1. Country and Sector Background

Mexico is an OPEC country rich in fossil fuel resources. Nonetheless, policy inadequacies and a scarcity of investment resources have meant that it has so far been unable to exploit these natural resources at a sufficient rate to ensure economic growth and macroeconomic stability. Natural gas production, in particular, has been insufficient to satisfy domestic demand and the power sector has been particularly affected by this. By some estimates natural gas imports are likely to rise by 500 percent over the next few decades. This situation has prompted growing interest from the Segretaría de Energía (SENER) and Comisión Federal de Electricidad (CFE) to develop domestic sources of renewable energy to complement fossil fuels in power production. In particular, the State of Oaxaca is endowed with world class wind resources, offering the prospect of economic competitiveness within the medium term. Development of these resources will offer benefits to the local economy, on a national economic basis, and to the environment.

The Mexican electricity system, operated primarily by Comisión Federal de Electricidad (CFE), serves 95 percent of the population, but is strained by under-investment and limited private sector participation. About 73 percent of Mexico’s installed power generation capacity of 44 GW is fossil fuel-based, with oil-fired plants, including combustion turbines, responsible for the largest share of both capacity (43 percent) and generation (49 percent). Combustion turbine plants comprise less than 8 percent of total generation and are used largely for meeting demands at peak and in isolated areas. Gas-fired plants represent more than 19 percent of generation, about the same share as hydro, with just under 14 percent of total generation capacity.

The most important element of Mexico’s power sector development is the considerable re-arrangement of the fuel mix expected by 2014 which indicates a doubling of natural gas use and a 50 percent increase in coal for generation. By 2020 the IEA expects Mexico to increase gas use in the power sector five-fold, to 44 percent of all generation. The country has seen a rapid rise in gas imports (presently from the U.S.), now running at over 820 million ft$^3$/d, equal to
about 20 percent of total use in the country and expected to rise to 25 percent in the next decade, equivalent to the entire current gas production of the country. Coal (including one coal/oil plant) currently provides almost 10 percent of electric power system capacity (public service) and about 12 percent of generation. Current annual output of 11 million tons falls short of consumption of 20 million tons. Some 40 percent of CFE’s installed capacity is old and is due for replacement, and CFE has put out tenders to import LNG to fuel their newer power stations at increasingly higher costs. The total capacity of all plants expected to be completed by 2010 is approximately 11.9 GW, slightly below the expected increase in peak demand.

The Constitution reserves power supply and distribution as an exclusive right of the state (except for self-suppliers with less than 20 MW capacity, which can sell power to the grid). Since 1992, reforms have been sought with limited success, and private power still accounts for no more than 30 percent of electricity generation. In September, 2002, the Fox administration tabled an electricity sector reform bill that would create a wholesale electricity market and unbundle transmission and distribution, but reform remains stalled. The Constitution also mandates least-cost procurement of electricity generation sources, and CFE employs a relatively strict interpretation of this mandate. While the Secretaría de Energía (SENER) has authority to specify how this mandate is interpreted, it has only relatively recently begun to do so.

The monolithic nature of CFE (and its relatively recent experience with IPP projects), its preference to develop projects internally, coupled with its focus on the ‘least-cost’ mandate and its pursuit of a significant shift to gas as a means to meet this mandate, have resulted in minimal experience to date with renewable energy. Despite having at least 5,000-6,000 MW of world class wind resource in the Isthmus of Tehuentepec and more in other regions, small hydro potential of up to 3,300 MW, and other potential significant bio-electricity sources, only a small portion of Mexico’s total energy needs are met by renewable energy sources other than large hydro. Grid-connected wind from CFE’s small demonstration project, La Venta I, currently provides only 2 MW. This will be augmented later this year when the CFE-owned 85 MW La Venta II, a build-transfer turnkey project slated to benefit from World Bank carbon emissions reduction purchase, enters into service. While hydro-electricity which represents more than 23 percent of installed capacity, it only represents about 18 percent of total generation. The only other major non-conventional energy source is geothermal, with less than 5 percent of both capacity and generation.

Recently, two important policy initiatives aim to reduce development barriers for renewables. These include a) a provision for Accelerated Depreciation, which makes 100 percent investment in renewable energy technologies after January 2005 eligible for depreciation in the first year, and b) a proposed Renewable Energy Law (passed by the lower house of Congress in late 2005; pending before the Senate) that specifies a range of methodologies and dispatch conditions to better capture the value of contributions of renewables, as well as creation of a domestically financed financial mechanism, the “Fondo Verde”.
2. Objectives

The project provides strong synergies in energy and sustainable development, and the energy diversification thrust underlying the project addresses these goals. The Country Assistance Program Strategy (Report No. 28141-ME, April 15, 2004) notes environmental sustainability as included in basic objectives for Bank activity in Mexico, i.e. to “promote development in harmony with nature and the environment”. In this context, consolidating infrastructure development to provide reliable and important public utilities services within a framework of fiscal restraint is also seen as critical for sustaining development. The CPS notes the importance of improving the business climate through further unbundling, strengthening regulatory frameworks, increasing private investment, and enhancing corporate governance. As the BAU scenario indicates a need to import 25 percent of its natural gas supply in the next decade, the project will contribute to energy fuel and source diversification.

3. Rationale for Bank Involvement

As noted in the April 2004 CPS, “the most important value-added of the Bank is not in transferring resources but in helping Mexico achieve better development effectiveness through targeted analytical work and improved project and policy design”. The World Bank and GEF, with other bi-lateral agencies, have engaged a broad array of Mexican policy, technical, financial, and environmental agencies and actors in building consensus on the need for energy sector diversification, the potential benefits of developing in-country renewable energy resources to achieve such diversification, and the technical assistance and program approaches required to stimulate and sustain long-term renewable energy development. SENER and other agencies have acknowledged the World Bank and GEF value added in (a) providing objective information on international experience and tailoring it to Mexican circumstances, (b) identifying and collaborating with a range of technical, financial, and policy experts within and outside of Mexico, and (c) carrying out key analyses required to inform decisions.

Given the entry into force of the Kyoto Protocol in February, 2005, the Bank’s engagement with Mexico (both through GEF and several projects under development through the Bank’s Carbon Finance business) remains important in helping Mexico position itself within emerging international accords on mitigating greenhouse gases (GHGs). While Mexico has assumed responsibilities beyond its legal obligations under the U.N. Convention on Climate Change and was the first non-industrialized country to create an inventory of its GHG emissions, Mexico is the world’s ninth largest greenhouse gas emitter and CO$_2$ emissions from fuel combustion increased by 23 percent between 1990 and 2000. The main CO$_2$ emission sources (excluding land use-related emissions) are energy combustion (89 percent) and industrial processes (11 percent).

Based on relationships and mutual understanding developed during the project development process, the World Bank is well positioned to integrate its broad experience (in power sector reform, renewable energy technologies and markets, and emerging financing potential from carbon mitigation sources) into the Mexican development context and make the project an example of international best practice for large scale renewable energy development. The key
role of the World Bank will be to continue to provide oversight on coordination of the various TA components, and keeping a sustained focus on the least-cost power issue to ensure cost-effective use of GEF funds applied through the project’s Financial Mechanism.

4. Description

The objective of the proposed project is to assist Mexico in developing initial experience in commercially-based grid-connected renewable energy applications by supporting construction of an approximately 101 MW IPP wind farm, while building institutional capacity to value, acquire, and manage such resources on a replicable basis.

1. Project Phases

The project will provide targeted GEF tariff support to an initial 101 MW wind energy IPP investment to overcome initial entry risks and stimulate learning, and will support a combination of policy and technical assistance activities to support development of additional renewable energy generation resources on a diversified basis.

Project Approach: The project addresses two primary tracks for developing and sustaining large-scale renewable energy development:

1. To open avenues for direct sale to CFE at prices that increasingly recognize over time the full value of renewable resources - including intermittent resources - to the grid system.
2. To reduce transaction costs barriers currently limiting private projects serving municipalities and industrials under provisions of the September, 2001 renewable energy self-supply regulations enacted by CRE, and amended and gazetted on January 30, 2006.

Project Phases: To achieve these objectives, the project is structured as the first phase of a proposed two-phase approach to address key policy and tariff issues currently hindering renewable energy development, and facilitate an initial investment in grid-connected wind IPP project with use of GEF support in a Financial Mechanism to overcome initial investment barriers. The $25 million Phase I, including technical assistance implemented over three years and tariff support payments for the wind installation spanning five years, was authorized by the May, 2003 meeting of the GEF Council. Based on Phase I project performance and subject to availability of funds, the GEF Council indicated its commitment to review a subsequent request for a Phase II $45 million program that would continue project replication and cost reduction with both wind and additional renewable energy technologies.

2. Project components

In its first phase, the GEF project supports three main components to remove policy, financial and transactional cost barriers in order to open IPP markets in renewable energy:

1) A Financial Mechanism to stimulate organizational learning and cost reduction, that will provide US$20.4 million in energy production incentives on an Output-Based Aid basis (1.1
US cents per kWh for the first 5 years of generation), offered in response to a CFE competitive solicitation for 101 MW of IPP wind power;

2) **Technical Assistance** to address analytical and policy barriers, and provide business development assistance to stimulate and facilitate project investment in both IPP and renewable energy self-supply markets; and

3) **Project Management** support to assist SENER, in coordination with NAFIN, in the management of both of the above substantive components, and to fulfill oversight, monitoring and evaluation, and reporting responsibilities.

5. Financing

<table>
<thead>
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<th>Source</th>
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</tr>
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<tr>
<td>BORROWER/RECIPIENT</td>
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<td>GLOBAL ENVIRONMENT FACILITY</td>
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<td>LOCAL SOURCES OF BORROWING COUNTRY</td>
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<tr>
<td>FOREIGN PRIVATE COMMERCIAL SOURCES (UNIDENTIFIED)</td>
<td>85</td>
</tr>
</tbody>
</table>

Total 150.35

6. Implementation

**Main Responsible Institutions:**

The **Ministry of Finance and Public Credit (SHCP)** is the official recipient of the grant. SHCP is the only entity of the Federal Government that has the capacity to receive donations from international financing agencies and it also assigns the financial agent for the project.

The **Secretaria de Energia (SENER)** through its Research, Technological, Development and Environment Directorate (Direccin General de Investigacin, Desarrollo Tecnolgico y Medio Ambiente) within the Undersecretariat for Energy Planning will execute certain components of the Project. In addition, SENER shall, during the implementation of the Project, maintain a Project coordinating unit (SENER’s Investment Promotion Unit: UPI, Unidad de Promoción de Inversiones) which will serve as the primary interface with CFE and with private sector investors regarding the promotional mechanism financed by the GEF and parallel technical assistance. UPI will also be responsible for project monitoring and evaluation, and regular reporting. In addition, UPI will contract for services under the Technical Assistance component, and will be responsible for outreach and business development services under this component. While ultimate responsibility for GEF project execution will reside with the management of SENER’s Research, Technological Development and Environment Directorate and the Head of UPI, UPI’s capacities will be augmented through specialized project management consultants financed by the GEF project on an incremental cost basis, including a Project Manager, a Utility/Renewable Energy Expert, and a Procurement Assistant. Although SENER’s energy policy capabilities are strong, its capacity in terms of financial management and procurement remains limited. This will be addressed by the Mexican state development bank, NAFIN.

**Comisión Federal de Electricidad (CFE)** will co-execute the Project and in coordination with SENER/UPI will be responsible for structuring the La Venta III IPP solicitation, evaluating responses and executing a Power Purchase Agreement (PPA) with the winning wind power
entity. The PPA will contain incentive allocation provisions that will be the basis for disbursement of GEF funds on an output-based aid basis against verified wind energy deliveries to the CFE grid. Finally, CFE will procure system modeling software, training, technical studies and goods related to the enhanced integration of wind energy in the CFE grid system.

**Nacional Financiera (NAFIN)** will be designated by SHCP as the financial agent for the Project and as such will provide overall financial management of the Project and the Special Account. NAFIN will also be responsible for formal correspondence with the Bank and providing procurement support to SENER.

*Other Institutions:*

*The Ministry of Environment and Natural Resources (SEMARNAT)* will ensure that the Project complies with the relevant environmental legislation and as such will grant the relevant permits and authorizations for the design, operation and maintenance of the facility.

The *Comisión Reguladora de Energía (CRE)* regulates the activities of both public and private energy operators. CRE will be responsible for development of adequate regulation for renewable resources (especially intermittent sources), including setting the basic economic framework for both IPP self-supply projects.

*The State of Oaxaca* will be responsible for the local environmental, construction, and land use permitting and local stakeholder outreach aspects of the GEF project.

**GEF incentive support to La Venta III.** Execution of the IPP project will require several parallel design and authorization processes, including:

1. The IPP procurement authorization procedure, mandated by the Law for Electricity Public Service (*Ley del Servicio Público de Energía Eléctrica*) and its regulations, as well as by Treasury (SHCP) regulations;
2. The plant definition, its technical and economic assessments, and incorporation procedure;
3. The structuring of GEF incentive payment;
4. The preparation of bid documents; and
5. The IPP project execution in itself.

The first three of the above processes have been completed as of project appraisal. Preparation of bid documents by CFE is taking place in May-June of this year, and will enable issuance of the La Venta III bid solicitation in July, 2006. Adequate bid documents will require the land leasing agreement, the PPA, the incentive allocation provisions, and the bidding documents proper, containing project description and payment mechanisms, as well as required guarantees and all other relevant information for developers to submit their bids. Guidance to CFE for the structuring of the bid package so as to meet wind IPP requirements and assure consistency with the GEF incentive scheme requirements has been provided through a detailed set of guidelines prepared by specialized consultants to SENER (financed from GEF PDF-B funds).
**Technical Assistance.** Execution of the technical assistance activities under the GEF project will be under the overall management of UPI. Terms of Reference for specific studies and services to be performed by consultants will be developed by technical units within CFE and SENER, or in the case of the business advisory and outreach services, by UPI itself, and forwarded to NAFIN for review. Contracts for consulting services, following no objection as required by the World Bank, will be issued by SENER and CFE. Payments against delivered services will be requested by the entity receiving the services, authorized by UPI, cleared by NAFIN following no objection by the Bank, and to the contractor by the entity, followed by reimbursement from the relevant GEF-financed Special Account.

7. **Sustainability**

Borrower commitment has been demonstrated by significant progress during project development of: (a) analysis and implementation of an accelerated depreciation provision applicable to renewable energy capital equipment generating electricity; (b) development of and advancement in the Congress of a draft Renewable Energy Law which, if passed, would strengthen the supporting framework for many of the activities and objectives sought by the project. Critical to achieving project objectives, and particularly for sustaining and replicating renewable energy activity in the long run is continued commitment by the Government of Mexico, and CFE in particular, to engage in pricing on a long-run system basis and to incorporate a broader analysis of costs of benefits of renewable energy generation to create market entry points for renewables in Mexico. Despite significant challenges in addressing analytical issues related to CFE’s issuance of its ‘reference price’ necessary to provide a tariff counterpart to GEF’s offer of tariff support, dialogue with stakeholders during final project preparation has resulted in clear agreement on determination of a reference price that is consistent with the principle of ‘least-cost’ power procurement guidelines expressed in Mexico’s Constitution, but is also fair and consistent with long-run marginal cost analysis. On the basis of these agreements, it is expected that the trajectory of the project will bring wind (and other selected renewable energy technologies) into near price parity with conventional sources by the end of the project, making the effort significantly self-sustaining.

It should be noted that additional funds from the proposed Renewable Energy Law (passed by the lower house of Congress in late 2005; pending before the Senate) are considered to be additional to international donor-leveraged funding, and will thus not endanger carbon finance operations in Mexico under Kyoto Protocol ‘additionality’ considerations. However, the developer of the La Venta III wind farm supported under this project will not be allowed to ‘double dip’ and use both GEF and carbon revenues, and any carbon revenues from La Venta III would be directed back to the Mexican *Fondo Verde*. The CFE La Venta II project, however, is expected to receive carbon revenues but not GEF support.

**Replicability:** The project is designed to create a favorable environment for initial market activity in renewables, to stimulate an initial IPP wind farm investment through targeted incentive support, and to help establish a framework to repeat this process through subsequent renewable power procurements that will result in organizational learning and cost reduction over time. Parallel activities in ‘self-generation’ markets will build additional experience in project
development, finance, and operation, further supporting replicability within Mexico. Further, as a regional technology and market leader, Mexico is well positioned to help effect broader replicability of project experience and cost reductions throughout Latin America.

8. Lessons Learned from Past Operations in the Country/Sector

Increasingly, incentive mechanisms and elements of mandated markets are being used as mutually reinforcing tools, and tailored to suit specific country circumstances and objectives. Further, as the Kyoto Protocol has emerged as an international framework to limit CO₂ emissions, new green pricing, Clean Development Mechanism, and/or tradable certificate mechanisms have emerged in response and can provide an important additional source of revenue for clean energy projects. Mexico has weighed the emergence of these carbon avoidance markets with other lessons learned in financing and implementing renewable energy support programs. Key elements include application of “close to market” level of incentives introduced in a competitive market framework, coupled with performance-based payments.

9. Safeguard Policies (including public consultation)

The number and type of safeguards triggered by the proposed project will depend on the type and location of renewable source based power generation projects benefited by the Financial Mechanism incentive during both Phase I and II.

For the wind based power generating project La Venta III (Phase I), it is expected that the following safeguards will be triggered:

<table>
<thead>
<tr>
<th>Safeguard Policies Triggered by the Project</th>
<th>Yes</th>
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<tbody>
<tr>
<td>Environmental Assessment (OP/BP/GP 4.01)</td>
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<td>Projects in Disputed Areas (OP/BP/GP 7.60)</td>
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<tr>
<td>Projects on International Waterways (OP/BP/GP 7.50)</td>
<td>[ ]</td>
<td>[X]</td>
</tr>
</tbody>
</table>

10. List of Factual Technical Documents

- WB/GEF Project Concept Document (Brief) for GEF Council (May, 2003)

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1 By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties claims on the disputed areas.
UNDP/GEF: Action Plan for Removing Barriers to the Full-Scale Implementation of Wind Power in Mexico (Phase 1), October 15, 2002

Instituto de Investigaciones Eléctricas (IIE); Non-Conventional Energy Unit

a) A Portfolio Approach to Energy Planning in Mexico. (Shimon Awerbuch and Martin Berger)
b) Task A: Background Information for Project Preparation
c) Task B: Preliminary Assessment of the Potential for Electricity Generation in Mexico with Renewable Energy other than Wind July 2005

Project Preparation Studies (prepared by Protego Asesores, S.A. de C.V.; Pace Global Energy Services, LLC; and Global Energy Concepts, LLC)

d) Task 1: Financial Mechanism and Operational Manual for GEF Incentive Support (3/7/05)
f) Task 3: Project Implementation Plan (5/31/05)

SENER Key Policy and other documents:

- Renewable Energy Law (as tabled before the Mexican Senate; April 19, 2005)

Other Reports and Studies:

- Social and Environmental Assessment Manual for the Large-Scale Renewable Energy Development Project
- Instituto de Investigaciones Eléctricas (IIE) – Study on the benefits from the integration of wind and hydro technologies
- Results of Dispatch and Avoided Cost Simulations – memo, Donald Hertzmark
- Future Generation Costs for CFE System, memo, Donald Hertzmark

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