Document of
The World Bank

Report No: ICR00003965

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-56781)

ON A

GRANT FROM
THE GLOBAL ENVIRONMENT TRUST FUND

IN THE AMOUNT OF US$25.0 MILLION

TO THE

UNITED MEXICAN STATES

FOR A

LARGE-SCALE RENEWABLE ENERGY DEVELOPMENT PROJECT

October 27, 2016

Energy and Extractives Global Practice
Mexico and Colombia Country Management Unit
Latin America and Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective October 2016)

Currency Unit = Mexican Peso (MXN)
US$ 1.00 = 18.65 MXN

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AMDEE	Spanish acronym for the Mexican Wind Power Association (*Asociación Mexicana de Energía Eólica*)
CDM	Clean Development Mechanism
CENACE	National Energy Control Center (*Centro Nacional de Control de Energía*)
CFE	Federal Electricity Commission (*Comisión Federal de Electricidad*)
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CPS	Country Partnership Strategy
CRE	Energy Regulatory Commission (*Comisión Reguladora de Energía*)
EIRR	Economic Internal Rate of Return
ESMAP	Energy Sector Management Assistance Program
FIRR	Financial Internal Rate of Return
FM	Financial Management
FMA	Financial Management Assessment
FOTEASE	Fund for the Energy Transition and Sustainable Use of Energy (*Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía*)
FY	Fiscal Year
GEF	Global Environment Facility
GEO	Global Environment Objective
GHG	Greenhouse Gas
GW	Gigawatt
GWh	Gigawatt-hour
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
INECOL	Institute of Ecology (*Instituto de Ecología A.C.*)
IP	Implementation Progress
IPP	Independent Power Producer
ISR	Implementation Status and Results Report
kWh	Kilowatt-hour
LAERFTE	Spanish acronym for the Law for the Use of Renewable Energy and the Energy Transition Financing (*Ley para el Aprovechamiento de las Energías Renovables y el Financiamiento para la Transición Energética*).
M&E	Monitoring and Evaluation
MTR	Mid-Term Review
MW	Megawatt
MWh	Megawatt-hour
NAFIN	*Nacional Financiera, S.N.C., I.B.D.*

NPV	Net Present Value
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PDO	Project Development Objective
PERGE	Spanish acronym for Large-Scale Renewable Energy Development Project (*Proyecto de Energías Renovables a Gran Escala)*
PIU	Project Implementation Unit (UREP for its acronym in Spanish)
POISE	Investment Plan for the Power Sector (*Programa de Obras e Inversiones del Sector Eléctrico*)
PPA	Power Purchase Agreement
ROE	Return on Equity
SEDESOL	Ministry of Social Development (*Secretaría de Desarrollo Social*)
SEMARNAT	Ministry of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*)
SENER	Ministry of Energy (*Secretaría de Energía*)
SESA	Strategic Environmental and Social Assessment
SHCP	Ministry of Finance and Public Credit (*Secretaría de Hacienda y Crédito Público*)
SRMC	Short Run Marginal Cost
TA	Technical Assistance
tCO_2e	Metric tons of CO_2e

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MEXICO
Large-Scale Renewable Energy Development Project

Contents

A. Basic Information			
Country:	Mexico	Project Name:	Large-scale Renewable Energy Development Project (Phase I = US$25 million; Phase II = US$45 million)
Project ID:	P077717	L/C/TF Number(s):	TF-56781
ICR Date:	09/05/2016	ICR Type:	Core ICR
Lending Instrument:	Specific Investment Loan	Borrower:	UNITED MEXICAN STATES
Original Total Commitment:	US$25.00 million	Disbursed Amount:	US$24.63 million
Revised Amount:	US$25.00 million		
Environmental Category: B		**Global Focal Area: C**	
Implementing Agencies: SENER			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	08/06/2002	Effectiveness:	05/02/2007	04/18/2007
Appraisal:	05/15/2006	Restructuring(s):		06/11/2013 05/12/2014 03/21/2015
Approval:	06/29/2006	Mid-term Review:	06/14/2013	07/02/2013
		Closing:	06/30/2014	04/30/2016

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Satisfactory
Risk to Global Environment Outcome	Low or Negligible
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry:	Satisfactory	Government:	Satisfactory

Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Satisfactory	**Overall Borrower Performance:**	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Central government administration	15	15
General finance sector	25	25
Other Renewable Energy	60	60
Theme Code (as % of total Bank financing)		
Climate change	17	17
Environmental policies and institutions	17	17
Infrastructure services for private sector development	17	17
Regulation and competition policy	16	16
Technology diffusion	33	33

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Jorge Familiar	Pamela Cox
Country Director:	Gerardo M. Corrochano	Isabel M. Guerrero
Practice Manager/Manager:	Antonio Barbalho	Susan G. Goldmark
Project Team Leader:	Guillermo Hernández González	Charles M. Feinstein
ICR Team Leader:	Guillermo Hernández González	
ICR Primary Author:	Eugene D. McCarthy	

F. Results Framework Analysis

Global Environment Objectives (GEO) and Key Indicators(as approved)

The GEO, as per the Global Environment Facility Operational Program #No.6 on Climate Change, is to reduce greenhouse gas (GHG) emissions by addressing and reducing the barriers to development of grid-connected renewable energy technologies and markets in Mexico.

The approved GEO indicators were:

1. Increased electricity supplied to national system from renewable energy sources, over baseline (GWh/yr.).

2. Increased total installed renewable capacity over baseline (MW)

3. Emissions reduced (tons/year) over baseline (CO2, NOx, SOx, and particles).

4. Barrier Removal outcome indicators under the PDO.

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

The GEO was not revised. However, during the second project restructuring in May 2014, two GEO targets were revised (electricity supplied to the national system per year from renewable energy sources and the avoided emissions per year) and two core indicators were incorporated, that is, generation capacity of renewable energy constructed (other than hydropower), and generation capacity of renewable energy constructed – Wind. The final set of key GEO indicators was the following:

1. Increased electricity supplied to national system from renewable energy sources, over baseline (GWh/yr.).

2. Renewable capacity over baseline (MW)

3. Emissions reduced (tons/year) over baseline (CO2, NOx, SOx, and particles).

4. Barrier Removal indicators as described under PDO.

5. Generation Capacity of Renewable Energy (other than hydropower) constructed

6. Generation Capacity of Renewable Energy constructed – Wind.

(a) GEO Indicator(s)

GEO Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Increased electricity supplied to national system from renewable energy sources, over baseline (GWh/yr.).			
Value (quantitative or qualitative)	7.36	367.9 GWh annually (257.5 GWh minimum)	270.3 GWh annually (257.5 GWh minimum)	287.8 GWh from January to December 2015.
Date achieved	04/18/2007	04/18/2007	05/12/2014	12/31/2015
Comments (incl. % achievement)	The project achieved the following: - 94.2 percent of revised target in 2013; - 104.5 percent of revised target in 2014; - 106.5 percent of revised target in 2015. Since commissioning, the project has supplied 1069 GWh (October 2012 to July 2016) to the national system.			
Indicator 2 :	Increased total installed renewable capacity, over baseline (MW).			
Value (quantitative or qualitative)	2 (wind)	101 MW (70 MW minimum)	n.a.	102.85 MW
Date achieved	04/18/2007	04/18/2007	n.a.	10/03/2012
Comments (incl. % achievement)	The project achieved 101.83 percent of target when the La Venta III wind farm was commissioned in October 2012.			
Indicator 3 :	Emissions reduced (tons/year) over baseline (CO2, NOx, SOx, and particles).			
Value (quantitative or qualitative)	0	247,000 tons per year of operation.	167,000 tons per year of operation.	177,594.45 tons of CO2e from January to December 2015.
Date achieved	04/18/2007	04/18/2007	05/12/2014	12/31/2015
Comments (incl. % achievement)	The project achieved the following: - 94.2 percent of revised target in 2013; - 104.5 percent of revised target in 2014; - 106.5 percent of revised target in 2015. Since commissioning, the project has avoided 659,634 tonCO2e (October 2012 to July 2016).			
Indicator 4 :	Barrier Removal results as described under PDO.			
Value (quantitative or qualitative)	As described in PAD	Barriers removed	n.a.	Partially achieved (Barriers greatly reduced).
Date achieved	04/18/2007	04/18/2007	n.a.	04/29/2016
Comments (incl. %	This indicator refers to those barriers identified at appraisal and addressed through the institutional capacity-building efforts supported by the			

achievement)	Technical Assistance component of the project (PDO indicators 1 and 2, and intermediate indicators 1-18). Barriers have been greatly reduced, as shown by the strong development of wind power in recent years (approximately 3,000 MW of installed capacity across the country by the end of 2015), as reported by the Mexican Wind Power Association (AMDEE).			
Indicator 5 :	Generation Capacity of Renewable Energy (other than hydropower) constructed (MW)			
Value (quantitative or qualitative)	0	n.a.	100	102.85
Date achieved	05/12/2014	n.a.	05/12/2014	10/03/2012
Comments (incl. % achievement)	The project achieved 102.85 percent of target. This indicator was introduced at project restructuring in May 2014 to incorporate core indicators into the results framework.			
Indicator 6 :	Generation Capacity of Renewable Energy constructed - Wind (MW)			
Value (quantitative or qualitative)	0	n.a.	100	102.85
Date achieved	05/12/2014	n.a.	05/12/2014	10/31/2012
Comments (incl. % achievement)	The project achieved 102.85 percent of target. This indicator was introduced at project restructuring in May 2014 to incorporate core indicators into the results framework.			

Project Development Objective (PDO) and Key Indicators(as approved)

The PDO of the project was 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.

The approved PDO indicators were the following:

1. Established CFE (*Comisión Federal de Electricidad*) system short-run marginal cost-based reference price combined with agreed maximum US cent 1.1 Global Environment Facility (GEF) tariff support (per kWh for 5 years) sufficient to attract bids, investment, construction, and operation of 70-100 MW wind farm.

2. Subsequent Investment Plans for the Power Sector (*Programa de Obras e Inversiones del Sector Eléctrico*, POISE) include plans for additional wind independent power producer (IPP) procurement at higher reference price and/or lower incentive support level (subject to the availability of subsidy funds - GEF or other).

3. The set of intermediate outcome indicators below (intermediate indicators 1-19).

Revised Project Development Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

The PDO was amended in the legal documents during the first project restructuring (June 2013) to make it identical to the PDO in the Project Appraisal Document (PAD). The PDO in the PAD included the approximate size of the wind farm that would be supported and built, while the one in the Legal Agreement did not. The amended PDO in the legal agreement became: "The development 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." The final set of key PDO indicators was the following:

(b) PDO Indicator(s)

PDO Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Established CFE system short-run marginal cost-based reference price combined with agreed maximum US cent 1.1 GEF tariff support (per kWh for 5 years) sufficient to attract bids, investment, construction and operation of 70-100 MW wind farm.			
Value (quantitative or qualitative)	None	IPP contract issued to winning bidder for construction and operation of $\geq$ 70 MW wind farm.	n.a	IPP contract issued to an international firm (Contract No. PIF-005/2009).
Date achieved	04/18/2007	04/18/2007	05/12/2014	06/09/2009
Comments (incl. % achievement)	Achieved. Two bids were received and one contract for 100 MW was awarded.			
Indicator 2 :	Subsequent POISE include plans for additional wind IPP procurement at higher reference price and/or lower incentive support level (subject to availability of subsidy funds - GEF or other).			
Value (quantitative or qualitative)	None	POISE includes $\geq$1 such plant	n.a.	8
Date achieved	04/18/2007	04/18/2007	n.a.	05/12/2014
Comments (incl. % achievement)	The project exceeded the target eight-fold since the POISE 2012-2026 included 8 new wind plants which are expected to start operation between 2014-2019: Sureste III, IV, and V (908 MW); Rumorosa I, II, III (300 MW); and Tamaulipas I, II, III (600 MW) - none of which benefits from additional tariff support.			

(c) Intermediate Outcome Indicator(s)

Intermediate Outcome Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Functioning mechanism for the auctioning of tariff subsidy support through competitive bidding established, with incremental tariff support provided by GEF.			
Value (quantitative or qualitative)	None	Full	Mechanism is in place and functioning.	Achieved
Date achieved	04/18/2007	04/18/2007	05/12/2014	06/09/2009
Comments (incl. % achievement)	One contract awarded for 100 MW through competitive bidding. Tariff support mechanism in place and with monthly disbursements since October 2012 until project closing (April 2016).			
Indicator 2 :	Operational Manual for the auctioning mechanism finalized with CFE sign-off, and adopted by CFE.			
Value (quantitative or qualitative)	None	Full	Operational Manual adopted.	Not completed
Date achieved	04/18/2007	04/18/2007	05/12/2014	06/09/2009
Comments (incl. % achievement)	Since the auctioning mechanism was finalized and implemented by CFE through competitive bidding, the Operations Manual was no longer relevant.			
Indicator 3 :	Regional Environmental Assessment is completed and made available for the La Venta III wind farm bidding package.			
Value (quantitative or qualitative)	None	Full	Regional Environmental Assessment completed.	Partially achieved
Date achieved	04/18/2007	04/18/2007	05/12/2014	04/30/2016
Comments (incl. % achievement)	An environmental assessment was prepared before the bidding but it did not include a regional review. A comprehensive Strategic Environmental and Social Assessment (SESA), which was completed before project closing, includes a review of the cumulative environmental and social impacts of wind development in the Tehuantepec area.			
Indicator 4 :	CFE base solicitation allowing for locations other than the currently identified for La Venta III wind farm, including those that would require a change in transmission lines.			
Value (quantitative or qualitative)	None	Full	Authorization to change location included in the bidding documents.	Achieved

Date achieved	04/18/2007	04/18/2007	05/12/2014	06/09/2009
Comments (incl. % achievement)	Flexibility to change the location of the wind farm was included in the bidding documents.			
Indicator 5 :	Number of qualified bids received from tender.			
Value (quantitative or qualitative)	None	3	At least three qualified bids received.	3
Date achieved	04/18/2007	04/18/2007	05/12/2014	06/09/2009
Comments (incl. % achievement)	100 percent (2 technical bids and 1 financial bid).			
Indicator 6 :	CFE commitment to acquire renewable energy capacity through Power Purchase Agreements (PPAs) (MW)			
Value (quantitative or qualitative)	None	IPP wind solicitation for >70 MW published.	n.a.	Achieved
Date achieved	04/18/2007	04/18/2007	n.a.	06/09/2009
Comments (incl. % achievement)	100 percent. IPP wind contract for 100 MW awarded to international firm.			
Indicator 7 :	Winning bid is to develop wind turbine site within area identified as suitable by CFE's REA.			
Value (quantitative or qualitative)	None	Full	n.a.	Achieved
Date achieved	04/18/2007	04/18/2007	n.a.	06/09/2009
Comments (incl. % achievement)	Environmental authorization obtained by CFE for the La Venta III wind farm site. If a different site were chosen, bidder would have been responsible for obtaining the authorization.			
Indicator 8 :	Financing plans presented by bidders as part of pre-qualification accepted as adequate by CFE (co-financing provided by private entities and export credit agencies by way of capital investments)			
Value (quantitative or qualitative)	None	> 1 bidder pre-qualified	n.a.	Achieved
Date achieved	04/18/2007	04/18/2007	n.a.	06/09/2009
Comments (incl. % achievement)	100 percent (1 financial bid). An international firm was awarded the contract for the construction of La Venta III wind farm after its technical and financial proposals were deemed as acceptable by CFE.			
Indicator 9 :	Mechanism for payments to *ejidos*, indigenous communities, and small landowners executed, with established process through which landowners or *ejidos* can verify revenue and requisite payments.			
Value (quantitative or	None	Executed	n.a.	Achieved

qualitative)				
Date achieved	04/18/2007	04/18/2007	n.a.	10/03/2012
Comments (incl. % achievement)	Mechanism for payments is in place since commissioning (October 2012). The IPP has continuously made all payments both for land use and for contributions to the municipal social program.			
Indicator 10 :	Funds disbursed to ejidos, indigenous communities, and small landowners.			
Value (quantitative or qualitative)	None	Payments received in accordance with negotiated land leases.	n.a.	MXN 54.423 million (approximately US$2.9 million) since 2012.
Date achieved	04/18/2007	04/18/2007	n.a.	12/31/2015
Comments (incl. % achievement)	Achieved. IPP disbursed MXN 11.884 million in 2015 both for land use and for contributions to the municipal social program, for accumulated MXN 54.423 million since 2012.			
Indicator 11 :	Significant avian/bat mortality is avoided.			
Value (quantitative or qualitative)	None	Number of turbine-associated bird and bat mortalities established by monitoring exercise / ongoing assessment.	Avian/bat mortality is within acceptable ranges.	1800 / yr.
Date achieved	04/18/2007	04/18/2007	05/12/2014	12/31/2015
Comments (incl. % achievement)	Achieved. Estimated avian/bat mortality, including the undercounting effect, was reported by CFE for the first time in 2015. Avian/bat mortality is in line with data from around the world.			
Indicator 12 :	CFE purchase tariff proposed for Phase II which reflects Short Run Marginal Cost (SRMC) plus renewable energy capacity value and energy portfolio diversification value as defined by the Ministry of Energy (*Secretaría de Energía*, SENER).			
Value (quantitative or qualitative)	None	Appropriate multi-component tariff proposed.	n.a.	Not completed (No longer necessary)
Date achieved	04/18/2007	04/18/2007	n.a.	04/30/2016
Comments (incl. % achievement)	This activity was no longer relevant since no subsidies are required anymore for wind power development in Mexico. Therefore, Phase II of the project, as originally envisioned, is no longer necessary.			
Indicator 13 :	CFE purchase price tariff proposed for Phase II which requires reduced GEF subsidy from Phase I.			

Value (quantitative or qualitative)	None	GEF subsidy for Phase II < US 1.1 cent/kWh	n.a.	Not completed (No longer necessary)
Date achieved	04/18/2007	04/18/2007	n.a.	04/30/2016
Comments (incl. % achievement)	This activity was no longer relevant since no subsidies are required anymore for wind power development in Mexico. Therefore, Phase II of the project, as originally envisioned, is no longer necessary.			
Indicator 14 :	Least-cost methodology for calculation of renewable energy procurement reflecting Full System Marginal Cost developed			
Value (quantitative or qualitative)	None	Full	n.a.	Completed
Date achieved	04/18/2007	04/18/2007	n.a.	04/30/2016
Comments (incl. % achievement)	This activity was completed with Energy Sector Management Assistance Program (ESMAP) funds but the developed methodology is no longer used since the Mexican power sector moved from a monopoly to a wholesale market approach according to the energy reform of 2013.			
Indicator 15 :	Planning and dispatch model installed and used in CFE to incorporate intermittent sources.			
Value (quantitative or qualitative)	None	Installed and used.	n.a.	Completed
Date achieved	04/18/2007	04/18/2007	n.a.	04/30/2016
Comments (incl. % achievement)	CFE implemented dispatch tools to incorporate renewables. In July 2013, a World Bank expert delivered a workshop on integrating renewables into the grid to top technical officials from CFE, SENER and the Energy Regulatory Commission (*Comisión Reguladora de Energía*, CRE). However, CFE is no longer in charge of dispatch. Instead, an Independent Operator System (the National Center for Energy Control, *Centro Nacional de Control de Energía*, or CENACE) is now responsible for the dispatch after the energy reform of 2013.			
Indicator 16 :	Strategic Environmental Assessment is developed and accepted as basis permitting scale-up of wind energy in Oaxaca region.			
Value (quantitative or qualitative)	None	Full	Strategic Environmental Assessment completed and disseminated.	Completed
Date achieved	04/18/2007	04/18/2007	05/12/2014	04/30/2016
Comments (incl. % achievement)	SESA has been completed and disseminated. Negotiations between SENER and the Ministry of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*, SEMARNAT) to decide whether SESA could be used as a basis for permitting scale-up of wind energy in Oaxaca region are still in progress, since the recommendations and findings of this assessment must be adapted to the new regulatory framework for the energy sector after the reform of 2013-2014.			

Indicator 17 :	Publishing of new intermittent energy connection contract by CRE including renewable energy capacity recognition.			
Value (quantitative or qualitative)	None	Full	n.a.	Completed
Date achieved	04/18/2007	04/18/2007	n.a.	05/31/2012
Comments (incl. % achievement)	In May 2012, CRE published the General Rules for permit holders (using renewable energy) to be granted the interconnection to the National Grid.			
Indicator 18 :	Strengthening of SENER Investment Promotion Unit business development services addressing marketing, permitting issues, financing facilitation, and business advisory services to sponsors of renewable energy projects, including for self-supply projects.			
Value (quantitative or qualitative)	None	Business development services of the Unit for Promotion of Investment within SENER judged adequate.	n.a.	Achieved
Date achieved	04/18/2007	04/18/2007	n.a.	04/30/2016
Comments (incl. % achievement)	The World Bank supported the design of a 'one-stop shop' for facilitating development of renewable energy projects. This activity was adjusted to adapt to SENER's necessities after the changes in the Mexican legislation derived from the energy reform of 2013.			
Indicator 19 :	Institutional capacity sufficient to issue and manage tenders for additional wind farms / other renewable energy resources.			
Value (quantitative or qualitative)	None	Assessed as adequate.	n.a.	Achieved
Date achieved	04/18/2007	04/18/2007	n.a.	04/30/2016
Comments (incl. % achievement)	Capacity is in place for various renewable energy sources, including wind. Development of wind farms has been very strong over the past few years (3000 MW installed capacity across the country by the end of 2015).			

G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	09/08/2006	Satisfactory	Satisfactory	0.00
2	05/11/2007	Satisfactory	Satisfactory	0.00
3	10/23/2007	Satisfactory	Satisfactory	0.00
4	06/09/2008	Satisfactory	Moderately Satisfactory	0.00
5	06/26/2008	Moderately Unsatisfactory	Moderately Satisfactory	0.00

6	12/17/2008	Moderately Unsatisfactory	Moderately Satisfactory	0.00
7	05/18/2009	Moderately Unsatisfactory	Moderately Unsatisfactory	0.00
8	06/23/2009	Moderately Satisfactory	Moderately Satisfactory	0.00
9	11/17/2009	Moderately Satisfactory	Moderately Satisfactory	2.00*
10	05/20/2010	Moderately Satisfactory	Moderately Satisfactory	2.08*
11	12/28/2010	Moderately Satisfactory	Moderately Satisfactory	0.08
12	06/28/2011	Moderately Satisfactory	Moderately Satisfactory	0.08
13	02/08/2012	Moderately Satisfactory	Moderately Satisfactory	0.33
14	09/19/2012	Moderately Satisfactory	Moderately Satisfactory	0.36
15	01/20/2013	Moderately Satisfactory	Moderately Unsatisfactory	0.36
16	10/30/2013	Moderately Satisfactory	Moderately Unsatisfactory	3.26
17	12/07/2013	Moderately Satisfactory	Moderately Satisfactory	3.98
18	07/19/2014	Moderately Satisfactory	Moderately Satisfactory	6.61
19	04/09/2015	Moderately Satisfactory	Moderately Satisfactory	9.94
20	12/17/2015	Moderately Satisfactory	Satisfactory	15.95
21	04/29/2016	Satisfactory	Satisfactory	23.26

*Note: The Government of Mexico applied for a US$2 million disbursement for a designated account which was later reimbursed due to a change in the cash-flow arrangements.

H. Restructuring (if any)[1]

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		GEO	IP		
06/11/2013	N	MS	MU	0.41	This restructuring transferred the responsibility of making payments to the IPP that built and operated the wind farm supported by the project from financial agent *Nacional Financiera* (NAFIN) to CFE. This change derived from amendments to Mexican laws that prevented NAFIN from

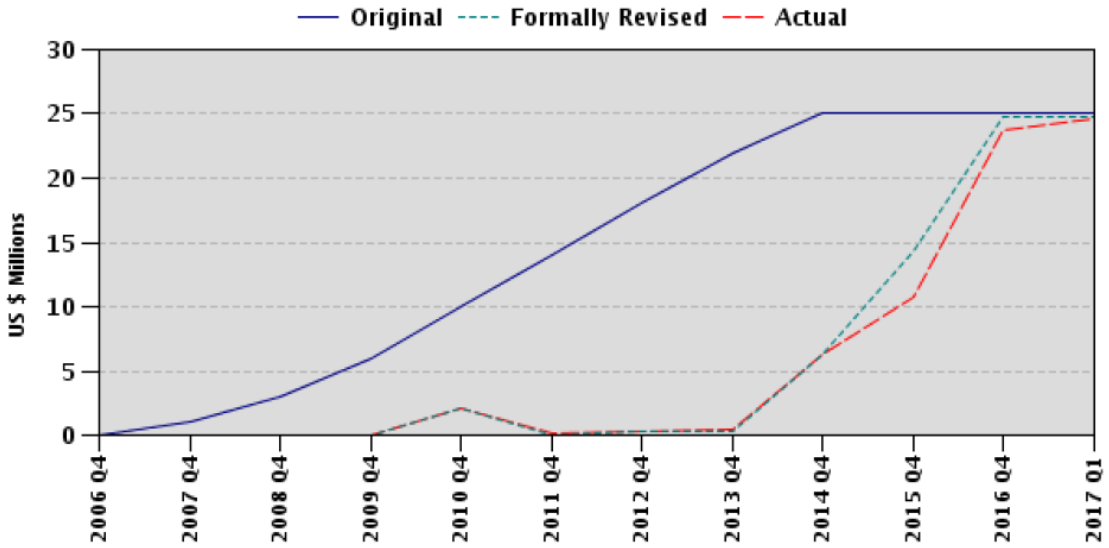
[1] The restructuring dates are those when the different restructurings were approved by the World Bank. The first grant amendment (first restructuring process) was signed by the Ministry of Finance and Public Credit (SHCP) on June 12, 2013, whereas the second grant amendment (third restructuring process) was signed by the borrower on April 13, 2015.

					making deposits to institutions other than the Federal Treasury (*Tesorería de la Federación*, TESOFE) or the treasuries of the project executing agency or implementing entity. Also, this restructuring amended the PDO in the legal documents to make it identical to the PDO in the PAD. The PDO in the PAD included the approximate size of the wind farm that would be supported and built, while the one in the Legal Agreement did not. The amended PDO in the legal agreement became: "The development 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.
05/12/2014	N	MS	MS	5.74	This restructuring adjusted the results framework by revising energy production and reduction of GHG emissions based on actual data collected over 1 year of wind farm operation. Original energy production and reduced emissions assumed an average capacity factor of 42 percent, whereas actual average capacity observed

					during wind farm's first year of operations was approximately 30 percent. The discrepancy was due to the limited data available in the area when La Venta III wind farm was going to be built at the project preparation stage. In addition, two core indicators were included (that is, Generation Capacity of Renewable Energy (other than hydropower) constructed, and Generation Capacity of Renewable Constructed - Wind. This restructuring also extended the project closing date by 22 months (that is, from June 30, 2014 to April 30, 2016) and reallocated US$2 million among categories.
03/21/2015	N	MS	MS	9.54	This restructuring increased the tariff subsidy for the operation of La Venta III wind farm from US cents 1.1/kWh to US cents 3.9/kWh. This restructuring allowed enhanced flexibility in case further increases were necessary by transferring the specific reference to the subsidy amount from the Grant Agreement to the Operations Manual. This increase in the subsidy to the tariff did not modify the aggregate subsidy amount being provided through the GEF grant but enabled the total subsidy allocated under the main component (Component 1) to be disbursed by the closing date (April 30, 2016), given the

					delays during the construction of the wind farm and the reduced annual generation from the La Venta III wind farm than had been forecast at appraisal.

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

1. **Country context**. Mexico's energy sector has been of strategic importance to the economy and is also an important driver of economic growth. Mexico has also been a major oil exporting country for many decades, with crude oil production being an important source of foreign exchange earnings and an important contributor to fiscal revenues. However, starting in 2004, oil production started to decline. The decline in domestic oil production gave rise to increasing pressures on Government fiscal policy. It also started to focus attention on the need to diversify the country's energy resources away from oil towards an increased use of natural gas and the development of the country's renewable energy potential. In this regard, Mexico's wind energy resources in the state of Oaxaca, estimated at the time to be of the order of 5,000-6,000 MW of electric power capacity, were considered to have significant potential. Finally, in the context of the Kyoto Protocol which had come into effect in February 2005, Mexico, at that time, was the world's ninth largest greenhouse gas (GHG) emitter. Consequently, the development of the country's renewable energy potential was an important component of a national strategy to reduce GHG emissions and commit the country to specific climate change goals at the Conference of the Parties, 14th meeting in Poland in December 2008.

2. **Sector context**. At the time of appraisal in 2006, the two main sector institutions with responsibility for the development of Mexico's electricity sector were: (a) Ministry of Energy (*Secretaría de Energía,* SENER), which was responsible for energy sector planning as well as for policy formulation in the sector; and (b) the state-owned power company, Federal Electricity Commission, (*Comisión Federal de Electricidad,* CFE), which was responsible for generation, transmission and distribution of electricity. In addition, the Energy Regulatory Commission (*Comisión Reguladora de Energía,* CRE) was responsible for regulation and oversight of the electricity subsector[2].

3. Historically, the Mexican electricity system had been dominated by a single, state-owned entity (CFE), which provided electricity to 95 percent of the population; CFE also owned approximately 75 percent of the country's installed capacity. Despite CFE's near monopoly presence in the sector, there had been a steady increase in investment in new capacity since 1990 provided by independent power producers (IPPs), which generated power for self-use as well as for sale to CFE under long term contracts. By 2009, IPPs represented approximately 23 percent of total installed capacity and generated 32 percent of total electricity[3].

4. The potential for renewable energy development in the country was considerable. However, the development of the country's renewable energy potential had been constrained by CFE's preference to develop large scale investment projects based on natural gas as well as to use least-cost criteria to prioritize its investment options. The need for large scale investments to meet the growing demand of Mexico's population together combined with the lack of incentives to

[2] The entire Mexican energy sector was re-shaped by a major reform supported by the Federal Administration in 2013, which among other changes, opened up generation and distribution to the private sector.

[3] The IPP and the generation for self-use figures were introduced by an earlier energy reform supported by the Federal Administration in 2008. In the first case, the IPP would sell its entire energy production to CFE, whereas in the second case, a cluster of companies would partner to buy electricity from another private investor.

promote the development of its own renewable energy potential had resulted in the development of only 2 MW of grid-connected wind power at the time of project preparation[4].

5. With a view to further promote the development of renewable energy sources, the Government had taken two recent policy initiatives: (a) a provision for accelerated depreciation, which allowed 100 percent investment in renewable energy technologies to be eligible for depreciation in the first year, starting in January 2005; and (b) a proposed Renewable Energy Law (and later enacted in 2008)[5], the purpose of which was to (i) define a range of methodologies and dispatch conditions that better captured the contributions of energy derived from renewable sources; and (ii) set up a domestic financing mechanism, that is, '*Fondo Verde*' (Green Fund) to further support the development of renewable energy.

Rationale for Bank Involvement

6. World Bank involvement in this operation, using funds from the Global Environment Facility (GEF), coincided with two important changes that were taking place in Mexico's energy sector. *First*, an active policy dialogue was underway within the Government on the importance of diversifying future power sector investment away from the country's high dependency on fossil fuels toward a strategy focused more on developing Mexico's significant renewable energy potential, particularly its wind energy resources; the World Bank's active involvement in this dialogue helped consolidate a consensus around a new energy diversification strategy. *Second*, within the Mexican Government, a consensus had been steadily formed with regard to the need to commit to national climate change goals. Both these changes in policy direction provided the World Bank with an opportunity to support Mexico's transition to a more diversified energy development strategy and to strengthen national commitment to bringing about a reduction in the country's significant emissions of GHGs.[6]

7. The rationale for World Bank involvement was, therefore, strong. First, it was able to bring its extensive past experience in power sector reform to the discussions underway within the Government. Second, it was also able to bring to the policy dialogue recent examples of international best practice in developing renewable energy resources, highlighting in particular the incentives needed to attract private investment capital for the development of Mexico's considerable wind energy potential. Finally, the availability of different lending instruments such as the GEF enabled the World Bank to use its broad experience in developing a market for renewable energy while limiting its financing involvement to a modest amount, in line with the stated goals of the World Bank's Country Partnership Strategy (CPS) of April 2004, i.e. Promote development in harmony with nature and the environment, and in particular in support to Pilar 4: Promote Environmental Sustainability.

[4] La Venta I, a CFE grid-connected, demonstration project.
[5] The Law for the Use of Renewable Energy and the Energy Transition Financing *(Ley para el Aprovechamiento de las Energías Renovables y el Financiamiento para la Transición Energética*, LAERFTE), was approved in 2008 and later replaced by the Electric Industry Law, which was published in 2014 after the major energy reform of 2013.
[6] At the time, Mexico was the 9th largest emitter of GHG while CO2 emissions increased by 23 percent between 1990 and 2000.

High Level Objectives to which the Project Contributes

8. The project made a number of specific contributions to higher level objectives that were an integral part of the World Bank's CPS of April 2004. First, supporting environmental sustainability was a basic objective of the World Bank's presence in Mexico. Second, the provision of important public utility services, without the need for budget support, was also critical for sustaining further development of the country's energy sector. Finally, improving the business climate in Mexico through attracting private capital to support the development of the country's energy resources was also a CPS objective to which the project contributed.

1.2 Original Project Development Objective (PDO), Global Environment Objectives (GEO) and Key Indicators

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

10. The GEO was to reduce GHGs emissions by addressing and reducing the barriers to the development of grid-connected renewable energy technologies and markets in Mexico.

11. The key GEF global performance indicators were the following:

- Total electricity generated (GWh/ per year.) from renewable energy
- Total renewable energy generation capacity (MW)
- Emissions reduced (tons/ per year): CO2, NOx, SOx, and particles
- Renewable energy barrier removal as indicated under the key outcome indicators below, that is, Institutional Capacity;

12. The key outcome indicators were the following:

- A successful IPP tender, including CFE reference price and GEF tariff support, resulting in the construction and operation of a 100 MW wind farm;
- Institutional capacity sufficient to issue subsequent tenders for additional wind farms/other renewable energy resources at a higher reference price and/or lower incentive support level (GEF or other);

1.3 Revised GEO (*as approved by original approving authority*) and Key Indicators, and reasons/justification

13. The GEO was not changed. Only the PDO was amended in the legal documents during the first project restructuring (June 2013) to make it identical to the PDO in the Project Appraisal Document (PAD). However, revisions were made to the target values of two of the key GEO indicators during a Level II Project Restructuring in May 2014. Both targets were revised downwards to reflect the fact that the capacity factor of the La Venta III wind farm was lower than had been estimated at appraisal. As a consequence, the forecast yearly production of the plant was reduced from an original target of 376.9 GWh to 270.3 GWh. Similarly, the original emissions reduction target was reduced from 247,000 tons per year to 166,769 tons per year. In addition, two core indicators were included: (a) Generation Capacity of Renewable Energy (other than hydropower) Constructed and (b) Generation Capacity of Renewable Energy Constructed - Wind.

1.4 Main Beneficiaries

14. The direct beneficiaries of the project were CFE and SENER, whose institutional capacities benefitted from the technical assistance (TA) components of the GEF operation; the indirect beneficiaries were the electricity consumers in Mexico. This first, large scale, commercial wind development project laid the basis for further private sector investment in IPPs based on wind resources. Since then, power generation based on renewable energy has expanded significantly over the past decade (approximately 3,000 MW of installed capacity by the end of 2015, according to the Mexican Wind Power Association (*Asociación Mexicana de Energía Eólica, AMDEE)*. The main benefits for the country have been to diversify new investment in power generation away from an almost exclusive dependence on fossil fuels to power generation based on renewable energy sources, in particular wind energy. In addition, there has been an important global benefit in reducing the growth of GHGs emitted by Mexico.

1.5 Original Components

15. The project comprises *three* main components, which are detailed below.

Component 1: **Financial Mechanism**

16. This component aims to stimulate organizational learning and cost reduction by providing US$20.4 million in energy production incentives on an output-based aid basis (US cents 1.1 per kWh for the first five years of generation) offered in response to a CFE competitive solicitation for 101 MW of IPP wind power.

Component 2: **Technical Assistance**

17. The activities supported by this component are the following:

(a) **System-based least-cost determination.** It comprises analytical and methodological activities designed to enhance the value of renewable resources within the CFE system and determine reference prices.

(b) **Integration of renewable energy in System Operations**. Modeling capabilities and associated training within CFE and dispatch operations for improved technical integration of renewable energy.

(c) **Project and Business Development.** Development of protocols and capabilities to strengthen SENER's capacity to serve as a 'one-stop shop' for prospective renewable energy developers and design renewable energy-tradeable permit systems.

(d) **Wind potential assessment**. Development of a national wind resource map and provision of measuring and monitoring equipment.

(e) **Regional plan for the Southern Isthmus of Tehuantepec.** Preparation of a long term wind development plan for this area of Mexico, including a regional environmental assessment, and other related studies.

Component 3: **Project Management**

18. This component was designed to strengthen the management capacity of SENER.

1.6 Revised Components

19. None of the original project components, or sub-components, were revised or dropped from the project scope. However, the project underwent *three* Level-II restructurings, described in detail in section 2.2.

1.7 Other significant changes

20. The tariff subsidy was increased from US cents 1.1 per kWh to US cents 3.9 per kWh during the third project restructuring in March, 2015 to enable the project to disburse all the funds allocated for such a purpose by the closing date of April 30, 2016, without changing the total remuneration of the original contract with the IPP (see paragraph 32). This tariff increase would compensate for the earlier delays, which occurred during the procurement process for the wind farm, which, in turn, resulted in delays in the commissioning date. There were no other significant changes made to the project during the implementation period. An amount of US$250,000 from the original US$25 million GEF grant was cancelled following the April 30, 2016 closing date, mainly due to the appreciation of the US dollar against the Mexican peso in recent years.[7]

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

21. Project preparation of the GEF grant started in 2003. The Project Concept Note was reviewed in March 2003. Project appraisal took place three years later in May, 2006, followed by Board approval on June 29, 2006. The GEF grant became effective on April 18, 2007. The main reasons for the lengthy preparation period were (a) the proposed first investment in wind energy on a commercial scale was not least cost and presented constitutional difficulties for CFE , which needed to be overcome; (b) this was one of the first operations for SENER, with a development bank, hence it took time to assess SENER's administrative capacity in the area of renewable energy as well as familiarize SENER with the World Bank's *modus operandi*; and (c) the World Bank's regional management was initially hesitant to process the GEF project preparation grant as a World Bank-executed grant because of perceived risks associated with the retention of fiduciary responsibility. One benefit of the long preparation period was the strengthened commitment to the main project development objective on the part of CFE and SENER, which turned out to be a key factor in achieving the first successful IPP development based on wind energy.

22. **Soundness of the background analysis**. Considerable attention was devoted to undertaking a detailed background analysis of Mexico's energy sector during project preparation during the three-year period from concept review to board approval. At the time, Mexico's energy sector was at crossroads and its future development called for radical though politically difficult policy changes. First, domestic oil production was declining and fossil fuel imports were steadily growing, placing increased pressure on the country's balance of payments. Second, while domestic energy reform measures were underway, power supply, transmission, and distribution remained

[7] Project expenses were incurred in Mexican pesos and later reimbursed by the World Bank using the exchange rate at the time of expense effectiveness.

an exclusive right of the state, with private investment limited to self-generation schemes of no more than 20 MW. Third, Mexico's considerable renewable energy potential –in wind energy, small hydro, and geothermal- was well established but remained undeveloped, lacking the needed incentives to attract private investment capital. *Finally*, Mexico, as the world's ninth largest emitter of GHGs, had recently made commitments to mitigate its GHG emissions under the Kyoto Protocol. These issues formed the sector backdrop to the GEF operation.

23. The World Bank had been gradually establishing a close working relationship with Mexico, encouraging the Government to embark on a strategy of energy sector diversification and to develop its renewable energy potential. In this regard, the World Bank was well positioned to bring its practical experience elsewhere-in power sector reform, renewable energy technologies, the development of markets for renewable energy, and in mobilizing the emerging financing potential from carbon mitigation schemes-to support Mexico's first significant development of its renewable energy potential.

24. **Project design.** The limited progress made in developing the country's renewable energy potential had a major influence on the project design. At the time of project preparation, it was important for Mexico to take a significant, 'demonstration,' step in developing its renewable energy potential by attracting an established international private company to invest in a commercially based, grid-connected wind energy development; in addition, it needed to build up sufficient institutional capacity to manage the further development of its renewable energy potential. The project design addressed both these objectives. The project's first component provided a financial mechanism, which addressed the main policy and tariff issues hindering the development of large-scale renewable energy, specifically wind energy. The inclusion of a financial mechanism to provide tariff price support was based on different experiences in developing wind energy in Europe as well as in California. The project's second component addressed the need for a strengthened institutional capacity within the main sector ministry, SENER, while also providing funds to address other barriers to renewable energy development more broadly and to support the business development aspects of renewable energy. In summary, the project design was sound and well targeted to provide a single, key incentive, that is, tariff support, for potential investors; it was also efficient in the sense that the project required only modest funds. Finally, the decision to design the project initially in two phases -of US$25 million and US$45 million, respectively- was also prudent, given the uncertainty at the time in terms of investor response to develop Mexico's wind energy potential.[8]

25. **Government commitment.** The Government was strongly committed to the main project objective of developing commercially based, grid-connected renewable energy applications through the construction of IPP wind farms. At the time of project preparation, a significant shift in the country's energy development strategy was underway, the main elements of which comprised (a) energy diversification away from fossil fuels; (b) incentives to attract increased private sector investment; and (c) development of the country's significant renewable energy potential. A measure of the Government's commitment to reduce existing barriers that were impeding the development of renewable energy was the enactment of two policy initiatives in 2005 at the time of project preparation (a) a provision for accelerated depreciation to enable 100 percent

investment in renewable energy technologies eligible for depreciation in the first year; and (b) a draft Renewable Energy Law [9]affecting, among others, dispatch conditions and designed to better capture the contributions made by energy provided from renewable sources. In addition, the Government had made a strong commitment to reduce its GHG emissions, a commitment that went beyond its obligations under the United Nations Convention on Climate Change. The development of its renewable energy potential was a key factor underlying the realization of this commitment.

26. **Assessment of risks**. During preparation, several risks to the development outcome were identified and specific steps proposed to mitigate these risks. Four of the identified risks were rated 'substantial' and included (a) a loss of political commitment; (b) difficulties in arriving at an agreed base tariff and being able to bridge the incremental costs with the available GEF funds; (c) a failed bid from any private sector party; and (d) lack of a competitive response from private sector bidders. Potential risks due to bird mortality- a possible consequence of which would have been to shut down the wind farm at times of peak bird migration- were also identified and rated as 'Modest'. The different risk mitigation measures were pragmatic and clearly identified. The overall project risk rating was 'Substantial', an appropriate rating given the untested market for investing in the development of Mexico's wind energy potential, the limited development of the country's renewable energy potential at the time, and political uncertainty regarding the longer-term sustainability of Government commitment. Overall, the risks were thoroughly assessed and the proposed mitigation measures were reasonable.

27. **Quality at Entry.** No Quality at Entry review was carried out by the World Bank for this GEF operation.

2.2 Implementation

28. Implementation covered a 10-year period, starting in June 2006 after Board approval and ending in June 2016, when the last GEF disbursement was made. The project implementation period had been initially planned from August 2006-August 2009, with disbursements continuing through to mid- 2013; the original closing date for the GEF grant was June 30, 2014 but was later extended by 22-months to April 30, 2016, to enable full disbursement of the tariff subsidy component. The project implementation period envisaged an initial bidding and construction period of three years for the wind farm plant (101MW), followed by a 5-year 'operational' period of the plant during which the targeted tariff subsidy of US cents 1.1 per kWh would be disbursed-starting in mid-2009 and continuing to mid-2013. The TA component of the GEF grant were expected to be implemented, and the corresponding funds disbursed during the first three years after board approval.

29. The planned implementation period of three years for bidding and construction was delayed. Only two bidders (from an initial group of 14 who had expressed interest) submitted proposals to the first bid request, because of a high demand for wind turbines globally.

[8] A planned Phase II for the project was not needed since investor response to the tariff incentive provided in Phase I was successful, despite initial delays, and has been followed by a rapid development of Mexico's wind energy potential over the past few years, which has not needed a similar incentive.

[9] Later approved in October, 2008

Subsequently, only one of these bidders met the technical requirements but its price proposal exceeded the maximum specified tariff (in US cents per kWh). Consequently, the bidding process had to begin again, with increased flexibility in regard to the permissible tariff. The second bidding process began in July 2008 and was completed in February 2009. Two pre-qualified firms presented bids and a contract was subsequently signed in June 2009 with the lowest bidder, which had offered a 'levelized' generation price of US cents 9.8 per kWh. The contract signing marked a critical step forward toward the development outcome since a contract had now been signed with an international power company with extensive experience in the development of wind energy, which was now contractually committed to develop, and market, Mexico's wind energy potential in this region of the country.

30. Construction of the wind energy plant took two years and the plant became fully operational in October 2012. During construction, considerable attention was given to safeguards supervision, in particular to social safeguards which are discussed further in section 2.4. The early operational data from the plant during the first three years of operation indicated that the plant was operating at a capacity factor of around 30 percent, significantly lower than had been forecast during appraisal, which was above 40 percent. This early operational data provided the basis for a restructuring of the tariff subsidy- from US cents 1.1 per kWh to US cents 3.9 per kWh- to enable full disbursement of the subsidy before the extended closing date of April 30, 2016.

31. **Midterm review (MTR)**. The MTR for the project took place in July 2013 and was timely since the La Venta III wind farm had already started operations and there was now a need to make a number of adjustments. Since Board approval in 2006, the project had suffered a number of delays due to: (a) a lengthy bidding process (2007-2009) followed by a two year construction period for the La Venta III wind farm (2010-2012); (b) administrative difficulties in enabling the main sector ministry, SENER, to access the TA funds; and (c) delays in processing the first project restructuring to enable payments to be made by CFE directly to the IPP. The MTR reviewed the following issues: (a) the need to adjust the target indicator values for electricity generation and emissions reductions to reflect the actual data from the wind plant during its first year of operation; (b) make changes to the content of the TA component to reflect current priorities within SENER; (c) extend the closing date for the GEF grant to compensate for the observed delays; and, finally, (d) to give increased attention to safeguards supervision in a project area prone to social conflict, and in particular to (i) enable environmental monitoring of birds and bats mortality throughout the year and (ii) prepare a Strategic Environmental and Social Assessment (SESA), which had been identified as a mitigation measure but had yet to be implemented. The review of these issues led to further project restructurings, adjustments to the specific target values, an extension of the closing date by 22 months, and a sustained supervision effort over the remaining period of implementation.

32. Implementation of TA components of the GEF grant was slow. Three years after the GEF grant was approved, no disbursements had been made and discussions continued within SENER, the main beneficiary, in regard to the most effective use of these funds. Part of the delay can be attributed to the earlier delays and uncertainties in the outcome of the bidding process for the IPP wind energy plant. At the same time, the amount of funding allocated for TA, that is, almost US$4 million, appeared to exceed the absorptive capacity of SENER at the time. In addition, SENER took time to assume full ownership of the funding while administrative budget limits within SENER- which did not appear to have been anticipated during appraisal-constrained the transfer

of GEF funds between the Ministry of Finance and Public Credit (*Secretaría de Hacienda y Crédito Público,* SHCP) and SENER, leading to further delays in implementation.

33. Notwithstanding these early delays, productive use was made of the TA funding before closing and the TA activities continued to remain relevant in support of the development of wind energy in Mexico. First, the TA helped Mexico address and remove the barriers to clean energy development. Then, a SESA was carried out to examine the more important social, economic, environmental impacts of wind energy development in the region. Despite delays in completing the SESA, it will have an important impact during the next phase of wind energy development in Mexico until 2022. In addition, a long term wind development plan was prepared for the Isthmus of Tehuantepec region, where most of the country's wind energy development was taking place. By project closing, installed wind capacity had reached 3,000 MW and is forecast to increase to 15,000 MW by 2022. Finally, funds were used to purchase the acquisition of wind speed metering stations, and software licenses to evaluate the impact of renewable energy on Mexico's power system planning and operation. Collectively, and despite the early delays, the studies and equipment acquisitions were a productive use of the TA funds.

34. **Supervision reporting.** Over the lengthy implementation period from 2006 to 2015, supervision missions visited Mexico, including the project development area in the state of Oaxaca, on average, about twice a year. The first supervision mission took place in July 2011 with the final supervision mission taking place in the first half of 2016. During the last five to six missions, the focus was on the remaining GEF component of the project (that is, Component 2, Technical Assistance and Institutional Strengthening). Overall, there were 21 Implementation Status and Results Reports (ISRs) completed during project implementation. Staff responsibility for supervision was shared between Washington, DC and Mexico C*ity.* The key GEO and implementation progress (IP) ratings were rated 'Satisfactory' for the first three ISRs. Following the failure of the first bidding process in May 2009, both the development objective and IP were downgraded to Moderately Unsatisfactory, reflecting uncertainty as to whether a qualified private company could be attracted to invest in the development of the country's first commercial wind energy development and delays in implementing the TA components. As a result, the project became a 'problem project'. However, following the success of the second bidding process, the development objective was upgraded to Moderately Satisfactory. Later, in 2013, the IP was again downgraded to Moderately Unsatisfactory, due to continuing, unresolved delays in implementing the TA component of the project. However, GEO and IP were rated 'Moderately Satisfactory' in ISRs 17-19, given the sustained progress on both the tariff subsidy and the TA components. Finally, the GEO and IP rating were rated 'Satisfactory' in the final ISR since most of the funds were either disbursed or committed, and the project was on track to meet all of its targets.

35. **Project restructurings.** Three Level II restructurings took place during the course of implementation. The first restructuring was on June 11, 2013, and transferred the responsibility from *Nacional Financiera*, (Mexico's Development Bank) to CFE to make payments to the IPP, which was building and operating the wind farm. The restructuring also amended the PDO in the legal documents to make it identical to the PDO in the PAD, which included the approximate capacity of the wind farm, that is, 101 MW being supported and built. A second Level II restructuring took place on May 12, 2014, which (a) extended the project's closing date by 22 months from June 30, 2014, to April 30, 2016; (b) reallocated approximately US$2.1 million of funds for consultants' services and for training and operating expenses to the purchase of goods,

in particular wind profile and oceanographic metering stations as well as for software licenses; and (c) made revisions to the target values of the project's indicators based on the results from the first year of operation of the plant. The third, and final, Level II restructuring took place on March 21, 2015, and amended the project's Grant Agreement through an increase in the subsidy to the tariff for the operation of the La Venta III wind farm from US cents 1.1 per kWh to US cents 3.9 per kWh. This increase in the subsidy to the tariff did not modify the aggregate subsidy amount being provided through the GEF grant but enabled the total subsidy allocated under the main component (Component 1) to be disbursed by the closing date, given the reduced annual generation from the La Venta III wind farm than had been forecast at appraisal.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

36. **M&E design.** A comprehensive set of indicators was chosen to monitor progress toward achievement of both the global environmental and project development objectives. The main GEO outcome indicator was the emissions reduction of *CO2, NOx, SOx*, and particles in reference to an agreed baseline. The main PDO indicators were: (a) increase in electricity supplied to the national network from renewable energy sources against an agreed baseline, measured in GWh per year; and (b) increase in total installed renewable energy capacity against an agreed baseline, measured in MW. In addition, two further indicators were selected to monitor progress being made in the reduction of barriers to the development of commercially-based and grid-connected renewable energy: (a) establishment of a CFE system reference price together with an agreed GEF tariff subsidy sufficient to attract commercial bids; and (b) progress of plans for a higher reference price/lower tariff subsidy still able to attract commercial bids for renewable energy development. Overall, the choice of the main outcome indicators was sound and broadly based and enabled an effective annual monitoring of progress towards both the GEOs and the PDOs.

37. A large number of intermediate indicators was also chosen. Their main purpose was to monitor readiness to move to a possible Phase II of the project; some of these intermediate indicators were already steps in the Phase I bidding process and could have been simplified. Intermediate indicators were also included to monitor the impact of the wind power development on sensitive social safeguards during project implementation such as fairness of compensation payments being made to small landowners and the effectiveness of mitigation measures to reduce avian and bat mortality as a result of the wind towers; these intermediate indicators were important in helping monitor compliance with key social and environmental safeguards.

38. **M&E implementation.** Responsibility for results monitoring of the main project component, that is, Component 1, was shared between CFE and SENER. CFE had the main responsibility for data collection, in particular generation data, which was the basis of payments made to the IPP. SENER had primary responsibility for the calculations of reduced emissions and for the preparation of progress reports. The monitoring performance of these Government agencies throughout the implementation period was *'Satisfactory'.* As noted in section 2.2 above, the monitoring data was used at the time of the MTR to make adjustments to the target indicator values for electricity generation and emissions reductions to reflect the actual data from the wind plant during its first year of operation.

39. **M&E Utilization.** The monitoring data obtained during the first year of operation of the La Venta III wind farm was used to make adjustments to the original quantitative target values. These targets had been based on a higher assumption for the capacity factor of the plant, that is,

42 percent versus an actual capacity of 30 percent, and did not have the benefit of the actual operational performance of a wind plant in this region. As a result, the first-year data was used to provide a more realistic forecast of the plant's future operational performance and, therefore, the future flow of tariff subsidy payments.

2.4 Safeguard and Fiduciary Compliance

(i) Safeguards

40. During preparation, it was expected that the project would trigger the following safeguard policies: Environmental Assessment (OP/BP/GP 4.01); Natural Habitats (OP/BP 4.04); Indigenous Peoples (OP/BP 4.10), given the location of the wind plant in a region of Mexico with a high proportion of indigenous peoples; and Cultural Property (OP 4.11), dependent on the specific location of the plant, which was not known at the time of preparation before the outcome of the bidding process.

(a) Environmental

41. The main environmental impact expected as a result of the construction of La Venta III wind farm was the potential collision of birds (both local and migratory) and bats with the wind towers. Because the specific area of the Isthmus of Tehuantepec was already recognized as an important corridor for migratory birds, a number of consultative and procedural measures had been agreed during preparation to minimize the impacts on both bird and bat populations.

42. Compliance with environmental safeguards was closely monitored throughout supervision. At the World Bank's request, monitoring of the wind plant's impact of bird mortality was extended to include the entire year, not just the migratory seasons; it was also extended to include the monitoring of bat mortality. The Institute of Ecology (*Instituto de Ecología A.C.*, INECOL) was hired by the IPP to monitor the wind plant's impact on bird mortality, and its contract will continue for a further two years beyond the closing date until 2018. The findings to date indicate that both bird and bat mortality are in line with data from other regions in the world, and was recently adjusted to reflect an under-counting phenomena, which is typically reported in the literature. The safeguard rating was used effectively to help ensure compliance when there were delays in submitting data or corrections needed to be made in mortality counts, as occurred, for example, in 2015 to be in compliance with the Natural Habitats safeguard policy. Finally, the methodology used for updating estimates of bird and bat mortality (including the undercounting effect) is an example of best practice, with applicability not only in Oaxaca but in other regions of Mexico where wind energy is being developed. The World Bank's supervision of this safeguard was 'Highly Satisfactory'.

(b) Social

43. The social impacts of the investment in the wind energy plant were also carefully monitored during supervision and exhibited many aspects of good practice. Even though the World Bank did not have a financing presence in the construction of the plant, regular updates on payments to landowners for land use as well as contributions to the municipality's social program were provided to the World Bank supervision team by the IPP, and reviewed by the World Bank's social specialist. The social investment program undertaken by the IPP, which comprised a number of infrastructure works beneficial to the nearby community (expansion of a high school facility, construction of a playground, equipment for a community gym, and

pavement, water and sewage works), and the social approach adopted by the IPP involving a continuous consultation process with the affected landowners and municipal leaders, was exemplary. It has set a standard to be followed by other companies developing wind energy in the Isthmus. The key to its effectiveness was strong and sustained commitment to the social concerns of the immediate community as well as the deployment of an experienced social team devoted to these tasks and able to offer assistance and guidance at a local level on a daily basis.

44. The construction of a 10 km transmission link from La Venta III wind farm to the main transmission grid during implementation raised the possibility that the Involuntary Resettlement safeguard policy (OP/BP 4.12) would be triggered. However, following a field visit in February 2011, during which several landowners affected by this link were interviewed, the World Bank concluded that this safeguard policy was not triggered because the transmission line involved the voluntary imposition of easements.

45. With regard to OP 4.10, Indigenous Peoples, an Indigenous Peoples plan was prepared and consulted locally in July 2012 to be in compliance with this safeguard requirement. Overall, World Bank supervision of social safeguards was 'Highly Satisfactory'.

Fiduciary

(a) Financial

46. A Financial Management Assessment (FMA) was undertaken before Board approval and the project financial management (FM) risk was rated as 'Modest'. Even though neither CFE nor SENER had prior experience managing a World Bank project, their financial systems were considered acceptable. Also, *Nacional Financiera* (NAFIN) was able to provide implementation support and oversight based on its own extensive experience as a financial agent in World Bank financed projects.

47. World Bank supervision of the project's FM aspects was satisfactory overall. The FM arrangements within SENER were closely supervised and the FM rating for most of the supervision period was Satisfactory. However, toward the end of project implementation, some of the concerns that had been raised in the 2014 external audit with regard to strengthening internal controls within SENER during the procurement planning and budgeting process had still not been addressed ,and the FM rating was downgraded to 'Moderately Satisfactory' in the final ISR as a result.

(b) Procurement

48. There were two main procurement activities under the project: (a) the selection of the IPP to construct the wind plant, which was undertaken using CFE international bidding procedures acceptable to the Bank (under paragraph 3.13(a) of the World Bank's 'Guidelines: Procurement of Goods, Works, and Non-Consulting Services Under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' dated January 2011); (b) the acquisition of wind measuring systems and other specialized equipment, specialized software, and studies and consultancy services, which were to be procured using either International Competitive Bidding (ICB) and National Competitive Bidding (NCB) procedures or in accordance with the World Bank's 'Guidelines: Selection and Employment of Consultants Under IBRD Loans and IDA Credits & Grants by World Bank Borrowers' dated January 2011.

49. As already noted in section 2.2, the selection of the IPP required two bidding processes, the second of which resulted in the selection of a qualified and experienced international company. However, when the procedures followed by CFE were later reviewed by the World Bank's Operations Procurement Review Committee (OPRC), it was found that they were not fully in agreement with World Bank requirements and a waiver had to be granted in May 2009. The waiver was granted on the basis of several considerations, which included: (a) the reasonableness of the price offered; (b) the strong likelihood that a further rebidding would result in a higher price; and (c) the strategic importance of developing wind power for the energy.

50. Overall, procurement issues were carefully supervised by the World Bank. As was the case for FM, the procurement supervision benefitted from the presence of specialists in the country office during the later years. The procurement rating was maintained as 'Satisfactory' throughout implementation until the final few months when a procurement ex-post review, carried out in March 2016, showed there were some irregularities in the final few months of implementation, which included contracts still in process, some of which lacked a signed contract. As a result, the project's procurement rating was downgraded to 'Moderately Satisfactory'.

2.5 Post-completion Operation/Next Phase

51. The original GEF operation envisaged a two-phase approach to address the policy and tariff issues impeding the development of renewable energy in Mexico. A US $45 million Phase II had been planned to support further cost reduction steps that might still be needed to continue supporting the development of wind and other renewable energy technologies. However, with the success of Phase I in supporting the development of the first commercial, grid-based wind energy plant in Mexico, Phase II became unnecessary.

52. The 101 MW wind energy IPP started operating in October 2012, supported by a tariff subsidy financed under Phase I. As discussed in paragraph 21, the tariff subsidy was an important element of the project design in attracting private investment. In effect, Phase I served as a 'demonstration' project, which has since helped catalyze a remarkable development of the region's wind energy potential; it has also helped spur similar wind energy developments in other regional areas of the country. Over the period 2008-2015, the installed capacity in wind energy commercial plants in the Isthmus region of Mexico increased more than ten-fold - from less than 200 MW to over 2,350 MW- as a result of more than US$9 billion in private investment. By 2018, the region's installed capacity in wind energy is forecast to increase further -to over 5,000 MW. The Mexican Wind Power Association (AMDEE) estimates that additional 12,000 MW could be installed throughout the country between 2020 and 2022.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Rating: High

53. **Relevance of the project objectives.** The main PDO directly supported the Government's policy goal of developing its renewable energy potential. The GEO was also closely aligned with the Government's commitment to reduce the country's overall emissions of GHGs. Government commitment to these objectives strengthened considerably during implementation. *First*, a renewable energy law was approved in 2008 (Law for the Use of Renewable Energy and Energy Transition Financing, LAERFTE), which was a major policy commitment underpinning the rapid

development of the country's wind energy potential during implementation, mainly because it promoted the creation of financing instruments (such as the Fund for the Energy Transition and the Sustainable Use of Energy, FOTEASE) to support renewable energy research and promotion. *Second,* in the area of climate change, the Government published in 2012 the Climate Change Law (*Ley General de Cambio Climático, LGCC*) and has committed itself to a National Climate Change Strategy (*Estrategia Nacional de Cambio Climático, ENACC*), which is now an integral component of its national development policy. In addition, it set a number of emission reduction targets, including an electricity-related emissions reduction goal of 14 to 28 MtCO2 by 2012. Finally, as a longer term goal, it set the formal objective of reducing GHGs by 50 percent by 2050 against a baseline of 2000. With regard to the World Bank's ongoing partnership with Mexico, the project remains aligned with the 2014-2018 CPS, specifically to Theme 4, Promoting Green and Inclusive Growth, by supporting efforts to (a) reduce the footprint of growth, (b) promote a low-carbon economy, (c) contribute to the reduction of GHG emissions, and (d) contribute to energy security by diversifying the energy matrix composition.

54. **Relevance of project design**. The specific project design was fully in line with the ongoing World Bank's CPS at appraisal (April 2004), and it remains aligned with the World Bank's recent country strategy for Mexico[10], where the Bank's main value added was in 'helping Mexico achieve better development effectiveness ….through improved policy and project design'. The project design incorporated lessons from the experience of other countries in developing wind energy. The design was also innovative in the sense that the main component focused on providing a single, key incentive, that is, tariff support during the initial years of operation, to help overcome the entry risks to private investment in renewable energy development. The second project component complemented the main component, providing funding for TA and project management to address particular policy barriers impeding further development of renewable energy; it also provided project management support to the sector ministry, SENER, to strengthen its administrative and monitoring capacity in renewable energy development. Overall, the project design was highly relevant, well targeted, and provided an essential incentive, namely tariff support, while, in parallel, building up a basic institutional capacity to monitor the development of Mexico's wind energy potential.

55. The overall project implementation arrangements were sound. Four Government entities were involved in these arrangements: (a) SHCP was the official recipient of the GEF grant; (b) NAFIN was the financial agent for the project and provided overall FM of the project; (c) CFE, the national power company, had the main responsibility for the bidding of the IPP for the La Venta III wind farm, evaluating the proposals received, and executing the power purchase agreement with the winning bidder; and (d) SENER as the main sector ministry responsible for project monitoring, evaluation and reporting. The institutional arrangements balanced effectively two Government entities, that is, SHCP and NAFIN, having extensive experience with World Bank operations, with two sector entities, CFE and SENER, which were essential for the implementation of the project but which lacked prior experience with World Bank- or GEF-financed operations. Finally, the three project restructurings made an important contribution to retaining the relevance of the project objectives and the realism of the target indicators, given the

[10] County Partnership Strategy, April 2014

limited operational knowledge at the time of preparation regarding the wind potential of this region of Mexico.

3.2 Achievement of Global Environmental Objectives

Rating: Substantial

56. The main GEO- namely, to reduce GHG emissions and remove barriers to the development of renewable energy technologies–were achieved. The project met all the targets for its global environmental objective indicators as summarized in table 1. The project also played a key role in catalyzing a major expansion of wind power in Mexico, and in particular, in the Isthmus of Tehuantepec, since it was the first IPP on a commercial scale. It has also helped build up significant institutional capacity within CFE and SENER to monitor, evaluate, and further promote the development of wind power, in line with the project development objective. Subsequently, following the energy reform in 2013, the Government addressed barriers impeding the development of other renewable energy sources such as geothermal, biomass and other clean technologies. Based on the above considerations, the achievement of the global environmental objectives is rated 'Substantial'**.**

57. Table 1 summarizes progress made toward the most important GEOs and PDOs.

Table 1. Achievement of the GEO and the PDO

Project Outcome Indicator	Baseline	2013	2014	2015	End Project Target	% Achieved
GEO 1. Increased electricity supplied to national system from renewable energy sources (GWh/year)	7.36	254.53	282.41	287.84	**270.3**	106.5 in 2015
GEO 2. Increased total installed renewable capacity (MW)[11]	2 (wind)	n.a.	n.a.	102.85	**101**	101.83
GEO 3. Emissions reduced (tons CO_2e/year)	0	157,044	174,248	177,594	**166,769**	106.5 in 2015
GEO 4. Barriers to wind energy development removed	Establish reference price; issue bid tenders	-	-	-	Barriers removed	Barriers greatly reduced
PDO 1. CFE system short run marginal cost based reference price is sufficient to attract bids.	No reference price in place	-	-	-	CFE Reference Price System established	CFE Reference Price System operating
PDO 2. Subsequent POISE includes plans for additional IPP wind procurement.	None	-	-	-	Greater than one wind plant	Exceeded 8 new wind plants will start by 2019

58. As a result of the revisions made to the end project target values during the second restructuring in May 2014, a split-evaluation methodology was carried out. The project outcomes

[11] Commissioning of the La Venta III wind farm contributes to achieving, or exceeding, targets for GEO indicators 2, 5 and 6, as well as PDO indicator 1 and numerous intermediate outcome indicators (which comprise PDO indicator 3). Other intermediate outcome indicators are achieved through the set of TA activities whose detail can be found in annex 2. Details for achievement of every GEO and PDO indicator can be found in section F.

were assessed against two phases of the operation: (a) project effectiveness in April 2007 to the May 2014 restructuring, which included changes to two GEO indicators, and (b) from May 2014 to project closing in April 2016. The results are shown in table 2. Based on these results, the overall achievement of the GEO is rated 'Satisfactory'.

Table 2: Results of the split evaluation[12]

	Pre-May 2014 Restructuring	May 2014 Restructuring - closing	Overall
GEO Rating	Moderately Satisfactory	Satisfactory	**Satisfactory**
Rating value	4	5	**5**
Weight[13]	23.30 percent	76.70 percent	**100 percent**
Weighted value	0.93	3.84	**4.77**

3.3 Efficiency

Rating: Substantial

59. An ex-post economic and financial analysis of the project was carried out to evaluate the efficiency of the project and verify its financial and economic viability as presented in the PAD. The economic analysis looked at the costs and benefits accruing to Mexico, including not only the actual values related to capital equipment and operating costs but also the monetized environmental benefits. The financial analysis compares the costs and benefits from the perspective of the IPP.

60. **Economic analysis**. For the purposes of this analysis, the economic benefits of electricity generation are calculated as the avoided cost of generating electricity using other options, in particular fossil fuels. During appraisal, the estimated avoided cost of generation was US$0.05 per kWh, based on an estimated crude oil price of US$46 per barrel. Although the oil price dropped to as low as US$43 per barrel in 2016, the average oil price since the plant came into operation in 2012 has been US$80 per barrel. The analysis also takes into account World Bank forecasts of a steady oil price increase in the coming years of minimum 5 percent a year.[14]

61. The main economic costs of the wind energy project are: (a) investment cost of the plant (US$184 million compared to the estimated cost during appraisal of US$120 million); and (b) an operation and maintenance (O&M) cost of 20 percent of the energy payments as assumed by CFE.

[12] The team carried out the split evaluation using the rating of 'Satisfactory' for progress towards achievement of GEO in the final ISR, that is, Sequence no. 21. In this regard, progress towards achievement of GEO could have been upgraded to 'Satisfactory several months earlier, based on results already achieved in terms of progress made towards the project indicators -which had been exceeded. However, the supervision team decided to maintain the GEO as 'Moderately Satisfactory' until project closing on April 30, 2016, to be sure that energy generation from the inherently intermittent wind resources continued to be sustained.

[13] Based on the actual disbursements in each of these two phases: Phase 1 (project effectiveness to May 2014 restructuring: US$5.74 million (23.30 percent); Phase II (May 2014 to project closing): US$18.89 million (76.70 percent).

[14] http://pubdocs.worldbank.org/en/732571470253390411/CMO-Pink-Sheet-August-2016.pdf

62. The cost-benefit analysis for the La Venta III wind farm shows that the project has a positive net present value (NPV) at a discount rate of 7 percent or less. The economic internal rate of return (EIRR) of the project is estimated to be 6.22 percent; if the environmental benefits derived from the CO2 emissions savings are included, the EIRR increases to 7.05 percent. The results of the ex-post NPV and EIRR calculations do not significantly deviate from the results estimated at the time of appraisal (that is, NPV of negative US$26.89 million with EIRR of 8.83 percent). Despite the project's moderate but positive economic results, the project has had a much wider impact due to its demonstration effect as the first wind IPP in Mexico and has paved the way for large scale development wind power in Mexico over the past five years.

63. **Financial analysis**. The NPVs of the project were calculated for a range of discount rates. The project has a positive NPV for discount rates of up to 17 percent (a negative NPV when discount rates of 18 percent or more are applied). The project's return on equity (ROE) is about 15 percent, lower than the originally assumed ROE of 18 percent. A financial rate of return was not calculated at the time of appraisal. However, applying the original assumptions, the financial internal rate of return (FIRR) at appraisal would have been 19.49 percent - while the ex-post analysis results in a FIRR of 17.75 percent. The lower rate of return can be explained as a result of the significantly higher investment costs for the company though partially offset by the higher energy payments received from CFE. Without the subsidy, the NPV of the project would still be positive (US$14,054,001), but with an FIRR of only 9 percent (annex 3).

64. Due to an acceptable economic outcome, a strong financial outcome as well as the catalytic impact of the La Venta III wind farm in preparing the way for a major expansion of large-scale private sector wind development in the country, the efficiency of the project is rated 'Substantial'.

3.4 Justification of Overall Outcome Rating

Rating: Satisfactory

65. The overall outcome rating is 'Satisfactory'. This rating is based on the following considerations: (a) the continuing high relevance of the project objectives for the Government as well as for the Bank. As noted earlier, Government commitment to the project objectives strengthened during implementation, reflected in the passing of a renewable energy law and a national commitment to specific climate change goals; for the World Bank, providing support to the Government's 'green growth' strategy is an integral component of the latest Country Partnership Framework; (b) the GEOs were achieved by project closing as reflected in table 1 and section F; and (c) the efficiency of the investment is also rated 'Substantial', a rating that considers the important catalytic impact of the first commercial IPP investment, which has helped pave the way for a major increase in private sector investment in developing wind power in Mexico. As a result, the main barriers that had been impeding the development of Mexico's considerable renewable energy potential have now been overcome and private investor interest in developing wind energy has expanded to other regions of the country. Overall, the main global and project development target indicators have been met while the economic and social benefits of the investment have been considerable.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

66. **Poverty Impacts, Gender Aspects and Social Development.** The wind energy development took place in one of the poorest regional areas of Mexico. The region has also a high proportion of indigenous peoples, employed mainly in agriculture, livestock, and in construction work. The La Venta III wind farm was located close to the small town of La Ventosa, which has a population of about 4,000 people. The main beneficiaries have been small landowners (*ejidatarios*) in the immediate vicinity of the wind farm, who have leased their land for the development of the wind energy plant. In addition, the private company, that is, IPP, which developed the wind farm has invested over US $1 million in small infrastructure works in the community such as water towers, drainage works, paved streets, and playgrounds for childr**e**n, which have brought tangible benefits to this community. This is an annual program, with the municipality agreeing each year with the IPP to the financing of a facility or civil works up to MXN$1.5 million (US$100,000). However, across this entire region of Mexico, where the wind energy development is taking place, the benefits have been uneven: a number of individual landowners who own land have benefitted, and some communities close to the wind farms now have improved water and sewerage infrastructure, which has had an important, if localized, poverty impact. A strategic social and environmental study has been undertaken to assess the social and environmental impacts of the wind industry in the region and a set of recommendations has been prepared. Consideration now needs to be given to redistribute the rent from wind energy produced in the region to help ensure a more equitable distribution of the benefits in these communities (see section 6).

(b) Institutional Change/Strengthening

67. **Institutional and other impacts.** Mexico already had a well-developed and experienced institutional framework in place at the time of project preparation to monitor the environmental and social impacts of the first commercial wind energy development. Also, the national power company, CFE, has several decades of experience in developing Mexico's electricity network. Nevertheless, there were a number of beneficial institutional impacts as a result of this project, especially at the state and local levels. The need to monitor closely compliance with the project's environmental and social safeguards benefitted the Ministry of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales, SEMARNAT*), Ministry of Social Development (*Secretaría de Desarrollo Social, SEDESOL*), and Indigenous Peoples Development Commission (*Comisión de Desarrollo de Pueblos Indígenas, CDI*). Also, INECOL's direct involvement in monitoring bird and bat migratory patterns and mortalities enhanced its institutional capacity and experience. Given the significant wind energy development that has taken place in the aftermath of the La Venta III wind farm, this has resulted in more knowledgeable and better prepared institutions to be able to monitor compliance with the environmental and social safeguards associated with this major expansion of wind capacity in this region of the country.

(c) Other Unintended Outcomes and Impacts

68. One unintended outcome of income improvement among land owners who rent their land has been deforestation, due to an increase in the amount of land being devoted to agriculture and cattle raising. This, in turn, is having an adverse impact on nesting areas of local birds. Thus, a positive social impact is having some adverse environmental impacts. Even though this impact is

currently limited, with the growing number of wind farms being installed in the Isthmus region, these impacts could become more significant.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

69. No beneficiary surveys or stakeholder workshops were carried out.

4. Assessment of Risk to Development Outcome

Rating: Low to Negligible

70. The main risks to the development outcome are considered to be *'Low or Negligible'*. At the time of project appraisal in 2006, the critical risks to the development objective that had been identified were (a) a loss, or change, in Government commitment to reducing GHG emissions and to further developing the country's renewable energy potential; (b) a failure to attract private capital to invest in developing the country's considerable wind potential through IPPs; and (c) the possible impact of high levels of bird mortality on the economics of wind energy development and the related reputational risk for the World Bank. A further risk, not noted in the PAD, was the possibility of significant social unrest occurring in this regional area of Mexico, which had a long history of social conflict.

71. While all these risks posed a threat to achieving the development outcome, none of them materialized. The main reasons have been a strengthened policy commitment of the Government since 2006 to reduce GHG emissions and develop more fully its renewable energy potential, which has been sustained through two changes of Government. The private sector response has also exceeded initial expectations in terms of investment levels, reflecting a growing confidence in the Government's policy commitment to develop the country's renewable energy potential as well as a favorable renewable energy resource base for further expansion. The potential for high levels of bird –and bat –mortality have also not materialized because of careful monitoring of bird migration patterns in this region of the country. Careful attention was given to monitoring this potential safeguard concern on a year round from the outset and the collaboration between the IPP operator and Government institutions has been very close. Finally, the potential for social conflict has been adeptly handled by the IPP operator and closely monitored by the World Bank in one of Mexico's poorest regional areas, which has had a long history of social conflict related to land issues. Based on the above considerations as well as the rapid expansion of electrical power capacity based on renewable energy which has taken place since 2006, the risk to the development outcomes in the future is considered 'Low to Negligible'.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Satisfactory

72. The World Bank made two strategic decisions during project preparation, based on a careful review of lessons from other countries in developing wind energy, which had an important influence on achieving the development outcome: (a) the project design, by focusing on the need to provide a single incentive- namely, tariff support- to help overcome the barriers impeding development of Mexico's sizeable renewable energy potential; and (b) the timing of the GEF

operation in that it followed recent policy initiatives taken by the Government, aimed at improving the investment climate for renewable energy development. As a result, the World Bank was able to make effective use of a GEF grant, using only a modest funding amount, to attract private investment, for the first time, to support the development of the country's wind energy potential.

73. Based on the above considerations, World Bank performance in project preparation is considered 'Satisfactory'.

(b) Quality of Supervision

Rating: Satisfactory

74. World Bank supervision of the GEF grant covered a 10-year period from Board approval in end-June 2006 until the extended GEF grant closing date of April 30, 2016; final disbursements were completed two months later at the end of June, 2016. The focus of World Bank supervision during the early years was in supporting the bidding process for the first IPP wind plant, the project's main component. The overall bidding process took almost three years because the first bidding procedure did not result in any responsive bid. Despite the lengthy bidding process, World Bank supervision teams made regular visits to Mexico to provide support to CFE and the Government to help ensure that the bidding process was successful. Task teams were staffed with the needed expertise and skills at this stage of implementation.

75. Following contract signing in October 2012, World Bank supervision missions began to focus on the safeguard aspects of the project, in particular on environmental and social safeguards. Over a period of almost five years, the World Bank gave sustained attention to the supervision of these safeguards, which was a commendable feature of the overall supervision effort. A close and effective working relationship was established with both CFE and the IPP, which enabled a year round monitoring of bird and bat migratory patterns to be put in place to help reduce mortality levels due to collisions with the wind towers. The supervision of the social safeguards was also effective. A continuous dialogue was established between (a) landowners (*ejidatarios*) affected by wind plant construction; (b) local community leaders; (c) IPP field managers; and (d) CFE regional staff which helped minimize land compensation disputes and gradually helped build up local 'ownership' in the benefits being provided by the construction of the wind plant. In a region known for decades of social conflict, this was a significant achievement.

76. Over the 10-year period, more than 20 World Bank supervision missions were undertaken, the final supervision mission taking place in November 2015 and focusing on the remaining GEF funded activities under Components 2 and 3. Despite four changes in task team leaders during the supervision of the project, continuity was maintained. The presence of procurement and FM specialists as well as environmental specialists in the Mexico Country Office provided continuity and additional support for the World Bank supervision effort.

77. Disbursements did not begin in any significant amount until 2013. The very low disbursement levels during the first 6-7 years reflected (a) the lengthy bidding process for the IPP (the overall bidding process took almost three years because the first bidding procedure did not result in any responsive bid); (b) the specific design of the project which linked disbursements to a tariff support subsidy and which could not begin until the IPP was operational; and (c) implementation delays in the TA component. Despite these delays, the intensive supervision effort

of the final 2-3 years enabled all the GEF funds to be fully used in line with the original development objective.

(c) Justification of Rating for Overall Bank Performance

Rating: Satisfactory

78. Based on satisfactory ratings during both preparation and supervision, the rating for overall World Bank performance is also considered 'Satisfactory'.

5.2 Borrower

(a) Government Performance

Rating: Satisfactory

79. The US$25 million GEF Grant Agreement was signed with the Government of Mexico. SHCP was the official recipient of the GEF grant while NAFIN acted as the financial agent for the project. SENER was responsible for energy policy and planning in the sector. SENER also had the responsibility for implementation of the TA and project management components of the GEF grant as well as for M&E of the overall project.

80. Government performance throughout preparation and implementation of the GEF grant was 'Fully Satisfactory'. First, its strong commitment to the development objective of the project was maintained throughout the 10-year implementation period. A measure of the Government's commitment over this period was the rapid growth in Mexico's IPP-based power generation capacity from renewable energy sources, especially from wind energy sources. Second, the Government -through SHCP and NAFIN- played a constructive role in finding solutions to internal administrative problems that were either impeding implementation of the TA components or which needed to be streamlined during implementation- for example, the small size of SENER's administrative budget initially limited the amount of funding that could be reimbursed for TA activities from the GEF grant and slowed down implementation of these activities. Finally, the Government acted as a supportive partner to help ensure compliance with the environmental and social safeguards requirements of the project, through the involvement of Government institutions such as INECOL. Overall, and despite some delays affecting each of the project components, the Government's sustained commitment to developing commercially-based, grid-connected electricity based on wind energy was the main factor in bringing about a successful outcome.

(b) Implementing Agency or Agencies Performance

Rating: Satisfactory

81. The main responsibilities for implementation were as follows: (a) Component 1, Financial Mechanism: CFE, in coordination with SENER; (b) Component 2, Technical Assistance: SENER had the main responsibility for contracting services; and (c) Component 3, Project Management: SENER was responsible to help carry out project M&E, and reporting responsibilities under the project.

82. CFE had overall responsibility for the management of the international bidding process for the La Venta III wind farm. The bidding process began in January, 2007 but had to be re-launched in July, 2008 because of the lack of a responsive bid. Despite the extended duration of the bidding

process, CFE managed the process capably and with flexibility, recognizing that high demand for wind turbines in international markets at the time limited the number of bidders. Its role in bringing about a successful conclusion of the bidding process was critical to achieving the development objective.

83. During plant construction, CFE also gave priority attention to resolving a number of conflicts that had arisen between *ejidatarios* and the IPP operators with regard to the payment of benefits to local communities. CFE's prior experience with similar issues during the construction of the La Venta II Plant was extremely helpful in resolving potential social conflicts; it also helped update the Indigenous Peoples Plan. Overall, CFE gave high priority to the different safeguards issues associated with the La Venta III wind energy development, which has helped provide a framework for social safeguards for future wind energy developments in this region.

84. The implementation of the smaller TA and project management components started slowly due to (a) the lack of an internal budget mechanism to enable SENER to access the GEF grant funds; (b) the inexperience of SENER's own staff with World Bank operations; and (c) the priority focus given to main component, namely the bidding process for the La Venta III wind farm. However, once these constraints were overcome, SENER made effective use of the funds allocated for TA. It proposed a number of specific TA activities which had been fully implemented by project closing and which included (a) a strategic environmental and social assessment of the region to measure the cumulative environmental and social impacts of wind power development; (b) a long-term wind development plan for the region; (c) the acquisition of wind equipment to expand wind data information; and (d) the purchase of specialized software-to support the further development of the wind potential in this region (See annex 2 for a detailed list of completed TA activities).

85. Despite delays in implementing the TA and Institutional Strengthening component, SENER had completed a series of studies and activities by project closing which has had a significant impact on the public policy and regulatory framework, and with significant potential for contributing to further renewable energy development not only in the Oaxaca region but throughout the country.

86. Overall, based on the progress made in implementing the three components of the project, the implementation performance of the different implementing agencies is considered 'Satisfactory'.

(c) Justification of Rating for Overall Borrower Performance

Rating: Satisfactory

87. Based on satisfactory ratings of the Government and the different implementing agencies, the overall performance of the borrower in preparing and implementing the project is also considered 'Satisfactory'.

6. Lessons Learned

88. **Importance of strong Government policy commitment in developing renewable energy**. The Government's sustained commitment to develop Mexico's wind energy potential was the key factor in achieving the project's development objective. The Government's decision to

seek private investment capital in a grid-based IPP had to overcome a number of setbacks - a lack of response to the first bidding process; social unrest in the regional area where the first commercial plant was to be developed; and domestic pressures to develop the country's wind potential using public resources rather than private resources. The Government also had to build up its own institutional capacity in a short time to be able to support and monitor the country's wind energy developments. The progress made over the last 10 years in developing Mexico's wind energy power generation capacity- through grid-connected IPPs as well as self-supply- is a measure of the strength of the Government's policy commitment to this objective, which has now been sustained through two changes of Government.

89. **Undertaking a review of other countries' experience in developing their renewable energy potential highly benefits the project design**. The reviews undertaken of European country experiences as well as those in California in promoting wind energy had an important influence on the design of this GEF operation. The main finding from these reviews was the importance of incentive mechanisms, which influenced the decision to include a 'Financial Mechanism' as the main component of the GEF through tariff-based support for the first five years of wind plant's operation. As a result, and using only a modest amount of GEF funding, the design of the GEF grant was able to provide the needed incentive to support the first commercial development of Mexico's wind energy. While a number of alternative approaches to developing Mexico's renewable energy potential were considered, the project design opted in the end to provide a financial incentive.

90. **Need for regional taxation instruments on wind energy production to support broader and more equitable regional development**. An important social finding of this wind energy development- and relevant to wind energy developments more generally- is the uneven distribution of the benefits, which can give rise to serious social unrest as well as opposition to further investment in wind energy. Some small landowners, who lease their land to the IPP investor in the area where the wind turbines are located, benefit considerably; others, however, do not benefit at all though they continue to live in the nearby communities. Even though some investment in community infrastructure has taken place, improvements tend to be unevenly distributed. As a result, the common perception is that wind energy development has benefitted only a few individual families and not the broader communities in the region. To offset this perception, the Government should consider redistributing the rent generated by the industry to ensure that it goes back to benefit the region. These funds would be earmarked and used exclusively for community and regional infrastructure works that benefit a broader cross-section of the population. Such a fiscal redistribution mechanism has been used effectively for mining production as well as oil and gas activities in a number of Latin American countries, which are often located in remote, low-income regional areas. The main lesson emerging from this wind energy development in the state of Oaxaca is that the Government should consider the redistribution of tax revenue to help ensure a broader and more equitable distribution of the benefits within the communities where the wind development has taken place.

91. **Good practices in the supervision of safeguards contribute to enabling a favorable environment for investors.** The project was an example of best practices in terms of observance of World Bank's social and environmental safeguards. Specifically, the performance of the IPP was an example of best practice in regard to the application of OP 4.10 and social issues in general. IPP personnel responsible for community relations maintained close relations with the local

ejidatarios throughout visiting and meeting with them several times per week and discussing their concerns. They also maintained an office in the local municipality of Juchitán, where people could go to discuss individual concerns, complains, or ask questions. There were written agreements to support the local municipality as part of the IPP's corporate social responsibility. These agreements enabled the IPP to become involved in the entire decision-making process - from priority setting by the local council to actual implementation of the community works - which, in turn, helped ensure that the investments were properly carried out and reached their expected outcomes. The La Venta III wind farm became a reference in regard to social practices for the other wind developers.

92. In regard to environmental safeguards supervision, the project not only met local requirements for avian mortality monitoring (twice a year during migration periods), but also promoted an enhanced protocol by expanding the monitoring periods to each season of the year for the purpose of accounting not only for the mortality of migration species but also the mortality of local species. Limited data existed at the project outset on bird migratory patterns in the Isthmus of Tehuantepec. By the end of the project, the accumulated data enabled the wind energy plant to better anticipate periods of the year when the plant would not be able to operate because of such migration. Also, the involvement of INECOL in the monitoring of bird (and bat) migratory patterns, not only strengthened 'safeguard ownership' but also added local, professional expertise, which has served to enhance the quality of information on bird migratory patterns in this regional area of Mexico, and which can now be extended to other regional areas of the country (in Baja California and the Yucatan Peninsula) where new wind energy developments are taking place. In particular, it was noted that migrating birds were flying above the turbine-span of La Venta III wind farm, and the most affected species were those considered as 'local' ones. This finding could be useful for future wind developments as the height of wind turbines is increasing and could eventually affect migratory birds. Finally strong collaboration of all stakeholders (the World Bank, CFE, and the IPP) resulted in an improved mortality estimation algorithm to also account for those bats/birds remains that were not directly observed during the regular monitoring process (i.e. the so-called *sub-conteo* effect). All of these safeguard enforcement initiatives are good practices that contributed to enable a favorable environment for investors, and are worth replicating in similar projects.

93. **Flexibility in the provision of TA support**. TA support for the development of renewable energy needs to be tailored to specific country situations; for this reason, such support must be both flexible and pragmatic. In the case of Mexico, the Government looked to the World Bank as a 'partner' in the development of its renewable energy potential, able to share country experiences in developing wind energy while it proceeded without external financial support to establish the needed tariff incentives, renewable energy law, and broader policy framework to encourage the development of Mexico's renewable energy potential. For this reason, the TA component of the GEF operation focused primarily on strengthening the technical and monitoring capacity of the sector ministry, that is, SENER, which had no prior experience in developing wind or renewable energy on a significant scale. As a result, the specific content of the TA needs to be decided on a country by country basis and should be flexible enough to adapt to sector reform developments- as occurred in Mexico which took place (in 2008, and again in 2013) during the course of implementation.

94. **Assessing longer term environmental and social impacts of wind energy development.** One unintended impact of the project was that beneficiaries of the payments for land use started engaging in new economic activities, which involved changes in the local environment as *ejidatarios* capitalized on these new opportunities to use their land for agricultural purposes (as noted in section 3.5). Such activity implied some degree of deforestation, which was not foreseen at the start of the project and which is currently having an impact on the nesting patterns of some bird species. An important lesson for future operations is therefore (a) to expand the scope of project's environmental and social impact until after the project is closed (for example by using grants to evaluate these longer term impacts); and (b) include in the TA component the financing of activities through which beneficiaries can engage in sustainable productive uses to improve their quality of life.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

The Government (SHCP, SENER, CFE, UREP-SENER and NAFIN) sent the draft ICR document with edits, which are reflected in the final ICR.

(b) Cofinanciers

Not applicable

(c) Other partners and stakeholders

Not applicable

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in US$ million equivalent)

Components	Appraisal Estimate (US$ millions)	Actual/Latest Estimate (US$ millions)	Percentage of Appraisal
1. Financial Mechanism	20.4	20.37	99.85
2. Technical Assistance	3.9	3.41	87.44
3. Project Management	0.7	0.85	121.43
Total Baseline Cost	**25.0**	**24.63**	**98.53**
Physical Contingencies	0.00	0.00	n.a.
Price Contingencies	*	*	*
Total Project Costs			
Project Preparation Facility (PPF)	n.a.	n.a.	n.a.
Front-end fee IBRD	n.a.	n.a.	n.a.
Total Financing Required	**25.0**	**24.63**	**98.53**

*Note: Price contingencies were included in project cost estimates.

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (US$ millions)	Actual/Latest Estimate (US$ millions)	Percentage of Appraisal
Borrower*		5.00	10.20	204.00
GEF		25.00	24.63	98.53
Local Sources of Borrowing Country**		35.00	200.38	572.41
Foreign Private Commercial Sources (unidentified)		85.00	0.00	0.00

Note*: Estimated by the Government of Mexico (this amount includes staff costs from SENER and CFE during the implementation of the project, as well as oceanographic measurement instruments whose procurement process was completed after the grant closing date).

**Private IPP firm reported that total investment was US$200 million, all of which was equity financed without a need for debt financing.

Annex 2. Outputs by Component

1. **Table 2.1** shows monthly energy production (including the plant capacity factor) and emission reductions of La Venta III wind farm since commissioning in October 2012 through to July 2016. **tables 2.2 and 2.3** show a summary of yearly energy production and avoided emissions, respectively (including percentage achievement with respect to the revised targets); only full calendar years (that is, 2013, 2014, and 2015) are reported. However, it can be seen that monthly production in 2016 is in line with production in 2015, and, therefore, on track to achieving the yearly target of 270.3 GWh per year, and consequently the corresponding target for avoided emissions (assuming the same emission factor of 0.617 tCO2e/MWh).

2. **Table 2.4** shows all the TA activities supported by the project.

Table 2.1 Monthly energy production and emission reductions of La Venta III wind farm since commissioning.

Month	Energy (GWh)	Avoided Emissions (tCO2e)	Capacity Factor (%)
October 2012	25.55	15,765.47	33.39
November 2012	39.62	24,445.64	53.50
December 2012	19.05	11,755.55	24.90
January 2013	36.40	22,460.80	47.57
February 2013	21.12	13,031.06	30.56
March 2013	34.10	21,042.57	44.57
April 2013	14.37	8,865.12	19.40
May 2013	14.73	9,089.08	19.25
June 2013	8.39	5,175.93	11.33
July 2013	18.15	11,196.86	23.72
August 2013	21.33	13,163.35	27.88
September 2013	1.36	837.37	1.83
October 2013	18.53	11,430.45	24.21
November 2013	31.89	19,676.89	43.07
December 2013	34.16	21,074.57	44.64
January 2014	41.91	25,858.85	54.77
February 2014	28.27	17,444.81	40.91
March 2014	22.01	13,581.27	28.77
April 2014	20.41	12,592.66	27.56
May 2014	22.25	13,728.95	29.08
June 2014	5.90	3,637.98	7.96
July 2014	33.11	20,427.66	43.27
August 2014	17.35	10,706.38	22.68
September 2014	9.54	5,888.47	12.89
October 2014	19.95	12,306.18	26.07
November 2014	32.13	19,825.78	43.39

December 2014	29.58	18,249.21	38.65
January 2015	43.40	26,777.30	56.72
February 2015	31.16	19,226.98	45.09
March 2015	29.08	17,939.44	38.00
April 2015	12.04	7,429.14	16.26
May 2015	13.51	8,335.42	17.65
June 2015	20.89	12,889.17	28.21
July 2015	20.59	12,705.21	26.91
August 2015	22.22	13,711.72	29.04
September 2015	11.39	7,027.53	15.38
October 2015	20.70	12,770.18	27.05
November 2015	36.20	22,333.31	48.88
December 2015	26.66	16,449.04	34.84
January 2016	38.98	24,051.52	50.94
February 2016	40.61	25,057.19	58.76
March 2016	17.63	10,878.20	23.04
April 2016	20.24	12,490.57	27.34
May 2016	10.83	6,679.64	14.15
June 2016	11.33	6,988.76	15.30
July 2016	20.48	12,634.93	26.76

Table 2.2 Annual Energy Production of La Venta III Wind Farm since commissioning.

Year	Energy (GWh)	Period	Target (GWh/year)	% Achievement
2012	84.22	October – December 2012	270.3	
2013	254.53	January – December 2013	270.3	94.17
2014	282.41	January – December 2014	270.3	104.48
2015	287.84	January – December 2015	270.3	106.49
2016	160.10	January - July 2016	270.3	
Accumulated	**1,069.10 GWh**			
Average Capacity Factor	**31.00 percent**			

Table 2.3 Yearly avoided emissions of La Venta III wind farm since commissioning.

Year	Emissions (tCO2e)	Period	Target (tCO2e/year)	% Achievement
2012	51,966.66	October – December 2012	166,769.00	
2013	157,044.06	January – December 2013	166,769.00	94.17
2014	174,248.22	January – December 2014	166,769.00	104.48
2015	177,594.45	January – December 2015	166,769.00	106.49
2016	98,780.81	January – July 2016	166,769.00	

Accumulated* **659,634.20 tonCO2e**

*Note: a 0.617 tCO2e/MWh factor was calculated by CFE at project restructuring in May 2014 using the CDM's ACM0002 methodology.

Table 2.4 TA activities

Id.	Activity	Cost (US$)
1	Purchase and installation of six wind measurement stations (vertical profile)	1,934,362.07
2	Study on integration of renewable energy into the grid	81,349.27
3	SESA for the south of the Tehuantepec Isthmus	302,909.72
4	Study to assess environmental and social Externalities on hydropower facilities	104,207.10
5	Design of 'one-stop shop' for facilitating development of renewable energy projects (Phase I)	148,554.79
6	Design of 'one-stop shop' for facilitating development of renewable energy projects (Phase II)	387,510.66
7	Long-term development plan for the Tehuantepec Isthmus	184,977.40
8	Study to identify and develop value chains	38,184.93
9	Revision and update of data base of self-supply permit holders (1996-2014)	60,376.29
10	Identification and analysis of competitiveness for local small- and medium-scale solar PV industry.	51,609.31
11	First draft of regulation for granting biofuel permits	57,551.45
12	Diagnosis on the status and viability of the Mexican energy system information under the new regulatory framework for the Mexican energy sector	9,850.64
13	Development of technical specifications and environmental protection guidelines for the production, transportation and distribution of biofuels	45,450.78
	Total	**3,406,894.41**

Annex 3. Economic and Financial Analysis

Overview

1. An ex-post economic and financial analysis was carried out to evaluate the efficiency of the project and verify its financial and economic viability as presented in the PAD. The economic analysis looked at the costs and benefits accruing to Mexico, including not only the actual values related to capital equipment and operating costs, but also the monetized environmental benefits. The financial analysis compares the costs and benefits from the perspective of the international IPP.

Economic analysis

2. **Economic benefits**. The main economic benefits of the La Venta III wind farm are: (a) the production of electricity; and (b) the reduction of GHG emissions in the global atmosphere. Other economic benefits, not quantified for the purposes of this analysis but useful in evaluating the project in a qualitative manner include, among other: (a) demonstration effect for future IPPs; (b) local economic benefits of increased employment during construction and O&M of the wind power plant; (c) increased income from land where the turbines are located and (iv) better access to agricultural land due to improved local infrastructure (for example, roads).

3. The economic benefits of electricity generation are set, for the purposes of this analysis, at the level of the avoided cost of generating electricity using other options, especially fossil fuels. During appraisal, the estimated avoided costs of generation was US$0.05 per kWh based on an estimated crude oil price of US$46 per barrel. Although the oil price dropped significantly in recent years to as low as US$43 per barrel in 2016, due to the increase of the oil price between 2012 and 2014 (above US$100 in these three years), the average actual oil price since the plant began operation in 2012 has been US$80 per barrel. The analysis also takes into account the World Bank forecasts of a steady price increase in the coming years of minimum 5 percent a year.[15]

4. **Project economic costs.** The main economic costs of the wind energy project are: (a) the investment necessary for the construction of the project (US$184 million[16] compared to the estimated cost during appraisal of US$120 million); and (b) the costs of O&M of 20 percent of the annual energy payments as assumed by CFE. For the economic analysis, all taxes and transfer payments are ignored. The capital costs occurred over a four year timeframe with the following schedule: 8.73 percent in Year 1, 58.80 percent in Year 2, 26.56 percent in Year 3 and 5.89 percent in Year 4 of the construction and operation of the power plant.

5. **Results.** The cost-benefit analysis for the La Venta III wind farm shows that the project has a positive NPV for a discount rate of less than 7 percent. The analysis also shows that with the benefits deriving from emissions reductions the project would have a much higher NPV. Table 3.1 summarizes the results of the sensitivity analysis, with and without the contribution of benefits from carbon emissions reductions for a range of discount rates.

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[15] http://pubdocs.worldbank.org/en/732571470253390411/CMO-Pink-Sheet-August-2016.pdf

[16] Excluding tax and freight costs

Table 3.1: La Venta III NPV at US$0.09per kWh

Discount Rate (in %)	NPV (in US$)	NPV Including Environmental Benefits (in US$)
6	3,771,767	18,800,814
7	(12,528,185)	771,763
8	(26,030,937)	(14,218,603)
9	(37,222,401)	(26,694,872)
10	(46,498,087)	(37,084,388)

6. If the environmental benefits derived from the 177,595 tCO2 emissions savings by the project are included, the project achieves an EIRR of 7.05 percent. Without taking into account these benefits, the EIRR is 6.22 percent. The results of the ex-post NPV and EIRR do not significantly deviate from the results estimated at the time of appraisal (NPV of Negative US$26.89 with an EIRR of 8.83 percent). The PAD originally noted that "the EIRR results for this proposed project are generally negative unless both world and domestic oil prices rise to a crude oil price level of US$55 per barrel" (which according to the ex-ante analysis resulted in an NPV of US$12.35 million with an EIRR of 13.36 percent). Although the oil prices have increased between 2012 and 2014, the modest but positive results of the ex-post analysis can be explained by the much higher investment costs than anticipated during appraisal. Without the investment cost increase of over 50 percent, the project would have yielded a high NPV of US$66.98-2.26 million (with discount rates from 6 percent to 10 percent) as well as an EIRR of 10.20 percent (including environmental benefits).

7. Finally, the EIRR of the La Venta III project is highly sensitive to the estimates regarding the future costs of electricity generation in the system. Given the significant dependence of the Mexican electricity generation on fossil fuels and uncertainties surrounding the future costs for oil and its related products, the optimal (least-cost) system expansion solution could vary. Without the forecasted increase of oil price as stated above, the economic results will be much lower.

8. Despite these results, the project had a much wider impact than captured in this analysis due to the experience accumulated and demonstration effect through this operation as the first wind IPP in Mexico that paved the way for large-scale wind power in Mexico. At the time of the preparation of this project, the installed and operational wind capacity was only 87 MW consisting of the CFE's La Venta I and La Venta II Projects in Oaxaca.[17] After the successful demonstration of la Venta III, more IPPs and self-suppliers entered the market expanding the overall wind capacity close to 3000 MW by the end of 2015. Due to the additional benefits derived from the significant IPP investment that followed La Venta III, the project's impact (and efficiency) is rated Substantial.

[17] https://hub.globalccsinstitute.com/publications/global-wind-2008-report/mexico

Financial analysis

9. The analysis uses the same financial spreadsheet model that was used during appraisal valued in real US dollars. The project's income is comes from two sources: electricity payments over the project's lifetime of 20 years and the subsidy payments (the GEF's project contribution for a total of about US$20.4 million over the first five years). Financial outflows are operating expenses, royalty payments for land use, insurance costs, and taxes. The model also accounts for the potential of using accelerated depreciation provisions available in the Mexican tax system for such investments. Unlike the original analysis, which assumed a standard 70 percent debt financing, the investment costs of the project were completely financed through the company's own resources. Original and actual figures and other general assumptions used for the financial model are summarized in table 3.2 below.

Table 3.2: Key Assumptions

	Original	Actual
Energy payments (US$/kwh)		
Year 1	0.047	0.095
Year 2		0.0988
Year 3		0.1028
Year 4 onwards		0.1198
Subsidy (US$/kwh)		
2012 - 2015	0.011	0.011
June 2015 – close		0.039
Subsidy disbursement		
Year 1	4,080,000	939,686
Year 2	4,080,000	2,803,735
Year 3	4,080,000	3,108,644
Year 4	4,080,000	7,198,450
Year 5	4,080,000	6,324,485
Total	20,400,000	20,375,000
Expenses		
Fixed O&M (US$/kw)	12.063	20% (of energy payments)
Variable O&M (US$/kwh)	0.0011	-
Site owner royalty		
2009-2011	1.50% (of revenues)	US$414,114
2012		US$472,505
2013		US$563,655
2014		US$607,049
2015		US$633,520
Tax rate (% of net income)	28%	19%
Insurance (% of equipment and balance of station costs)	0.10%	0.10%
Depreciation		
Percentage that can be depreciated	70%	70%
Depreciation base (years)	5	5

10. As in the original analysis and to evaluate the financial viability of the project, NPVs of the project's (financial) rate of return figures are calculated for a range of discount rates. The project has a positive NPV for discount rates of up to 17 percent (or a negative NPV when discount rates of 18 percent or more are applied).

Table 3.3: NPV of the Project for various discount rates

Original		Actual	
Discount Rate *(%)*	**NPV (US$)**	**Discount Rate (%)**	**NPV (US$)**
8	99,887,213	8	146,799,802
9	85,411,198	9	121,925,212
10	72,516,842	10	100,159,849
11	61,003,865	11	81,077,380
12	50,700,689	12	64,316,986
13	41,459,910	13	49,572,223
14	33,154,534	14	36,581,934
15	25,674,859	15	25,122,830
16	18,925,864	16	15,003,388
17	12,825,033	17	6,058,834
18	7,300,523	18	(1,853,010)
19	2,289,630	19	(8,855,174)
20	(2,262,510)	20	(15,054,403)
FIRR	19.49%	**FIRR**	17.75%
ROE	18%	**ROE**	14.89%

11. The project's ROE is about 15 percent, slightly lower than the originally assumed ROE of 18 percent. A FIRR was not calculated at the time of appraisal - but applying original assumptions, the original FIRR would have been 19.49 percent - while the ex-post analysis results in an FIRR of 17.75 percent. The slight deviation can be explained due to the significantly higher investment costs for the company, though partially offset by the higher energy payments received from CFE. Without the subsidy, the NPV of the project would still be positive (US$14,054,001), but with an FIRR of only 9 percent. The revised cash-flow analysis for the project is presented in the table 3.4.

Table 3.4: Cash Flow Analysis

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Revenues																								
Energy Payment	$0	$0	$0	$0	$8,000,900	$25,147,564	$29,031,748	$34,483,232	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633	$34,482,633
Tariff Subsidy Payment					$926,420	$2,799,830	$3,106,510	$7,196,000	$6,346,240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest on Reserves				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenues	**$0**	**$0**	**$0**	**$0**	**$8,927,320**	**$27,947,394**	**$32,138,258**	**$41,679,232**	**$40,828,873**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**	**$34,482,633**
Capital Costs	**$17,492,740**	**$117,820,514**	**$53,219,606**	**$11,802,089**																				
Operating Costs																								
Fixed O&M	$0	$0	$0	$0	$1,600,180.00	$5,029,512.80	$5,806,349.60	$6,896,646.40	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60	$6,896,526.60
Variable O&M	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Site Owner Royalty	$0	$414,114	$414,114	$414,114	$472,505	$563,655	$607,049	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520	$633,520
Insurance	$0	$0	$0	$0	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925	$152,925
Other Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Operating Costs	**$0**	**$414,114**	**$414,114**	**$414,114**	**$2,225,610**	**$5,746,093**	**$6,566,324**	**$7,683,092**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**	**$7,682,972**
Operating income	**($17,492,740)**	**($118,234,628)**	**($53,633,721)**	**($12,216,203)**	**$6,701,710**	**$22,201,301**	**$25,571,934**	**$33,996,140**	**$33,145,901**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**	**$26,799,661**
Other expenses																								
Interest on Loans		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Depreciation Percentage		100%	100%	100%	100%	20%	20%	20%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Maximum possible depreciation		$0	$0	$0	$140,262,516	$161,613,309	$167,464,511	$169,945,080	$164,001,443	$130,855,542	$104,055,881	$77,256,220	$50,456,559	$23,656,898	-$3,142,763	-$29,942,424	-$56,742,085	-$83,541,746	$0	$0	$0	$0	$0	$0
Maximum depreciation without compensation ag		$0	$0	$0	$6,701,710	$22,201,301	$25,571,934	$33,996,140	$33,145,901	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	-$83,541,746	$0	$0	$0	$0	$0	$0
Actual depreciation		$0	$0	$0	$6,701,710	$22,201,301	$25,571,934	$33,996,140	$33,145,901	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	-$83,541,746	$0	$0	$0	$0	$0	$0
Pending depreciation		$0	$0	$0	$133,560,806	$139,412,008	$141,892,577	$135,948,940	$130,855,542	$104,055,881	$77,256,220	$50,456,559	$23,656,898	-$3,142,763	-$29,942,424	-$56,742,085	-$83,541,746	$0	$0	$0	$0	$0	$0	$0
Total other expenses		$0	$0	$0	$6,701,710	$22,201,301	$25,571,934	$33,996,140	$33,145,901	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	-$83,541,746	$0	$0	$0	$0	$0	$0
Before-Tax Profit		($118,234,628)	($53,633,721)	($12,216,203)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$110,341,407	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661
Profit x tax rate		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$21,135,764	$5,133,443	$5,133,443	$5,133,443	$5,133,443	$5,133,443	$5,133,443
Income Tax Paid		($22,647,701)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$21,135,764	$5,133,443	$5,133,443	$5,133,443	$5,133,443	$5,133,443	$5,133,443
After-Tax Profit		($95,586,927)	($53,633,721)	($12,216,203)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$89,205,643	$21,666,218	$21,666,218	$21,666,218	$21,666,218	$21,666,218	$21,666,218
Additions																								
Depreciation		$0	$0	$0	$6,701,710	$22,201,301	$25,571,934	$33,996,140	$33,145,901	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	-$83,541,746	$0	$0	$0	$0	$0	$0
Released from Reserve		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total additions		$0	$0	$0	$6,701,710	$22,201,301	$25,571,934	$33,996,140	$33,145,901	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	-$83,541,746	$0	$0	$0	$0	$0	$0
Total subtractions																								
Before-Tax Cash Flow	($17,492,740)	($118,234,628)	($53,633,721)	($12,216,203)	$6,701,710	$22,201,301	$25,571,934	$33,996,140	$33,145,901	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661
Taxes Payable (Benefit Received)		($22,647,701)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$21,135,764	$5,133,443	$5,133,443	$5,133,443	$5,133,443	$5,133,443	$5,133,443
Tariff subsidy payment if not taxable						$778,193	$2,351,857	146368.488	$11,375,482															
After Tax Cash Flow	($17,492,740)	($140,882,329)	($53,633,721)	($12,216,203)	$6,701,710	$22,979,494	$27,923,791	$34,142,509	$44,521,383	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$26,799,661	$47,935,425	$31,933,104	$31,933,104	$31,933,104	$31,933,104	$31,933,104	$31,933,104
Cumulative after tax cash flow		($140,882,329)	($53,633,721)	($12,216,203)	$6,701,710	$29,681,204	$57,604,995	$91,747,504	$136,268,887	$163,068,548	$189,868,209	$216,667,870	$243,467,531	$270,267,192	$297,066,853	$323,866,514	$350,666,175	$398,601,600	$430,534,704	$462,467,807	$494,400,911	$526,334,015	$558,267,119	$590,200,223
Project Cash Flow	($17,492,740)	($95,586,927)	($53,633,721)	($12,216,203)	$13,403,420	$44,402,603	$51,143,868	$67,992,280	$66,291,802	$53,599,322	$53,599,322	$53,599,322	$53,599,322	$53,599,322	$53,599,322	$53,599,322	$53,599,322	-$77,877,849	$21,666,218	$21,666,218	$21,666,218	$21,666,218	$21,666,218	$21,666,218

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Charles Feinstein	Team Leader	LCSFP	
Demetrios Papathanasiou	Energy Economist	LCSFE	
Gabriela Elizondo Azuela	Energy Specialist	LCSFE	
Victor Manuel Ordonez Conde	Senior Finance Officer	LCSFM	
Efraim Jimenez	Procurement Specialist	LCSFM	
Anna Marti-Kiemann	Counsel	Consultant LEGLA	
Daniel Farchy	Environmental Specialist	LCSFE	
Tania Carrasco	Social Specialist	Consultant LCSES	
Ted Kennedy	Renewable Energy Specialist	Consultant ENVCC	
Donald Hertzmark	Energy Economist	Consultant	
Fabio Arjona	Environmental Specialist	Consultant	
Carl Thelander	Environmental Specialist	Consultant	
Smriti Goyal	Junior Professional Associate	LCSFE	
Supervision/ICR			
Guillermo Hernandez	Team Leader	GEE04	
Gabriel Penaloza	Procurement Specialist	GGO04	
Luis Barajas Gonzalez	Financial Management Specialist	GGO22	
Alonso Zarzar Casis	Safeguards Specialist	GSU04	
Jose Luis Calderon	Environmental Specialist	GEN04	
Karla Olguin Hernandez	Consultant	GEEDR	
Luis M. Vaca-Soto	Consultant	GEE04	
Karen Bazex	Senior Energy Specialist	GEE01	
Lara Born	Jr Professional Officer	GEE01	
Eugene McCarthy	Consultant	GEE04	
Farah Mohammadzadeh	Consultant	GEE08	
Alexandra Ortiz	Program Leader	LCC1C	
Daniel J. Farchy	Industry Specialist	CFGCC	
Karina M. Kashiwamoto	Language Program Assistant	LCC1C	
Victor Manuel Ordonez Conde	Senior Finance Officer	WFALN	
Felix Prieto Arbelaez	Senior Procurement Specialist	LCSPT - HIS	
Kennan W. Rapp	Senior Social Development Spec	GSU04	

Zayra Luz Gabriela Romo Mercado	Senior Energy Specialist	GEE01	
Tomas Socias	Senior Procurement Specialist	GGODR	
Nancy Montes de Oca Allende	Team Assistant	LCC1C	
Oscar Avalle	Manager	SECPO	
Don Hertzmark	Consultant		
Lea Braslavsky	Consultant		
Daniel Boyve	Practice Manager	GG022	
Juan Carlos Serrano	Sr Financial Management Specialist	GG022	
Gabriela Vidals	Operations Officer	LCC1C	
Karim Omar Lara Ayub	Operations Analyst	LCC1C	

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of Staff Weeks	US$ thousands (Including Travel and Consultant Cost)
Lending		
FY05	21.45	61.93
FY06	14.28	39.44
FY07	17.77	49.00
FY08	21.83	50.31
Total	**75.33**	**200.68**
Supervision		
FY08	7.83	26.91
FY09	9.39	36.05
FY10	36.38	117.71
FY11	18.52	67.13
FY12	8.85	37.37
FY13	27.38	62.06
FY14	20.61	71.12
FY15	16.01	61.81
FY16	12.04	29.37
	157.01	**509.53**

Annex 5. Beneficiary Survey Results

1. The project did not carry out a ‘formal’ beneficiary survey. However, during several field missions the team’s social specialist as well as other team members had the opportunity to meet with stakeholders and local authorities. The team’s social specialists also visited some of the stakeholders’ houses during the preparation of a dissemination video on the social impacts of the project.

2. During these meetings, land owners shared their views on the project, the history of their relationships with the IPP, and the way the project had improved their income and the well-being of their families. They also expressed their wishes to increase local employment and local skilled labor. They stated that the benefits they were receiving were being invested mainly in improving their houses and in their children’s and grandchildren’s education.

3. The local authorities also participated in some of the meetings during field missions and shared with the team their satisfaction with the support that the IPP was providing to the local municipality. They also emphasized that more financial support is needed from the federal budget due to the limited income sources that local rural municipalities have.

Annex 6. Stakeholder Workshop Report and Results

Not applicable.

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

The Government (SHCP, SENER, CFE, UREP-SENER and NAFIN) sent the draft ICR document with edits, which are reflected in the final ICR.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not applicable.

Annex 9. List of Supporting Documents

World Bank (2006) Grant Agreement. Large-Scale Renewable Energy Development Project; Washington, D.C.
World Bank (2006) Project Appraisal Document, Report No: 35075-MX, Washington D.C.
World Bank (2006) Environmental Assessment (Vol. 1). Manual de cumplimiento de las normas ambientales. Large-Scale Renewable Energy Development Project; Report No. E1398; Washington, D.C.
World Bank (2006) Environmental Assessment (Vol. 2). Manual de cumplimiento de las normas ambientales. Large-Scale Renewable Energy Development Project; Report No. E1398; Washington, D.C.
World Bank (2012) Indigenous People Plan: Plan de desarrollo de poblaciones indígenas. Large-Scale Renewable Energy Development Project; Report No. IPP179, Washington, D.C.
World Bank (2008) Procurement Plan: Plan de contrataciones específico (PAC) No. 46250. Large-Scale Renewable Energy Development Project. Washington, D.C.
World Bank (2011) Greening the Wind: Environmental and Social Considerations for Wind Power Development No. 66233.
World Bank (2012) Indigenous People Plan: Plan de desarrollo de poblaciones indígenas. Large Scale Renewable Energy Development Project; Report No. IPP581, Washington, D.C.
World Bank (2012) Amendment to the Disbursement Letter, Washington, D.C.
World Bank (2013) Restructuring No. RES12574 May 14, 2014, Washington, D.C.
World Bank (2013) Restructuring Project Paper No. 78770, Washington, D.C.
World Bank (2013) Amendment to the Project Agreement for GEF TF056781
World Bank (2012 – 2016) Supervision Aide Memories and Implementation Status and Results Reports. Large-Scale Renewable Energy Development Project; Washington, D.C.
World Bank (2016 – 2006) Implementation Status reports

MAP (provided by the GSD map design unit)