



**PROJECT IDENTIFICATION FORM (PIF)**  
**PROJECT TYPE: Full-sized Project**  
**THE GEF TRUST FUND**

**Submission Date:** 30<sup>th</sup> Sept 2009

**PART I: PROJECT IDENTIFICATION**

**GEF PROJECT ID<sup>1</sup>:** PROJECT DURATION: 48 months  
**GEF AGENCY PROJECT ID:**  
**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 (IE)  
**GEF FOCAL AREA (S)<sup>2</sup>:** Climate Change  
**GEF-4 STRATEGIC PROGRAM(S):** CC-SP3  
**NAME OF PARENT PROGRAM/UMBRELLA PROJECT:** Strategic Program on Technology Transfer

INDICATIVE CALENDAR*	
Milestones	Expected Dates
Work Program (for FSP)	Nov 2009
CEO Endorsement/Approval	Mar 2010
Agency Approval Date	Apr 2010
Implementation Start	May 2010
Mid-term Evaluation (if planned)	May 2012
Project Closing Date	May 2014

\* See guidelines for definition of milestones.

**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 mill technologies. The specific objectives are to: (i) structure a value chain for the production of goods and services at the national level in the wind energy sector; (ii) consolidate the human talent required for the design of state of the art wind turbines; (iii) consolidate the technical capabilities for the manufacturing, testing and certification of wind turbines; (iv) establish the necessary industrial capabilities for the production of wind turbines with a high component of national technology; and (v) support the development 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 <sup>b</sup>	Expected Outcomes	Expected Outputs	Indicative GEF Financing <sup>a</sup>		Indicative Co-Financing <sup>a</sup>		Total (\$) c = a + b
				(\$ a)	%	(\$ b)	%	
1. Design and Specification of Wind Turbine Components	TA	1. A certified wind turbine prototype that satisfies wind resource and market conditions in Mexico.  2. Local capacity for wind turbine design developed and strengthened,	- Blueprints for manufacturing and assembly of wind turbine components and technical specifications of all subcomponents to be integrated  - Operational manuals for the installation, operation, maintenance and safety certifications of the turbine	--	0%	3,900	100%	3,900
2. Procurement,	Inv	1. Increased	- 1.2 MW	2,650	30%	6,000	70%	8,650

<sup>1</sup> Project ID number will be assigned by GEFSEC.

<sup>2</sup> Select only those focal areas from which GEF financing is requested.

Manufacturing and Assembly of the Wind Turbine Components		<p>national capacity and competitiveness for technological development and manufacturing of of 1.2 MW wind turbines.</p> <p>2. One wind turbine prototype with a high component of national technology and manufacturing assembled.</p>	<p>Class IA wind turbine Prototype</p> <ul style="list-style-type: none"> <li>- Detailed documentation/ guidance of the manufacturing process of all the components</li> <li>- Verification of the blueprint parameters in comparison to the assembled prototype</li> </ul>					
3. Erection, Start Up and Operational Testing of the Wind Turbine	Inv	<p>1. Locally developed and tested 1.2 MW Class I wind turbine prototype for wind energy generation with replicability potential in Mexico and LAC.</p> <p>2. Stenghtening of installation and testing capacity in the Regional Wind Technology Centre (CERTE).</p>	<ul style="list-style-type: none"> <li>- Revised Operational manuals</li> <li>- Certified power curve for the prototype in free wind conditions</li> <li>- Detailed results of all the conducted tests and identification of the required improvements for the turbine</li> </ul>	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	<p>1. Wind Power market for SPPs is strengthened through financial mechanism designed to promote Distrubuted Generation (DG) wind power applications, operational guidelines and training courses</p> <p>2. XX potential SPPs have been educated and informed on DG for wind power applications and wind power projects implementation.</p>	<ul style="list-style-type: none"> <li>-Financial mechanism to promote DG for wind applications, designed</li> <li>- Guidelines and operational manuals for wind power application for SPPs, completed</li> <li>-XX Training courses in the CERTE to improve installation, operation and maintenance skills for DG wind power applications, implemented.</li> </ul>	725	100%	5,000	0%	5,725

4. Project management		200	50%	200	50%	400
<b>Total project costs</b>		5,000	27%	18,600	73%	23,600

<sup>a</sup> List the \$ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component.

<sup>b</sup> TA = Technical Assistance; STA = Scientific & Technical Analysis.

**B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and by NAME** (in parenthesis) if available, (\$)

Sources of Co-financing	Type of Co-financing	Project
Project Government Contribution	Cash (70%) and Kind (30%)	9,600,000
GEF Agency(ies)-IDB <sup>3</sup>	Loan	5,000,000
Private Sector (Ruhrpumpen)	In-kind	4,000,000
Beneficiary End users <sup>4</sup>	cash	pending
<b>Total Co-financing</b>		18,600,000

**C. INDICATIVE FINANCING PLAN SUMMARY FOR THE PROJECT (\$)**

	Previous Project Preparation Amount (a) <sup>5</sup>	Project (b)	Total c = a + b	Agency Fee
GEF		5,000,000	5,000,000	500,000
Co-financing		18,600,000	18,600,000	
<b>Total</b>		23,600,000	23,600,000	24,100,000

**D. GEF RESOURCES REQUESTED BY AGENCY (IES), FOCAL AREA(S) AND COUNTRY(IES)<sup>1</sup>**

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

<sup>1</sup> No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

<sup>2</sup> 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.

**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

<sup>3</sup> As part of the Policy Based Loan to Support Mexico's Climate Change Agenda (2047/OC-ME, US\$ 200 million), the co-financing from the IDB will include the activities in relation to policy and regulation related to climate change mitigation, estimated in US\$ 5 million.

<sup>4</sup> This value will be calculated in detail in the preparation of the Full Size Document.

<sup>5</sup> Include project preparation funds that were previously approved but exclude PPGs that are awaiting for approval.

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-CO2 emitting energy forms.

The National Inventory of Greenhouse Gas (GHG) Emissions (INEGEI) indicates the following breakdown by sector of CO2 emissions in Mexico in 2002: energy/electricity accounting for 24% of total emissions, transportation 18%, manufacturing and construction 8%, fugitive emissions 6%, and industrial processes 8%; land use change and forestry 14%; agriculture 7%; sanitary landfills 5% and sewage 5% 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 priority of government.

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 MtCO2e); (ii) efficiency in generation and distribution of electric power by the CFE<sup>6</sup> and *Luz y Fuerza del Centro* (LFC) (27.7 MtCO2e), 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 MtCO2e), such as tapping the cogeneration potential of the cement, iron and steel, sugar, and other industries; (v) transportation (3.5 MtCO2e), such as elimination of the old vehicle fleet and promotion of train transportation; and (vi) electricity generation from RE (9 MtCO2e); particularly by tapping Mexico's large wind power potential.

The electricity sector in Mexico relies heavily on thermal sources (75.8%, see table 1). 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 (large hydroelectric plants and high temperature geothermal with 18.7% and 1.6% of the power supply, respectively). Little has been added in terms of the so-called new renewable or non-conventional sources, in spite of the relatively large resource base available.

**Table 1: Installed capacity in Mexico up to 2008**

<b>Plant Type</b>	<b>Installed Capacity (MW)</b>
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
<b>Sub-total Non-Renewable</b>	<b>42,848</b>
Nuclear	1,365
Geothermal	960
Hydro	10,566
Wind	87
Permits	673
<b>Sub-total Alternative</b>	<b>13,651</b>
<b>TOTAL</b>	<b>56,499</b>

<sup>6</sup> CFE supplies power to the whole of Mexico, except for Mexico City, which is supplied by *Luz y Fuerza del Centro*.

The RE resources in Mexico have neither been satisfactorily quantified, nor systematically analyzed as to their real potential for electricity generation. Estimates<sup>7</sup> have indicated that Mexico's most viable wind resources would be sufficient for the installation of 3000 - 5000 MW of wind power. These figures are based on rough regional estimates<sup>8</sup>, as detailed evaluations of wind resources have yet to be carried out. Other sources<sup>9</sup> 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 5000 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.

Mexico's strongest wind energy resource is found in a 3000 km<sup>2</sup> 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 2000 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 1.6 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 years 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. A total of 770 MW are due to be commissioned in 2009, with additional projects planned for conclusion between now and the year 2012, according to the list of electricity generation permits issued by the Energy Regulatory Commission (CRE). Total installed wind capacity is expected to reach 2,267 MW by 2012. Most projects in this period will be implemented in the 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<sup>10</sup>, recently approved by Congress, the total wind capacity installed in Mexico will continue to grow.

**Distributed generation with wind power applications for Small Power Producers (SPP).** The IIE has been working in the last decade in the promotion of distributed generation (DG). DG is another approach of power generation. It 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 that must be constructed. 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. In México, policy and regulation for DG, especially for the case of wind power generation, is not fully in place or operative. In addition to the latter, there are no financial mechanisms in place or qualified human resources to install, operate and maintain these systems. The IIE together with United Nations Development Program (UNDP) are preparing a Global Environment Facility (GEF) funded project for the preparation of recommendations for policy and technical regulations for DG wind power applications, namely the Promotion of distributed Wind Power Supply (PRODIWE) project.

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<sup>7</sup> National Commission for Efficient Use of Energy (CONUEE), the New Energy Sources Unit of the Federal Electricity Commission, and the Unit of Non Conventional Energy Sources of the Electrical Research Institute.

<sup>8</sup> 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 wind power potential.

<sup>9</sup> National Association for Wind Power (AMDEE, acronym in Spanish).

<sup>10</sup> Law to promote usage of RE, approved in November 2008.

**Wind Technology Development:** The GEF, through the UNDP and the Government of Mexico (GoM) are cofinancing 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 it’s 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.

**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; and (iii) the conviction that most capacities required for turbine manufacturing are found in Mexico, albeit with varying degrees of competitiveness. 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 that accommodate to the wind conditions of the Isthmus of Tehuantepec.

**Reason to choose a design for the 1.2 MW Class IA Wind Turbine.** Currently, a consortium composed by IIE, the Mexican Center for Advanced Technology in Querétaro (CIATEQ, acronym in Spanish) and the private company RuhrPumpen S.A.<sup>11</sup> is leading an effort to design of a 1.2 MW Class I A wind turbine (Mexican Wind Power Turbine Project – *Máquina Eólica Mexicana*-MEM project), that suits to the wind resource conditions of the Isthmus of Tehuantepec. It was decided to develop a 1.2 MW capacity wind turbine because: (i) wind turbines with more capacity require industrial and metal mechanic capabilities that Mexico doesn’t have at this moment; (ii) Mexico has a limited logistical infrastructure (transportation, cranes etc.) to be able to efficiently install and commercialize bigger wind turbines in places with limited infrastructure (roads, bridges, etc.); and (iii) there is a market advantage given that most of the companies that build wind turbines shifted from building 800 kW turbines to 2 MW+ turbines, and the 1.2 MW capacity is very adequate for Central American and Caribbean countries (potential markets). After 2 years work, basic engineering design is in its final stages of completion and the detail design for manufacturing purposes will take place in early 2010. According to the project work program, the first prototype will be finished in 2011 and ready to be shipped for testing and fine tuning in La Ventosa. A team of experts from all scientific and engineering fields required for the development of wind turbines was put together in August of 2007. Members of this team come from the various technical divisions of IIE and from the CIATEQ. Group leaders from the team were sent abroad for intensive training on wind turbine design and software packages were purchased for this purpose.

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; (ii) manufacture all the required components and integrate the industrial prototype of the wind turbine; (iii) install the prototype in the CERTE in Oaxaca for testing and evaluation; (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) so it can be transferred to the industries.

**Replication/scale up potential.** The consortium is currently working on a specific legal framework to determine intellectual property rights, tasks and responsibilities of the participants of the consortium, and the conditions on how the

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<sup>11</sup> RuhrPumpen S.A. is a Mexican multinational company founded in 1980. They have extensive experience in the area of metal mechanic manufacturing and engineering.

wind turbine will be commercially exploited. Under the recently approved Law to Tap Renewable Energy Resources, IIE is establishing agreements to use the MEM 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. 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 promote the commercialization and use of the MEM. 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 is currently trying to access resources of the Fund for Energy Sustainability administered by the National Science and Technology Council (CONACYT acronym in Spanish). The CONACYT requires that the project develops a strategy for technology transfer to the private and public sector. IIE is currently working on this strategy, and it will be finalized once the proposed project is approved. However, internal IIE regulations stipulate 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 MEM 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;

- i. **Component I - Design and Specification of Wind Turbine Components (duration 18 months):** This component aims to complete the final design and certification<sup>12</sup> of the wind turbine, 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 components (mechanical, electrical and civil works) and the subsystems of the wind turbine; (ii) review of the designs by recognized external advisors; and (iii) elaboration of the operational manuals for the installation, operation, maintenance and safety certifications.
- ii. **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) engineering and manufacturing of all the components (electrical, electronic, mechanical and civil works); (iii) assembly of the different subsystems and testing; and (iv) shipping to the CERTE in Oaxaca.
- iii. **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.
- iv. **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

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<sup>12</sup> 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.

to have a sound financial mechanism in place; (ii) the preparation of 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 to promote DG for wind applications for SPPs that will show the benefits of this procedure.

- B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL/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.
- C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF 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 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 RE technologies, namely a wind turbine 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) priorities for Mexico call for explicit support to facilitate and develop 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) (2047/OC-ME) with the formulation and implementation of a mitigation agenda as one of its main pillars. The approved PBL (US\$250 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 channeled a package of Technical Cooperation (TC) projects to help create the conditions that facilitate its implementation. With respect to the program's Mitigation Component, the TCs will help promote carbon markets and financial instruments through the: (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.

In addition to the Climate Change PBL, the IDB, through its Structured and Corporate Finance Department (SCF) is currently preparing 2 projects to support wind energy development in Mexico, namely:

- **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 two Cemex Mexico S.A. de C.V. subsidiaries under a 20-year power purchase agreement. The proposed IDB Loan would be for approximately US\$30 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 turbine generators 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
- **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 construction and is expected to start operations in the last quarter of 2009. The total cost of the Project is approximately US\$198 million. The proposed IDB Loan would be for approximately US\$30 million.

**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. They have developed technological solutions to face this challenge, but due to the lack of adequate financial resources, the development of a wind turbine and its testing has not been possible. Without the proposed GEF project, the development of local wind energy technologies could take several years. Given the potential of wind energy generation in Mexico, not having a locally developed and tested wind turbine in the near future will: (i) shift the project sponsors to purchase equipment (that doesn't perform optimally in the Mexican wind conditions) in the international markets; and (ii) the technology transfer, capacity building and potential market advantage that the Mexican industry will acquire, will be delayed. Also, without the proposed GEF project, the concept of DG with wind energy can't be developed, given that large scale wind developers and manufacturing companies are not interested in this specific market, thus losing an attractive possibility to generate clean energy in smaller scale.

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 to implementation of a large number of RE projects. 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 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 IF POSSIBLE INCLUDING RISK MITIGATION MEASURES THAT WILL BE TAKEN:**

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, and the Special Program on Renewable Energy issued by the Mexican Government in August 2009.

Risks	Likelihood	Mitigation Measures
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.
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. The project will provide technical assistance to upgrade the capacities of small and medium enterprises, as necessary, for the manufacture of turbine parts and components.
Local financial market not willing to lend to wind power project.	Low	This risk is addressed via 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. In addition to that, this project will also contribute by supporting the design and implementation of financing mechanisms to promote SPG DG using wind applications that could be later pilot implemented and replicated in larger scale in the future.

**H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT:** 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 500MW, 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). The implementation of the proposed GEF project will result in direct GHG emissions reductions totaling 50,293 tons of CO2 equivalent, considering an emission factor for the current Mexican grid of 0.53 t CO2e/MWh. Using the GEF bottom-up approach, indirect emission reductions for the project are 0.15 M t CO2 equivalent (assuming a replication factor<sup>13</sup> of 3). Using the GEF top-down methodology, indirect emission reductions for the project are 1.26 MtCO2 equivalent (assuming that total technological and economic potential for GHG emissions reductions is 2.09M tCO2 equivalent in over 10 years, and a project causality factor of 60%). More importantly, the project is expected to

<sup>13</sup> This is the maximum replication factor following GEF guidelines, although for this project the replication factor would much more than this due to the fact that for every wind turbine installed the project will be considered to be replicated, therefore if there are 50 wind mills installed, the replication should be 50 times. This calculation will be adjusted for the full size document. For this PIF, the conclusion is that the reduced carbon emissions are under estimated.

result in a substantial increase in electricity generation, through wind power applications, streamlining the efficient use of wind for electricity generation, making this a high impact GEF intervention in a sector with enormous potential for RE generation. Using the indirect top down approach, which appear more realistic in terms of emissions reduction, the cost effectiveness of this project is **3.96 US\$/tCO<sub>2</sub>**.

This cost is below the cost effectiveness of other GEF financed projects, according to a review of GEF projects<sup>14</sup>. In this review, ongoing EE projects had an average of US\$ 4/tCO<sub>2</sub>e of GEF financing cost-effectiveness, and US\$ 6/tCO<sub>2</sub>e 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.

**I. JUSTIFY THE COMPARATIVE ADVANTAGE OF GEF AGENCY:** The IDB is a major lending institution in Latin America and the Caribbean (LAC) supporting both the public and private sector. During the last decade, IDB has been involved in supporting climate change mitigation programs in Mexico, particularly by assisting the country in its efforts to develop a national climate change policy through the approved Policy Based Loan (2047/OC-ME). The IDB has also channeled resources through TC projects to help promote carbon markets and financial instruments that facilitate the implementation of the climate change PBL. The IDB is also currently studying a potential financing of 2 private sector projects for large scale wind energy generation in Oaxaca region. The proposed GEF project is consistent with the IDB Sustainable Energy and Climate Change Initiative (SECCI), because it promotes the development of RE and access to carbon markets and supports the development of new technologies or methods that can provide replication throughout the LAC region. Therefore the IDB is well positioned to provide maximum value added in this field. This project fits squarely within the comparative advantage of the IDB for GEF projects in three main aspects:

- a) Development impact. the program targets technological development and innovation with a positive impact on climate change and energy use in LAC, all core themes of the IDB;
- b) Private sector focus: many initiatives in LAC have been focused on non-profit institutions, based in the region. However, since innovations often come from the private sector, this project explicitly encourages the participation of the local private sector;
- c) Future business opportunities for the IDB through scaling up. One of the main pillars of the project will be the potential for scaling up, creating new opportunities for the IDB to engage with public and private sectors in LAC.

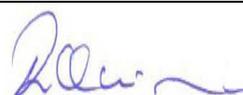
**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**

**A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):**  
(Please attach the [country endorsement letter\(s\)](#) or [regional endorsement letter\(s\)](#) with this template).

NAME	POSITION	MINISTRY	DATE
Claudia Grayeb Bayata	Directora General Adjunta	Secretaría de Hacienda y Crédito Público	September 30 2009

**B. GEF AGENCY(IES) CERTIFICATION**

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.

Agency Coordinator, Agency name	Signature	Date	Project Contact Person	Telephone	Email Address
Ricardo Quiroga GEF Coordinator IDB		September 30 2009	Christiaan Gischler	202- 6233411	christiaan@iadb.org

<sup>14</sup> World Bank,(2004), “WB-GEF Energy Efficiency Portfolio Review and Practitioners’ Handbook”, World Bank Environment Department, Climate Change Team

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