procured
- Verification of the blueprint parameters in comparison to the assembled prototype	No Blueprints available 0%	100% Subsystems Blueprints developed are verified	80% of all Blueprints are verified	100% of all Blueprints are verified
- Engineering and manufacturing of all the components (electrical, electronic, mechanical and civil works)	No components have been manufactured 0%	At least 75% of all the components have been manufactured	At least 100% of all the components have been manufactured	100% of all the components have been manufactured
- Different subsystems assembled and tested	No components have been assembled 0%	50% of components have been assembled and tested	75% of components have been assembled and tested	All components have been assembled and tested
- Detailed documentation/ guidance of the manufacturing process of all the components	No documentation available 0%	Drafts of the guidelines developed	Guidelines of the manufacturing process completed	Guidelines of the manufacturing process completed

Component III: Wind Turbine erected, started up and operating for testing				
- Installation of the prototype and the required monitoring instrumentation in the CERTE	The required monitoring equipment and prototype have not been installed	Instrumentation installed	Interconnection permit granted	Prototype and the monitoring equipments are installed
Operational testing of the prototype in Class I winds;	No test have been carried out	Types and Number of Tests required identified	Power Curve Tests have been carried out	All testing carried out according to international standards
- Review of the installation, operation, maintenance and safety manuals developed for the wind turbine	No data available for validation of manuals	No data available for validation of manuals	Data available for validation	All guidelines reviewed
Component IV: Capacity Building and institutional strengthening to promote a wind power market through distributed generation by SPPs.				
-Financial mechanism to promote DG for wind applications, designed	No proposal available	No proposal available	A Draft Proposal has been developed	A Proposal have been developed
- Guidelines and operational manual of practices to promote DGs & guidelines completed	No manuals available	All drafts completed	All drafts completed	All final versions completed
-4 Training courses in the CERTE to improve installation, operation and maintenance skills for DG wind power applications, implemented.	No courses have been implemented	1 Training course implemented	2 Training courses implemented	4 Training courses implemented
- A public awareness campaign developed and findings of the project presented	0 Workshop implemented	0 Workshop implemented	1 Workshop implemented	2 workshops implemented

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'S COMMENTS

1) Mexico has an ambitious plan to increase wind energy capacity from about 85 MW now to 2,267 MW by 2012. Such "leapfrog" development is impossible without significant lifting of existing barriers for penetration of wind energy technologies. STAP recommends conducting detailed barrier analysis that should include market survey (incl. supply/demand analysis for projected installed capacity), analysis of infrastructure barriers, and competitiveness of domestic designs of wind turbines vs. technologies available in international markets.

IDB reply: According to Mexico's Special Renewable Energy Program, issued by the Energy Secretariat (SENER, acronym in Spanish) in early 2009, total installed wind farms capacity by the year 2012 will be 2,500 MW. As of this writing, 516.5 MW have already been built, as listed in the following table; 400 MW more are under construction by different companies, and 500 MW more have recently been assigned by CFE to different contractors under the modality of Independent Power Producers (La Venta III and Oaxaca I – IV, all close to 100 MW each). About 1,000 MW more have been permitted to date by the Energy Regulatory Commission (CRE, acronym in Spanish). Project developers are urging CRE to launch a new "Open Season" for approval of close to 2,500 MW in additional permits, which, if conceded, could bring to 5,000 MW the total permitted capacity to be installed in Mexico in the mid-term.

The GoM recognizes that it will probably be difficult to reach the 2012 goal. Nevertheless, the rate at which wind farm projects are currently being developed in Mexico is a clear signal that the legal and regulatory framework for wind energy has been changing in the last five years in the right direction. A study commissioned in 2005 within the previous GEF-UNDP[22] project "Action Plan to Remove Barriers to the Large Scale Implementation of Wind Energy in Mexico" carried out a thorough analysis of the constitutional, legal, regulatory and institutional barriers in Mexico that limited the increase of wind power capacity in the national energy portfolio. As a result of the study a set of proposals to remove such barriers were identified and later, served to support the development of new regulations, standards and laws that have favored the penetration of wind energy in the national mix by the public and private sector (Table B.1). The improved legal and regulatory framework includes among others changes: a) recognition of generated capacity by wind farms under self-supply of electricity ; b) law for the use of RE sources; c) environmental national standard for the installation, operation, commissioning and dismantling of wind farms in Mexico[23]; d) implementation of the small power producer modality for the generation of electricity through RE; e) open season for the development of additional transmission capacity and its interconnection to the national grid; f) updated guideline for the development of RE projects in Mexico with emphasis on wind power[24]. The implementation of the mentioned legislations considers: i) increased participation of RE in the national energy mix in the next 10 years; ii) development of adequate methodologies to evaluate the impact of RE in the generation of electricity; iii) public trust fund to facilitate the implementation of the green fund, the rural electrification fund, and the R&D fund. The updated legislation considers an increased participation of the rural sector in the development of RE projects for electricity generation.

[22] Analysis of the legal, regulatory and institutional framework of the electricity sector affecting the development of wind power in Mexico. Prepared by the Mexican Environmental Academy of Law (AMDA acronym in spanish); 2005.
[23] A preliminary proposal of the NOM-051 is under revision/discussion by the respective authorities.
[24] The updated guideline was developed by the National Commission for Energy Saving with the support of GEF-UNDP Wind Action Plan.

Table B.1. Growing wind power installed and in development capacity in Mexico

Project Name (in operation)	Location	Commissioning year	Total Wind Farm Capacity (MW)	Turbine Individual Capacity (MW)	Turbine Brand
La Venta I y II (CFE-Iberdrola)	Oaxaca	2007	83	0.85	Gamesa
Parques Ecológicos (Iberdrola)	Oaxaca	2009	80	0.85	Gamesa
Eurus (CEMEX-ACCIONA)	Oaxaca	2009	250	1.5	Acciona
BII NEE STIPA (CISA-GAMESA	Oaxaca	2009	26	0.850	Gamesa
Electricidad del Valle de México (Electricite de France)	Oaxaca	2009	67.5	2.5	Clipper
La Rumorosa I (Government of Baja California)	Baja California	2009	10	2.0	Gamesa
Projects Under Construction					
Fuerza Eolica del Istmo	Oaxaca	2010-2011	50		
La Venta III	Oaxaca	2010-2011	101		
Oaxaca II, III y IV	Oaxaca	2010- 2011	304.2		
Oaxaca I	Oaxaca	2010-2011	101		
Los Vergeles	Tamaulipas	2010-2011	161		
Projects Under Development					
Vientos del Istmo	Oaxaca	2012-2015	395.9		
Fuerza Eolica del Istmo	Oaxaca	2012-2015	30		
Bii Hioxio	Oaxaca	2012-2015	227.5		
Bii Stinu	Oaxaca	2012-2015	164		
Santo Domingo	Oaxaca	2012-2015	160		
Bii Nee Stipa	Oaxaca	2012-2015	288		
Desarrollo Eolicos Mexicanos	Oaxaca	2012-2015	227.5		
Union Fenosa	Baja California	2012-2015	400		
Sempra	Baja California	2012-2015	1200		
Fuerza Eolica	Baja California	2012-2015	400		
Total Wind projects (2007- 2015)			**4726.6**		

As per previous paragraphs, 3,500 MW of wind farm projects are at different stages of development in Mexico, on top of the over 2,400 MW either built or committed to be built prior to 2012. Developers of new projects in Mexico and other Latin American countries have expressed their concern about the potential lack of supply of wind turbines in the international markets once the current surplus (created by the stalling of a number of projects around the world, triggered by the recent financial crisis) comes to an end. This could be exacerbated by fast growing wind programs in countries such as the US, Brazil and others. IIE has received expressions of interest from some of these new project developers as potential buyers for the IIE wind turbine. It is estimated that within the first ten years of commercial production the IIE wind turbine could capture 10% of this newly developing market in Mexico, which means around 290 turbines. One hundred additional turbines are expected to be sold for small, distributed generation projects, both in Mexico and other countries in the Latin American and The Caribbean region. This means a total power close to 470 MW in ten years.

Nevertheless, assumptions on production costs and other parameters used in the analysis will be updated from time to time as the project advances to fine-tune the results.

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

Position Titles	*$/ person week**	*Estimated person weeks***	*Tasks to be performed*
For Project Management			
Local			
Project Coordinator Duration: 4 years (US 5,400 per month)	1200	192	To ensure the success of the project by coordinating all project's activities in tight collaboration with the executing partner and supervision of the GEF agency.
Project Administrator Duration: 4 years (US 4,000 per month)	650	192	To ensure the effective control of the project financial resources and for instituting proper systems of financial reporting and internal controls, with particular emphasis on financial management requirements of the Inter-American Development Bank (IDB) and the executing partner.
Justification for Travel, if any: Local employees will make domestic travels to support the execution of the project. Main local destination for national travels will be to the CERTE, located in the State of Oaxaca.			
For Technical Assistance			
Local			
IT engineer (US 2,300 per month)	500	192	Assist the project in maintaining reliable, efficient, and flexible telecomunication and computer-based system. Support the project in ensuring a professional, proactive IT and telecommunication service to achieve objectives in time and at most cost-effective way.
Electrical Engineer (US 2,700 per month)	675	192	Technical support in the execution of all project's activities and will assist in the preparation of technical documents for the project monitoring.
Project analyst (US 2,500 per month)	625	192	Assist in the planning, development and monitoring of all project activities and provide information and financial management support. The project analyst will coordinate and assist in the preparation of reports requested by GEF Agency and the executing partner.
International			
Senior Technical Advisor in wind turbine design and certification Duration: 20 days per year, 80 days in 4 years	2,500	16	Support to the executing partner in: wind turbine design and review, data analysis, aerodynamic modeling, power performance testing, structural dynamic modeling and testing.
Senior Technical Advisor in wind turbine assembling and commissioning Duration: 20 days per year, 80 days in 4 years	2,500	16	Support the executing partner in: assembly of wind turbine equipments, installations and commissioning.
Senior Technical and	2,500	4	Support the executing partner in the

financial Advisor in wind power projects development Duration: 20 days in 4 years			preparation of a program for the industrial development of the prototype.
Justification for Travel, if any: Based on contract conditions, international and local technical advisors will travel to Cuernavaca City and La Ventosa County in Mexico.			

* Provide dollar rate per person week. ** Total person weeks needed to carry out the tasks.

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. N/A

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

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

Project Preparation Activities Approved	*Implementation Status*	*GEF Amount ($)*				*Co-financing ($)*
		Amount Approved	*Amount Spent Todate*	*Amount Committed*	*Uncommitted Amount**	
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
Total						

* 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: CALENDAR OF EXPECTED REFLOWS

N/A