

Document of  
The World Bank

Report No.ICR00003814

IMPLEMENTATION COMPLETION AND RESULTS REPORT  
(IBRD-7501, TF-091733)

ON A

LOAN  
IN THE AMOUNT OF US\$15 MILLION

AND A

GRANT FROM THE  
GLOBAL ENVIRONMENT FACILITY TRUST FUND  
IN THE AMOUNT OF US\$15 MILLION

TO THE

UNITED MEXICAN STATES

FOR AN

INTEGRATED ENERGY SERVICES PROJECT

August 31, 2016

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

## CURRENCY EQUIVALENTS

(Exchange Rate Effective July 2016)

Currency Unit = Mexican Peso (MXN)  
US\$ 1.00 = 18.50 MXN

## FISCAL YEAR

[January 1 – December 31]

## ABBREVIATIONS AND ACRONYMS

BANOBRAS	National Bank for Public Works and Services
CDI	Indigenous People Development Commission
CFE	Federal Electricity Commission ( <i>Comisión Federal de Electricidad</i> )
CMU	Country Management Unit
CO <sub>2</sub> e	Carbon dioxide equivalent
CPS	Country Partnership Strategy
CSF	Centralized Solar Farms
ERR	Economic Rate of Return
ESMAP	Energy Sector Management Assistance Program
FM	Financial Management
FMA	Financial Management Assessment
FIRCO	Shared Risk Trust Fund for Agricultural Productive Activities
FIT	Federal Implementation Team
FOTEASE	Fund for the Energy Transition and Sustainable Use of Energy
FY	Fiscal Year
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO	Global Environmental Objective
GNI	Gross National Income
GoM	Government of Mexico
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IFR	Financial Monitoring Report
IIE	Electrical Research Institute
INEGI	National Institute of Statistics and Geography
IP	Implementation Progress
ISR	Implementation Status and Results Report
kWh	Kilo-Watt/hour
M&E	Monitoring and Evaluation
MTR	Mid-Term Review
MW	Mega-Watt
MWh	Mega-Watt/hour
NAFIN	<i>Nacional Financiera</i>
NGOs	Non-Governmental Organizations
PAC	Project Advisory Committee

PAD	Project Appraisal Document
PDO	Project Development Objective
PIBAI	Basic Infrastructure Program for Indigenous People Development
PIU	Project Implementation Unit (UREP for its acronym in Spanish)
PMC	Project Monitoring Committee
PND	National Development Plan
PPMT	Project Planning and Management Team
PROSENER	Energy Sector Program
PV	Photovoltaic
RE	Rural Electrification
RET	Renewable Energy Technology
SAGARPA	Ministry of Agriculture, Livestock, Rural Development and Fishing
SEDESOL	Ministry of Social Development
SENER	Ministry of Energy ( <i>Secretaría de Energía</i> )
SHPC	Ministry of Finance and Public Credit (Treasury)
SIT	State Implementation Team
SPIC	State Project Implementation Committee
TSMG	Technical Supervision and Monitoring Group
TA	Technical Assistance
WTP	Willingness to Pay

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Practice Manager: Antonio Barbalho

Project Team Leader: Guillermo Hernández González

ICR Team Leader: Guillermo Hernández González

**MEXICO**  
**Integrated Energy Services Project**  
**CONTENTS**

A. Basic Information	
B. Key Dates	
C. Ratings Summary	
D. Sector and Theme Codes	
E. Bank Staff	
F. Results Framework Analysis	
G. Ratings of Project Performance in ISRs	
H. Restructuring (if any)	
I. Disbursement Profile	
1. Project Context, Development and Global Environment Objectives Design .....	1
2. Key Factors Affecting Implementation and Outcomes .....	7
3. Assessment of Outcomes .....	19
4. Assessment of Risk to Development Outcome and Global Environment Outcome ....	23
5. Assessment of Bank and Borrower Performance .....	24
6. Lessons Learned.....	26
7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners.....	28
Annex 1. Project Costs and Financing.....	29
Annex 2. Outputs by Component.....	30
Annex 3. Economic and Financial Analysis .....	35
Annex 4. Bank Lending and Implementation Support/Supervision Processes.....	38
Annex 5. Beneficiary Survey Results .....	41
Annex 6. Stakeholder Workshop Report and Results.....	42
Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR .....	43
Annex 8. Comments of Co-financiers and Other Partners/Stakeholders.....	45
Annex 9. List of Supporting Documents .....	46
MAP	

Data Sheet

<b>A. Basic Information</b>			
Country:	Mexico	Project Name:	Mexico (CRL) Integrated Energy Services
Project ID:	P088996, P095038	L/C/TF Number(s):	IBRD-75010, TF-91733
ICR Date:	08/31/2016	ICR Type:	Core ICR
Lending Instrument:	SIL, SIL	Borrower:	UNITED MEXICAN STATES
Original Total Commitment:	USD 15.00M, USD 15.00M	Disbursed Amount:	USD 11.95M, USD 11.92M
<b>Environmental Category: B,B</b>		<b>Focal Area: C</b>	
<b>Implementing Agencies:</b> Secretaría de Energía (with Comisión Federal de Electricidad as the operator for executing the Rural Energy Subprojects under Part 2 of the Project).			
<b>Cofinanciers and Other External Partners: N/A</b>			

<b>B. Key Dates</b>				
<b>Mexico (CRL) Integrated Energy Services - P088996</b>				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	03/16/2004	Effectiveness:		07/16/2009
Appraisal:	02/12/2007	Restructuring(s):		10/22/2012 06/05/2014 04/21/2015
Approval:	01/17/2008	Mid-term Review:		03/25/2011
		Closing:	06/30/2013	10/30/2015

<b>MX-GEF Integrated Energy Services - P095038</b>				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	03/16/2004	Effectiveness:	08/05/2009	07/16/2009
Appraisal:	02/12/2007	Restructuring(s):		10/22/2012 06/05/2014 04/21/2015
Approval:	01/17/2008	Mid-term Review:	04/21/2010	03/25/2011
		Closing:	06/30/2013	10/30/2015

<b>C. Ratings Summary</b>	
<b>C.1 Performance Rating by ICR</b>	
Outcomes	Moderately Unsatisfactory
GEO Outcomes	Moderately Unsatisfactory
Risk to Development Outcome	Substantial
Risk to GEO Outcome	Low
Bank Performance	Moderately Satisfactory
Borrower Performance	Moderately Satisfactory

<b>C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)</b>			
Bank	Ratings	Borrower	Ratings
Quality at Entry	Moderately Satisfactory	Government:	Moderately Satisfactory
Quality of Supervision:	Moderately Satisfactory	Implementing Agency/Agencies:	Moderately Satisfactory
Overall Bank Performance	Moderately Satisfactory	Overall Borrower Performance	Moderately Satisfactory

<b>C.3 Quality at Entry and Implementation Performance Indicators</b>			
<b>Mexico (CRL) Integrated Energy Services - P088996</b>			
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
DO rating before Closing/Inactive status	Moderately Satisfactory		

<b>MX-GEF Integrated Energy Services - P095038</b>			
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	Moderately Satisfactory		

<b>D. Sector and Theme Codes</b>		
<b>Mexico (CRL) Integrated Energy Services - P088996</b>		
	<b>Original</b>	<b>Actual</b>
<b>Sector Code (as % of total Bank financing)</b>		
Central government administration	33	42
General industry and trade sector	12	12
Other Renewable Energy	32	46
Sub-national government administration	9	0
Thermal Power Generation	14	0
<b>Theme Code (as % of total Bank financing)</b>		
Climate change	33	33
Rural services and infrastructure	67	67

<b>MX-GEF Integrated Energy Services - P095038</b>		
	<b>Original</b>	<b>Actual</b>
<b>Sector Code (as % of total Bank financing)</b>		
Central government administration	36	53
General agriculture, fishing and forestry sector	4	4
General industry and trade sector	4	4
Other Renewable Energy	39	39
Sub-national government administration	17	0
<b>Theme Code (as % of total Bank financing)</b>		
Climate change	67	67
Rural services and infrastructure	33	33

<b>E. Bank Staff</b>		
<b>Mexico (CRL) Integrated Energy Services - P088996</b>		
<b>Positions</b>	<b>At ICR</b>	<b>At Approval</b>
Vice President:	Jorge Familiar	Pamela Cox
Country Director:	Gerardo M. Corrochano	Axel van Trotsenburg
Practice Manager/Manager:	Antonio Barbalho	Philippe Charles Benoit
Project Team Leader:	Guillermo Hernández González	Gabriela Elizondo Azuela
ICR Team Leader:	Guillermo Hernández González	
ICR Primary Author:	Guillermo Hernández González	

<b>MX-GEF Integrated Energy Services - P095038</b>		
<b>Positions</b>	<b>At ICR</b>	<b>At Approval</b>
Vice President:	Jorge Familiar	Pamela Cox
Country Director:	Gerardo M. Corrochano	Axel van Trotsenburg
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ICR Team Leader:	Guillermo Hernández González	
ICR Primary Author:	Guillermo Hernández González	

## **F. Results Framework Analysis**

### **Project Development Objectives (from Project Appraisal Document)**

Increase access to efficient and sustainable integrated energy services in predominantly indigenous rural areas of Mexico.

### **Revised Project Development Objectives (as approved by original approving authority)**

Not applicable

### **Global Environment Objectives (from Project Appraisal Document)**

To achieve reduction of greenhouse gas emissions through the use of renewable energy in rural areas for the provision of electricity.

### **Revised Global Environment Objectives (as approved by original approving authority)**

Not applicable

**(a) PDO Indicator(s)<sup>1</sup>**

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1 :</b>	Number of households (HH) electrified with RET (solar PV)			
Value (quantitative or Qualitative)	0	34,000	4,432	2,235
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	50.43% achieved (99% when compared to project target of 2,060 HH <sup>2</sup> ). The revised target decreased from 34,000 HH electrified with RET (solar home systems) to 4,432 HH through Centralized Solar Farms (CSFs). Such a decrease was compensated by a nearly tenfold increase in the electricity capacity offered per household, thus enhancing the potential benefits to households and the project's acceptability, as the scope moved from individual, limited systems to a centralized, utility-like facility.			
<b>Indicator 2 :</b>	Costs per new connection (US\$/HH)			
Value (quantitative or Qualitative)	2400	960	1,097	1,535
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	40% overprice. This overprice can be explained mainly by the following: (i) the CSFs are equipped with a very advanced telecommunication system that allows CFE to operate them remotely, (ii) the quality of service provided by the CSFs is comparable to the grid, and (iii) the battery banks are dimensioned to prevent outages in the absence of solar radiation for two days.			
<b>Indicator 3 :</b>	New Renewable Capacity (kW)			
Value	0	6,289	6,205	2,357

<sup>1</sup> Upon a major restructuring in October 2012 (see Section 1.4 for further detail), the formally-revised results framework agreed with the Government maintained a broader scope where the targets corresponded to a federal rural electrification program (i.e. the Bandera Blanca Program), as opposed to targets which could be directly attributable to the Project. Accordingly, the federal program would provide electricity access to 86 communities, with 36 of them financed by IBRD/GEF resources and 50 by the Government. When the supervision team attempted to provide an update for the results framework in December 2014 (ISR Seq. 15), CFE informed the Bank that the Government's share of the program (i.e. access for 50 communities under the Bandera Blanca program) was not progressing as expected, since CFE decided to focus on providing access to the 36 communities financed by IBRD/GEF resources and only 4 pilot projects under Bandera Blanca had been completed in: (i) Guaycora (Sonora), (ii) Guásima del Metate (Nayarit), (iii) Tierras Blancas del Picacho (Nayarit) and (iv) La Ciénega (Nayarit). Since the project was about to close (April 2015), the results framework was not adjusted because any "updated" results framework would have been in place for such a small period of time (4 months), that it would have had a negligible impact on the project results assessment at completion. Although the project's closing date was further extended from April 30, 2015 to October 30, 2015, the results framework was never adjusted to clarify the program-versus-project issue. Nonetheless, the supervision team started updating some indicators (as information became available), based on **project targets** (i.e. those associated to the solar farms funded by IBRD and GEF resources only), rather than the targets of the entire federal program (i.e. **program targets**) since December 2014. This ICR presents both, project outcomes (40 solar farms under PSIE) and program outcomes (40 solar farms under PSIE plus the 4 pilot projects under Bandera Blanca).

<sup>2</sup> As explained above, the supervision team started updating project indicators based on **project targets** since December 2014. (See Annex 2 for details).

(quantitative or Qualitative)				
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	38% achieved (74% when compared to project target of 2880 kW <sup>3</sup> ). The revised target remained practically the same, and only the delivery mechanism was modified (from solar home systems to centralized, utility-like solar farms).			
<b>Indicator 4 :</b>	Emissions reduction (thousand tons CO <sub>2</sub> e/year)			
Value (quantitative or Qualitative)	0	254	241	139
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	57.7% achieved (117% when compared to project target of 112 thousand tons CO <sub>2</sub> e/year <sup>4</sup> ). The revised target remained practically the same as the displaced carbon-intensive sources of energy were not modified. The project has a significant mitigation potential due to replication effects throughout the country.			
<b>Indicator 5 :</b>	Incremental increase of electricity consumed for productive uses (MWh/year)			
Value (quantitative or Qualitative)	0	5,650	5,768	151
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	2.6% achieved (4.9% when compared to project target of 2,682 MWh/year <sup>5</sup> ).  Although this indicator target was lower-than-expected at the end of the implementation period, the project successfully managed to provide utility-like electricity access to 36 communities (in addition to 4 communities soon-to-be electrified), including significant potential for developing productive/social activities within the next few years.  Initial efforts to make use of the new infrastructure for productive/social purposes include: (i) lighting for extended use in those communities where schools are found, (ii) development of local reading groups, (iii) acquisition of coolers for livestock vaccines and for fishing production, (iv) improvement of craftsmanship production processes, (v) water pumping for agricultural purposes, (vi) revamping of mechanical and carpentry workshops, among others. Potential productive uses identified by the beneficiaries are, among the most important: internet supply for productive, communication and educational purposes, and water pumping for continuous drinking-water supply. In one of the benefitted communities ( <i>Potrero de la Palmita</i> , in Nayarit), the community is already requesting a three-phase supply to install a water-treatment facility, which could contribute both to a sustainable use of resources and to create few jobs in the community. All of the above activities should eventually lead to a better quality of life of those communities benefitted by the project. In particular, internet access could be			

<sup>3</sup> Ibid

<sup>4</sup> Ibid

<sup>5</sup> Ibid

	replicated in all the benefited communities and could have an exponential effect on the development of productive uses, since beneficiaries would have full access to information related to all federal and local entrepreneurship programs.			
<b>Indicator 6 :</b>	Number of new social/productive activities and micro-business developed			
Value (quantitative or Qualitative)	0	1,000	2,179	150
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	<p>6.88 % achieved (12.7% when compared to project target of 1,013 activities<sup>6</sup>).</p> <p>Although this indicator target was lower-than-expected at the end of the implementation period, the project successfully managed to provide utility-like electricity access to 36 communities (in addition to 4 communities soon-to-be electrified), including significant potential for developing productive/social activities within the next few years.</p> <p>Initial efforts to make use of the new infrastructure for productive/social purposes include: (i) lighting for extended use in those communities where schools are found, (ii) development of local reading groups, (iii) acquisition of coolers for livestock vaccines and for fishing production, (iv) improvement of craftsmanship production processes, (v) water pumping for agricultural purposes, (vi) revamping of mechanical and carpentry workshops, among others. Potential productive uses identified by the beneficiaries are, among the most important: internet supply for productive, communication and educational purposes, and water pumping for continuous drinking-water supply. In one of the benefited communities (<i>Potrero de la Palmita</i>, in Nayarit), the community is already requesting a three-phase supply to install a water-treatment facility, which could contribute both to a sustainable use of resources and to create few jobs in the community. All of the above activities should eventually lead to a better quality of life of those communities benefited by the project. In particular, internet access could be replicated in all the benefited communities and could have an exponential effect on the development of productive uses, since beneficiaries would have full access to information related to all federal and local entrepreneurship programs.</p>			
<b>Indicator 7 :</b>	Total RET energy consumption per household (kWh/year)			
Value (quantitative or Qualitative)	0	Not applicable	2,077	799
Date achieved	10/10/2012	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	<p>38.5% achieved (84% when compared to project target of 966 kWh/year<sup>7</sup>).</p> <p>This indicator is likely to be met and passed within the next few months, as the electrified communities fully embraced the benefits of the new infrastructure in place. This indicator was included in the results framework at project restructuring in October 2012.</p>			

<sup>6</sup> Ibid

<sup>7</sup> Ibid

<b>Indicator 8 :</b>	Number of Households electrified			
Value (quantitative or Qualitative)	0	50,000	Dropped	Not applicable
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	This indicator was dropped at the project restructuring in October 2012.			
<b>Indicator 9 :</b>	Income generation to project beneficiaries due to increased productive/economic uses of electricity.			
Value (quantitative or Qualitative)	0 to 2 USD/day	> 3	Dropped	Not applicable
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	This indicator was dropped at the project restructuring in October 2012.			
<b>Indicator 10 :</b>	Number of private companies operating as service companies.			
Value (quantitative or Qualitative)	0	45	Dropped	Not applicable
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	This indicator was dropped at the project restructuring in October 2012.			
<b>Indicator 11 :</b>	Amount of private equity invested in rural projects (% total investment)			
Value (quantitative or Qualitative)	0	> 10%	Dropped	Not applicable
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	This indicator was dropped at the project restructuring in October 2012.			
<b>Indicator 12 :</b>	Number of extension agents trained			
Value (quantitative or Qualitative)	0	940	Dropped	Not applicable
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	This indicator was dropped at the project restructuring in October 2012.			

**(b) GEO Indicator(s)**

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1 :</b>	Emissions reduction (thousand tons CO <sub>2</sub> e/year)			
Value (quantitative or Qualitative)	0	254	241	139
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	57.7% achieved (117% when compared to project target of 112 thousand CO <sub>2</sub> e/year <sup>8</sup> ). The revised target remained practically the same as the displaced carbon-intensive sources of energy were not modified. The project has a significant mitigation potential due to replication effects throughout the country.			

**(c) Intermediate Outcome Indicator(s)**

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1 :</b>	SENER/CFE operational			
Value (quantitative or Qualitative)	None	Operational	Operational	Operational
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/10/2012
Comments (incl. % achievement)	Original indicator was PPMT/SPICs/PAC/PMC/TSMG operational. However, the scope of the project was modified in October 2012 and therefore only SENNER and CFE had to be operational for the project to be implemented.			
<b>Indicator 2 :</b>	Design of bidding documents			
Value (quantitative or Qualitative)	None	Complete	Complete	Complete
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	Achieved. Seven bidding processes were successfully launched and completed during project implementation.			
<b>Indicator 3 :</b>	Issuance of technical guidelines			
Value (quantitative or Qualitative)	None	Complete	Complete	Complete
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	Achieved. Technical guidelines were included in each of the seven bidding processes which were launched and completed during project implementation.			

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<sup>8</sup> Ibid

achievement)				
<b>Indicator 4 :</b>	Baseline Impact Evaluation Assessment			
Value (quantitative or Qualitative)	None	Complete	Complete	Complete
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	Achieved.			
<b>Indicator 5 :</b>	Medium Term Impact Evaluation Assessment			
Value (quantitative or Qualitative)	None	Complete	Complete	Complete
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	Achieved. The Bank and the Government assessed project situation in 2011-2012 which led to the restructuring of October 2012.			
<b>Indicator 6 :</b>	Design procedure for technology and service provider pre-qualification/certification.			
Value (quantitative or Qualitative)	None	Complete	Dropped	Not applicable
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	This indicator was dropped at project restructuring in October 2012.			
<b>Indicator 7 :</b>	Successful ownership transfer of SHS to Households			
Value (quantitative or Qualitative)	None	At least 50% of SHS installed in YT1	Dropped	Not applicable
Date achieved	12/05/2008	12/05/2008	10/10/2012	10/30/2015
Comments (incl. % achievement)	This indicator was dropped at project restructuring in October 2012.			

## G. Ratings of Project Performance in ISRs

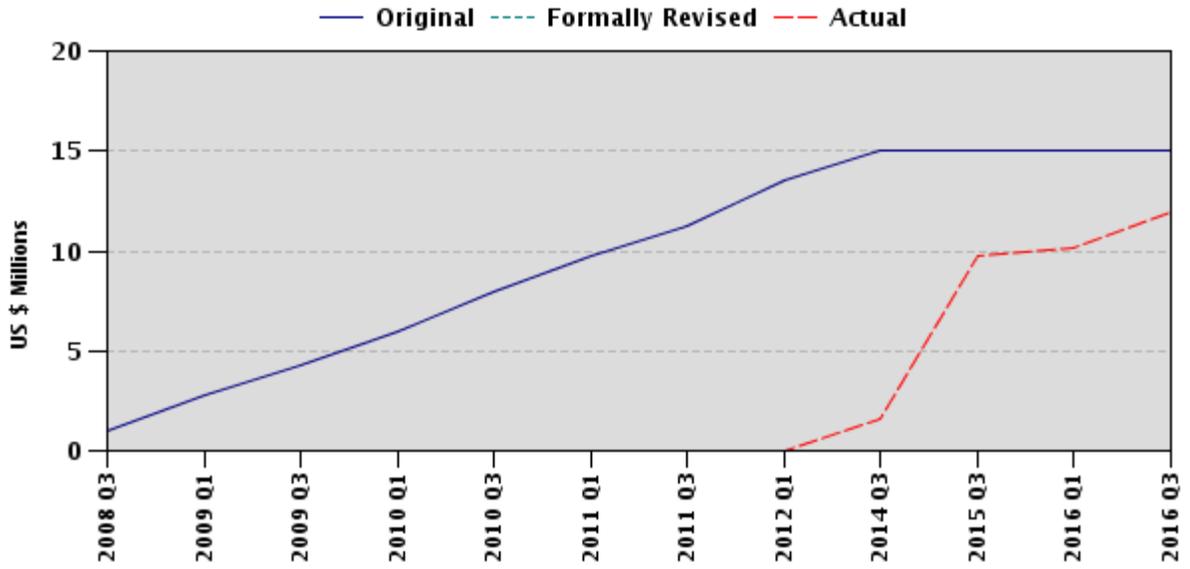
-						
No.	Date ISR Archived	DO	GEO	IP	Actual Disbursements (USD millions)	
					Project 1	Project 2
1	03/26/2008	S	S	S	0.00	0.00
2	06/27/2008	MS	MS	S	0.00	0.00
3	12/16/2008	MU	MU	MS	0.00	0.00
4	05/15/2009	MU	MU	MS	0.00	0.00
5	11/17/2009	MS	MS	MS	0.00	0.00
6	06/18/2010	MS	MS	MS	0.00	0.00
7	01/03/2011	MU	MU	MU	0.00	0.41
8	05/31/2011	MU	MU	U	0.00	0.45
9	08/13/2011	MU	MU	U	0.00	0.45
10	05/13/2012	U	U	U	0.00	0.45
11	12/22/2012	U	U	MU	0.00	0.20
12	07/27/2013	U	U	MU	0.00	0.20
13	02/16/2014	MU	MU	MU	0.00	0.20
14	04/29/2014	MS	MS	MS	1.56	0.20
15	12/30/2014	MS	MS	MS	8.56	3.84
16	07/13/2015	MS	MS	MS	10.04	6.37
17	10/30/2015	MS	MS	MS	10.12	9.09

## H. Restructuring (if any)

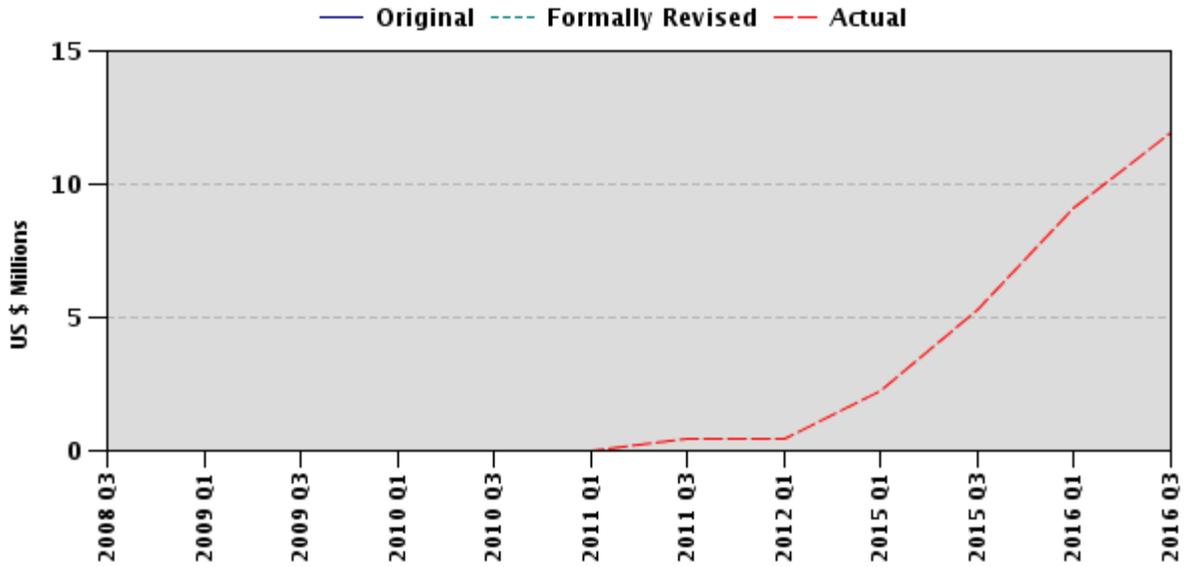
Restructuring Date(s)	Board Approved		ISR Ratings at Restructuring			Amount Disbursed at Restructuring in USD millions		Reason for Restructuring & Key Changes Made
	PDO Change	GEO Change	DO	GEO	IP	Project1	Project 2	
10/22/2012			U		U	0.00		This restructuring addressed institutional constraints that had delayed implementation and consequently, disbursements. Specifically, the restructuring: (i) simplified the implementation arrangements and involved the national power utility, the Federal Electricity Commission (CFE), in the execution of the Rural Energy Subprojects, and (ii) focused only on solar photovoltaic (PV) technology in the form of “centralized solar farms”. In addition, this restructuring extended the closing date by one year, i.e. to June 30, 2014, to ensure completion of the tenders under the proposed new procurement plan. The results framework was adjusted to reflect the changes in the project scope.
10/22/2012				U	U		0.20	This restructuring addressed institutional constraints that had delayed implementation and consequently, disbursements. Specifically, the restructuring: (i) simplified the implementation arrangements and involved the national power utility, the Federal Electricity Commission (CFE), in the execution of the Rural Energy Subprojects and (ii) focused only on solar photovoltaic (PV) technology in the form of “centralized solar farms”. In addition, this restructuring extended the closing date by one year, i.e. to June 30, 2014, to ensure completion of the tenders under the proposed new procurement plan. The results framework was adjusted to reflect the changes in the project scope.

06/05/2014			MS		MS	1.56	This restructuring extended the closing date of the loan and the GEF grant supporting the project by 10 months, from June 30, 2014 to April 30, 2015.
06/05/2014				MS	MS	0.20	This restructuring extended the closing date of the loan and the GEF grant supporting the project by 10 months, from June 30, 2014 to April 30, 2015.
04/21/2015			MS		MS	9.73	This restructuring included a 6-month extension to the closing date of both the IBRD Loan 7501-ME and the GEF Grant TF091733 (to October 30, 2016) and a reallocation of funds among categories supported by the GEF Grant TF091733.
04/21/2015				MS	MS	5.31	This restructuring included a 6-month extension to the closing date of both the IBRD Loan 7501-ME and the GEF Grant TF091733 (to October 30, 2016) and a reallocation of funds among categories supported by the GEF Grant TF091733.

**I. Disbursement Profile**  
P088996



P095038



# 1. Project Context, Development and Global Environment Objectives Design

## 1.1 Context at Appraisal

### A. Country and Sector Context.

1. By the time of preparation of the Integrated Energy Services Project (commonly referred to as **PSIE**, for its acronym in Spanish), Mexico's electrification coverage had already reached 96.6 percent. An estimated 3.5 million people remained without electricity in poor rural areas of the Southern States (Oaxaca, Chiapas, Guerrero and Veracruz) and other regions. Providing electricity to the remaining households was particularly challenging, since the majority of them were in small, remote, isolated communities. About 60 percent of the people with no electricity were indigenous. Typically, these communities also lacked other basic services and infrastructure such as roads, water, telecommunications, education and health. Further, the number of people without electricity was expected to increase by 20 percent due to population growth over the following decade.

2. Although in 2000 the Government of Mexico (GoM) expressed its commitment to increase the electrification coverage through the implementation of a renewable-based rural electrification program (PROSENER 2001-2006), such program had not been set in place by the mid-2000s, mainly due to institutional, programmatic and fiscal constraints. Consequently, the federal administration for the period 2006-2012 set as a priority the implementation of a rural electrification program as part of the energy sector strategic platform. A priority emphasized by the GoM was to target one hundred municipalities with the highest degree of poverty, i.e. with the lowest human development index.

3. In 2007 the PAD identified the following main constraints to the implementation of a national rural electrification program:

- Decentralization policies introduced in 1996 transferred the administration of federal resources for social infrastructure development from the central government to the states and municipalities. As a consequence, programmatic and executing functions for rural electrification shifted from the Federal Electricity Commission (CFE) to municipalities. However, decentralization efforts were not accompanied by a build-up of local capacity to address electrification needs, thus slowing down the implementation of social infrastructure, particularly in remote rural localities.
- Social programs aimed at improving the expenditure efficiency of municipal resources through Federal-State-Municipal co-financing agreements, including rural electrification. However, these components focused mostly on grid extensions and, due to planning and implementation shortcomings, yielded very high unit costs (e.g. the national average cost per rural connection over the period 2001-2005 was in the order of US\$2,400).
- Another constraint was the lack of understanding regarding the performance of renewable energy in rural applications, which caused a generalized resistance to the use of these solutions.
- Further constraints were:
  - i. lack of a legal framework addressing specific provisions for the development of renewable energy;
  - ii. high and inefficient consumer subsidies (not targeted to the poor) that affected the competitiveness of renewable energy;
  - iii. the complexities of inducing service provision —especially private— in rural areas; and

- iv. absence of a strategic framework streamlining the expertise and efforts of key government agencies while continuing to strengthen municipal and local capacities.

4. To bridge the electrification gap and promote a more efficient use of available public resources, the GoM requested assistance from the World Bank to prepare and implement a project to: (a) guide and streamline national rural electrification efforts; (b) increase access to efficient and sustainable integrated energy services; (c) improve the quality of life and promote the economic development of remote rural communities; (d) develop a sustainable market for the provision of least-cost integrated energy solutions; and (e) leverage municipal government funds with co-financing from non-government stakeholders.

## **B. Rationale for Bank assistance.**

5. The IBRD and GEF-financed project was consistent with the government agenda and the National Development Plan (PND 2007-2012 and previous PND) as it aimed to contribute in reducing poverty, developing basic infrastructure, strengthening institutional capacities and improving environmental protection.

6. The project was designed to support the strategies and actions on rural electrification established by the Ministry of Energy (SENER) and prioritized by the federal administration during the period of 2006-2012 (and later ratified as a priority by the current federal administration). In supporting this initiative, World Bank involvement aimed at introducing an approach to adopt international best practice in rural electrification. Also, the Bank would deepen its support to poverty reduction efforts in Mexico and would leverage its comparative advantage of extensive experience in rural electrification and renewable energy.

7. The Project focused on off-grid solutions and therefore, was complementary to the rural electrification strategy of the Basic Infrastructure Program for Indigenous People Development (PIBAI) led by the Indigenous People Development Commission (CDI). The Project was also complementary to the objectives and scope of the Micro Regions Program being implemented by the Ministry of Social Development (SEDESOL), which focused on improving social and economic development in the Municipalities that exhibited the highest degree of poverty.

### **1.2 Original Project Development Objectives (PDO) and Key Indicators (as approved)**

8. The development objective of the Project was to:

***Increase access to efficient and sustainable integrated energy services in predominantly indigenous rural areas of Mexico.*** To achieve this, the proposed Project intended to support the national rural electrification program by: (i) contributing to the financing of sub-projects to supply electricity services to about 50,000 currently un-served rural households, and businesses and public facilities such as schools and health clinics, using renewable integrated energy services; (ii) developing a sustainable market for the provision of least-cost integrated energy solutions in rural areas; and (iii) demonstrating the key elements of a strategy for electricity provision in rural areas that attracts investment from private and public sector electricity providers, as well as national, regional and local governments.

9. To ensure the success of the main development objective, project activities also meant to:

***Promote the development of social and productive activities to increase the use of electricity.*** The project intended to implement a pilot program to: (i) promote a more intensive use of electricity for subsistence and productive activities; (ii) increase the number of community

projects and investments with high developmental impact (e.g., leverage and maximize the productive impact of remittances) and; (iii) promote public private partnerships aimed at community development.

10. The key performance indicators were: (i) the number of new electricity connections; (ii) improved efficiency of public expenditures, i.e. resources saved due to co-financing with private sector and users, and the introduction of least-cost considerations; (iii) the number of new productive uses of electricity established in rural areas; and (iv) the number of community and economic development projects facilitated by the use of electricity.

### **1.3 Original Global Environment Objectives (GEO) and Key Indicators (as approved)**

11. The global environmental objective of the project was *to achieve reduction of greenhouse gas emissions through the use of renewable energy in rural areas for the provision of electricity*. The key global performance indicator was avoided carbon emissions (CO<sub>2</sub>e). Total estimated carbon emission reductions from facilities installed during Project implementation were expected at 4.98 million metric tons of carbon dioxide equivalent (CO<sub>2</sub>e), over the lifetime of the systems, i.e. 20 years (241 thousand tCO<sub>2</sub>e accrued during the 5 years of implementation). The long-term national impact of the project was expected to be larger due to replication effects.

### **1.4 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification**

12. By mid-2012, three years after the project had been declared effective, disbursements amounted to only 1.3 percent and 0.25 percent of the GEF grant and IBRD loan, respectively. Progress toward achieving the PDO was considered to be unsatisfactory. Hence, the project was restructured in October 2012 with view to address institutional constraints that had contributed to a delayed implementation and the consequent disbursements. Although the restructuring entailed substantive institutional and technology changes, the PDOs were not amended. However, the wording of the PDO in the legal agreements was adjusted in order to correct an inconsistency with the corresponding wording of the PAD at the time of approval (prior to the restructuring, the PDO in the legal documents did not include the indigenous aspect of the project).

13. Changes in the Project scope and activities justified the revision of seven performance indicators as well as dropping other seven indicators. The most noticeable change was a reduction of the number of households to be electrified, from 34,000 HH electrified with RET (solar home systems) to 4,432 HH through Centralized Solar Farms (CSFs). This reduction was compensated by a nearly tenfold increase in the electricity capacity offered per household, thus enhancing the potential benefits to households and the project's acceptability, as the scope moved from individual, limited systems to a centralized, utility-like facility. Original and revised Performance Indicators are presented in Annex 2.

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

14. No changes were made to the GEO. However, the indicator for emissions reductions was revised to reflect changes made in the selection of technology and the expectations of the productive uses component (Annex 2).

## 1.6 Original Main Beneficiaries

15. The project was designed to benefit households, businesses and public facilities in predominantly indigenous rural areas through the provision of electricity services, mostly using Renewable Energy Technologies (RET). The original design targeted as main beneficiaries 50,000 rural households (approximately 220,000 people), of which 47,080 were expected to benefit from RETs<sup>9</sup>. The original project had a strong focus on building the capacity of existing entities – those with formal and legal functions in the planning, decision-making, financing and execution of rural infrastructure development projects – as well as on strengthening the policy and regulatory frameworks<sup>10</sup>. Also, a technical assistance component to support community entrepreneurs in developing productive uses of electricity was expected to benefit 1,000 new productive activities and micro-businesses.

16. Upon the 2012 restructuring the project focused on one single photovoltaic (PV) technology in the form of mini-grids based on centralized “solar farms”, or CSFs. Though this technology offered a much larger capacity per connection and, hence, the potential for greater benefits per household, the targeted population was reduced to 4,432 households (17,578 people). Also, changes in the project’s implementation institutional arrangements meant that institutional benefits were limited to Federal and, to lesser degree, Community entities.

## 1.7 Original Components (as approved)

17. The approved Project had five main components, which are described below:

- **Component 1. Strengthening of strategy, policy, and regulatory frameworks** (Estimated Cost US\$ 4.1 Million). This component included: (a) the review and design of strategy, policy and/or regulatory measures for electricity tariff and subsidy schemes as well as ownership and property rights associated with off-grid rural electrification projects; (b) the design of incentives to foster the development of renewable off-grid electricity services; (c) the development of technical specifications, standards and manuals to ensure minimum quality levels in technical installations and service delivery practices; (d) the development of methodological guidelines and tools for public consultation activities; and (e) the design of a conflict resolution mechanism to ensure transparency and reduce risks.
- **Component 2. Investment in Rural Electrification Sub-projects** (Estimated Cost US\$68.4Million). This component provided capital cost subsidies for a certain fraction of the investment cost of rural electrification sub-projects, as well as targeted output-based subsidies focused on service quality and market development. The sub-projects were to be implemented by qualified electricity service providers. Two different service delivery models applied, depending on the type of sub-project. The main off-grid technological options considered: (a) Photovoltaic-Solar Home Systems; (b) Wind Home Systems; (c) Micro-Hydro and Hydro Based Mini-grids; (d) Small Scale Biomass Power Generation;

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<sup>9</sup> Out of 47,080 households to benefit from RETs, 34,000 were expected to be electrified with solar energy (PV).

<sup>10</sup> Mexico has a complex institutional setting for rural infrastructure development that involves participation of many government entities at the Federal, State and Municipal levels. The original project design focused on strengthening the coordination and technical capacity of these entities to plan, finance and execute projects for electricity services in rural and indigenous people’s territories.

and (e) Diesel/RET/ Battery Hybrids. In addition, the Project included the installation of a limited number of efficient wood stoves in rural households.

- **Component 3. Capacity Building to State, Municipal and Community Stakeholders** (Estimated Cost US\$ 12.6 Million). This component aimed to assist the various stakeholders that were expected to work under the project. Under this component the project was to strengthen the capacity of Federal, State, Municipal and Community stakeholders to identify, plan, prioritize, implement, supervise and monitor, sustainable off-grid rural electrification sub-projects in cooperation with electricity service providers, the private sector, decentralized government institutions such as the CFE and when appropriate, NGOs and academia. The component focused on all those stakeholders that would be ultimately responsible for execution, implementation and for ensuring sustainability.
- **Component 4. Co-Financing and Technical Assistance to Increase Productive Uses of Electricity** (Estimated Cost US\$ 6.0 Million). The objective of this component was two-fold: (a) promote a more intensive use of electricity while contributing to increase the number of social and productive activities (i.e. foster local economic development) and; (b) support community entrepreneurs through technical assistance and co-financing to increase the number of community projects and investments with high developmental impact. To the extent possible, the project would seek to leverage and maximize the productive impact of remittances. The component included technical assistance and capacity building activities focused on: (i) access to micro-financing and development of business plans; (ii) development of social or community projects with high impact on health and education; and (iii) development and financing of productive and economic activities.
- **Component 5. Project Management** (Estimated Cost US\$ 7.5 Million). The objective of this component was to support the overall management of the proposed project, including all Federal and State level institutions in charge of its execution and implementation. The actual administration of the GEF and IBRD resources was to be carried out by *Nacional Financiera* (NAFIN).

## 1.8 Revised Components

18. In the attempt to address the lack of progress observed during its first four years of implementation –to a large extent derived from an 18 month delay in achieving effectiveness and the difficulty of transferring the loan and grant resources to the Ministry of Energy (SENER) - , the project was restructured in October 2012 after a thorough assessment carried out by the GoM in 2011 and 2012. The main changes approved by the Bank were: (i) the focus on one single photovoltaic (PV) technology in the form of CSF; (ii) a decrease in the number of target households to better reflect the change of scope from individual, limited systems to centralized, utility-like facilities; and (iii) the incorporation of the public utility CFE as the operator of Component 2 (Rural Electrification Sub-projects) while SENER remained as the Project Implementing Agency. Reducing the project’s scope to a single technology helped facilitating the implementation challenge. Although CFE had a role under the original project – in supporting State and Municipal entities when required in the execution of projects, consistent with the legal mandate under decentralization policies that transferred rural electrification functions from CFE to States and Municipalities –, the utility was incorporated as the main operator of the restructured project. The electrification initiatives were financed with public resources (SENER through the Fund for the Energy Transition and Sustainable Use of Energy – or FOTEASE for its acronym in Spanish - for

the CSFs and CDI / local governments for the associated distribution networks). The GoM would later be reimbursed for eligible expenses (CSFs only) using IBRD/GEF resources.

19. The main changes described above entailed the following:

- Redesigning **Component 2**, focusing only on solar projects and eliminating the possibility to electrify with other options, i.e. wind power, micro-hydro, small-scale biomass and diesel/RET hybrids, as well as the wood stoves delivery model. Nevertheless, the scale of this component increased from a total investment of US\$68.4 million to US\$ 110 million, which implied almost doubling the financing of IBRD, GEF and the GoM; and
- Dropping the technical assistance **Component 3**, since the participation of CFE as operator meant that these capacity building activities were no longer necessary for local governments and other institutions originally considered.

20. It is noted that since its design, the World Bank-supported component (i.e. IBRD loan and GEF grant) accounted for a relatively minor part of the project's electrification effort<sup>11</sup>, which encompassed the entire Government rural electrification program. It is important to make this distinction because upon the restructuring of 2012, the timetable of these parts differed as the restructured project-supported locations –**the project**, for the purposes of this report– were given first priority while the electrification of other localities supported under the Government's rural electrification program *Bandera Blanca* lagged behind. Nevertheless, Project indicators kept the same scope: the entire GoM rural electrification program –**the program**<sup>12</sup>.

### 1.9 Other significant changes

21. Other important changes associated to the 2012 restructuring were: (i) the World Bank financing was limited to Component 2, Project Management (which was considerably reduced), and some TA activities, while the GoM assumed full financing responsibility for all other technical assistance components, i.e. policy, regulation and strategy –already underway–, and the TA for productive uses; (ii) private financing, which accounted for 8.6 percent of the original project financing, was no longer included in the financing plan; (iii) service management contracts considered in the original plan were eliminated; and (iv) the project closing date was extended by one year, from June 30, 2013 to June 30, 2014 (costs and financing plans for the original and restructured project are presented in Annex 1).

22. **Extensions of loan and grant for a total of twenty-eight months.** In addition to the closing date extension of October 2012, the Bank approved a ten-month extension of the loan and grant in June 2014, prolonging the closing date to April 30, 2015. Furthermore, in April 2015, the Bank authorized a six-month extension till October 30, 2015. The last two extensions were justified in

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<sup>11</sup> 30.4 percent of the project's total budget, which went down to 24.6 percent upon the restructuring of the project.

<sup>12</sup> The *Bandera Blanca* Program included both conventional (grid extension) and non-conventional electrification efforts through CSF. At the time of the restructuring process in October 2012, such program was still in place, but was modified after the change of federal administration in December 2012: the conventional electrification actions were transferred to SEDESOL, whereas the CSF projects were put on hold and only those under PSIE remained as a priority to the GoM. Thus, the Project met its own targets in terms of benefitted communities, installed capacity and emission reductions, but in the absence of additional CSF projects supported by *Bandera Blanca*, the program targets could not be met by the time of ICR preparation.

order to complete bidding processes for additional sub-projects, since a significant depreciation of the Mexican currency against the USD throughout 2013 and 2014 made available additional resources for expanding the benefits of PSIE to 4 additional communities, i.e. from 36 to 40 communities.

## **2. Key Factors Affecting Implementation and Outcomes**

### **2.1 Project Preparation, Design and Quality at Entry**

#### **A. Fit with CPS and Government Priorities.**

23. Project design was well aligned with the CPS and the objectives and priorities of the GoM to invest in rural electrification and renewable energy. In particular, the design of the project was consistent with the Government's objective to target the rural poor. The project's implementation arrangements were aligned also to decentralization policies introduced by previous administrations. Such policies encompassed an additional implementation challenge because the decentralization effort had not been accompanied by a build-up of local capacity.

#### **B. Soundness of the Background Analysis.**

24. Project design was based –in addition to its alignment to the GoM rural policies and priorities– on the World Bank's experience in rural electrification in Latin America and other regions. Project justification was based on solid analyses, including: i) a field investigation and assessment of the institutional setting formally and legally established at the Federal, State and Municipal levels for the planning and execution of rural electrification projects and their functions (by British organization Practical Action and other consultants), ii) assessment of previous experiences with rural electrification projects in Mexico (by the Mexican Institute of Electrical Research and Economic Research Center, CIDE), iii) study of applicable business models and survey of private sector companies supplying services in renewable energy (by reputable consultants in rural electrification), and iv) economic and incremental cost analyses developed by Bank experts, among other. Ex-ante social and environmental assessments undertaken during preparation addressed adequately the potential environmental impacts of different technologies and mitigation measures, baseline socio-economic information in four Mexican States, including gender issues, and consultations with targeted indigenous people beneficiaries.

25. The PAD also pointed out the following lessons from previous experiences: (i) the need for a robust program to work within a well-coordinated institutional network across Federal, State and Municipal levels; (ii) emphasis on continuous capacity building; (iii) specific lessons to enhance sustainability of off-grid electrification projects; and (iv) need to identify productive loads to improve the financial sustainability of energy renewable off-grid projects.

26. The rationale for the Bank's intervention was justified on the grounds of its alignment to the GoM agenda and its contribution in introducing international best practices in rural electrification.

#### **C. Project Design.**

27. The proposed Project Development Objectives (PDOs) are an appropriate response to country's needs and, as mentioned, fully compatible with the GoM's rural policies and priorities. Also, the five original project components included the inputs necessary to fulfill the PDOs, given the existing institutional structure in Mexico. It should be noted that because the organizational

structure contemplated the participation of a relatively large number of institutions –and some whose capacity needed to be strengthened – the original design included a US\$ 12.6 million technical assistance component (*Component 3: Capacity Building to State, Municipal and Community Stakeholders*). The allocation of such a substantial amount, i.e. 12.7 percent of the total project cost and 26.5 percent of the World Bank (IBRD plus GEF) contribution showed that a key component of the project was to build capacity across Federal, State and Municipal levels.

28. Project design was consistent with the GoM’s decentralization policies and was informed by a thorough assessment completed by Intermediate Technology Consultants in November 2005 which identified different institutional arrangements for rural electrification already in place in different *Estados* (States or Provinces), and which included a proposal on suitable alternatives for successful implementation of the project. The existing institutional setting in Mexico for rural infrastructure development involved a substantial number of Federal, State and Municipal agencies working towards rural development goals, and for this reason the project focused on streamlining the functions via committees in the three government levels.

29. Specifically, a report from British consultant Practical Action commissioned by the Bank to inform project design observed that CFE was finding it financially challenging to provide services in rural areas mainly because electricity tariffs targeting residential and agricultural customers were insufficient to recover cost. As a consequence, off-grid electrification had stalled. The original project design included also a component to review the legal and regulatory framework (including a review of tariffs and subsidies).

30. From a broader perspective, the original design intended to strengthen the capacity of public sector entities in charge of planning, decision making, financing and execution of rural electrification projects and support a more coordinated approach given the number of agencies involved. The institutional arrangements of the original project therefore included: i) a Program Planning and Management Unit (PPMU) at SENER (main counterpart), with two committees at the Federal level (an advisory committee that brought representatives of other ministries with functions on rural development and a project monitoring committee), ii) for benefited States, a State Implementation Committee and a Technical Supervision and Monitoring Group (that brought together the agencies with technical expertise in off-grid electrification such as CFE and FIRCO).

31. In addition, the assessments and surveys conducted during preparation showed the existence of a large number of private companies already selling electrification equipment in States and Municipalities (most of them specialized in solar PV and wind), thus the business development model proposed in the project included the possibility to attract private sector participation into concessions, whenever feasible.

32. The original project design entailed several challenges (as it is typical with rural development and poverty reduction projects), most notably: i) the need to develop a new project implementation unit at SENER (the PPMU) with the capacity to effectively develop the project and coordinate with the program with different entities at State level, ii) developing a good coordination among existing agencies would necessarily entail a long period of time (including the need to launch and manage consultations in indigenous communities intervened), and more generally, iii) building the capacity of existing institutions to plan and procure rural electrification initiatives.

33. In addition, and given the “non-additionality rules” that apply in Mexico with regards to projects financed via multilateral agencies (i.e.; loans for projects do not change or increase Ministries’ approved budgets), the project needed to create a mechanism to transfer loan and grant resources to SENER and the overall program. This last aspect proved to be a key bottleneck to the

project, which resulted in an unsatisfactory performance during the initial years of implementation, and eventually led to the project restructuring of October 2012<sup>13</sup>.

#### **D. Risks.**

34. A set of institutional, technical, economic and market/commercial risks was identified at preparation level, including the possibility of a lack of commitment and/or coordination among government institutions. The project also identified the risks inherent to rural electrification programs (i.e.; those associated with the sustainability of the installations in the long term, failure to create appropriate incentives to attract external agents and private providers, low technical quality of prepared projects, etc.). However, the original project did not properly identify the possibility of constraints at the Federal level for the creation of an arrangement or a mechanism to transfer the IBRD loan and GEF grant resources towards the project activities (initially, to sustain the expenditures of the project implementation unit at SENER). This proved to be an unsurmountable challenge, as the unit was created but the lack of resources forced its dismantling in the initial stage of project implementation.

35. The Financial Management risk was rated as substantial based on the findings of a Financial Management Assessment (FMA), mostly since at the time of approval NAFIN and the participating states (Guerrero, Oaxaca and Veracruz in a first phase) had indirect experience with Bank projects, and several strengthening actions had to be completed prior to launching the project, including the establishment of a financial mechanism to facilitate the transfer of IBRD and GEF resources.

## **2.2 Implementation**

### **Original Project Implementation Arrangements<sup>14</sup>**

**The organizational structure agreed for the execution and implementation of the original Project within the Government network was supported by agents whose assigned roles and activities were already in line with the national strategic objective of increasing access to electricity in rural areas.**

**At the Federal level, the project was expected to be implemented by the Ministry of Energy (SENER) with the fiduciary assistance of Nacional Financiera (NAFIN). Two committees were supposed to be integrated to support project execution and implementation at this level, a Project Advisory Committee (PAC) that brought representatives of other ministries with functions on rural development, and a Project Monitoring Committee (PMC).**

**At the State level the project was expected to be executed by the State Project Implementation Committees (SPICs) with the support of the Project Planning and Management Team (PPMT), and the Technical Supervision and Monitoring Group (TSMG) (i.e., technical networks being operated in the field with participation of CFE, CDI, FIRCO and SEMARNAT).**

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<sup>13</sup> Originally, the project design considered the transfer of loan resources to the Indigenous Peoples Development Commission (CDI) -which had the fiduciary structure to capture the loan proceeds, and an experienced procurement unit (with NAFIN capturing the grant proceeds). However, this arrangement could not be implemented after the project was approved. Not only the IBRD could not be transferred and used via CDI, but also the agency identified at entry as the financial institution to manage the grant resources (NAFIN) –assessed as adequate during project preparation- was substituted for BANOBRAS.

<sup>14</sup> See Annex 6 in the PAD for a detailed description.

**The Ministry of Energy (*Secretaría de Energía* – SENER) was the leading agency responsible for the project’s coordination and implementation, and for promoting the participation of Federal, State, Municipal and private entities in the programming, co-financing and execution of sub-projects, whereas the Financial Agent (NAFIN) was responsible for administering the IBRD and GEF resources, and was expected to provide support with procurement procedures. With the support of NAFIN for resources allocation and administration, SENER would be responsible for strategic planning functions, i.e. planning, programming and technical oversight.**

**The CDI (Indigenous People Development Commission) was expected to participate in supporting the project implementation, integrating a technical team to coordinate activities with SENER, and aligning programmatic efforts aimed at rural electrification. CDI was also responsible for opening of the fiscal space necessary to accommodate the IBRD loan and if necessary the GEF grant, and the private sector (through the scheme of ESCOs) and NGOs were supposed to provide electricity services.**

**In sum, the institutional arrangement was structured around five entities: (i) a Program Planning and Management Team (PPMT) within SENER; (ii) the financial agent NAFIN; (iii) a Project Advisory Committee (PAC) integrated by seven government agencies; (iv) a set of State Project Implementation Committees (SPIC), to be responsible for project planning, programming and implementation in each State; and (v) the Project Monitoring Committee (PMC), to be presided by SENER and integrated by representatives of other three government entities.**

36. It took eighteen months from project approval to effectiveness, i.e. from December 2007 to July 2009, casting doubts on both the effectiveness of the implementing agency and the Government’s commitment to the project. Three years after effectiveness, disbursements were almost negligible (1.3 percent and 0.25 percent of the GEF grant and IBRD loan, respectively) and the prospects of achieving its development objectives were compromised. Consequently, PDO and IP were rated Unsatisfactory or Moderately Unsatisfactory.

37. During this initial period, implementation efforts faced a number of obstacles: i) the difficulty of creating a mechanism or fund to facilitate the project development within SENER, ii) a period of about 20 months to create the PPMU at SENER (July 2009 to March 2011), and, iii) the need to dismantle the PPMU due to lack of resources to pay the salary of its members (March 2011). At the same time, the federal administration focused strongly on advancing an overarching energy sector reform of the energy sector which diverted attention to this new Government decision. During this initial period, SENER had difficulty coordinating and dealing with the work being advanced at the State level.

38. In different supervision missions –including the mid-term review<sup>15</sup>– delays were attributed to a set of problems, such as the complexities of the GoM budgetary process (complexities for a

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<sup>15</sup> A Bank supervision mission of March 2011 –ex-post upgraded to the project's mid-term review– provided the following snapshot of the implementation problems: (i) the project had been unable to use either the grant funds or the loan funds during 2011 due to coordination and budgetary problems with the Ministry of Finance, i.e. SHCP (in the case of the grant funds) and BANOBRAS (in the case of the loan); (ii) consequently, the staff of the Project Implementation Unit (PIU, or PPMU) had not been paid since December 2010; half of its members had already quit the team and there was an impending risk that the remaining members of the PIU

federal Ministry such as SENER to make use of IBRD and GEF resources, which derived in a significant delay to establish and maintain the Project Implementing Unit, or PIU), lack of counterpart funds (as federal Ministries must prepare annual budgets and the project required multiannual resources), and other more related to the work being advanced at the State level and more typical of rural electrification programs: i) defining the role and responsibilities of institutions involved, disagreements on the selection criteria of beneficiary communities, the uncertain interest of some States in the project (most notably after State level elections), and the delaying effects of an energy sector reform undertaken by the federal administration (starting in April 2008) which involved, among other measures, the formulation of a new legal and regulatory framework.

39. It is noted that, in spite of supporting the development of renewable energy and rural electrification, the energy reform of 2008 distracted most Federal entities associated to the sector, as they were forced to allocate important resources in establishing the bases for the new order. Finally, a constant personnel rotation both in SENER (Undersecretaries, General Directors and Deputy General Directors) and at the Bank (a total of 5 Team Leaders from approval to the restructuring process of October 2012, and some of them without strong background in rural electrification) aggravated the situation.

40. **Project restructuring.** In 2011 SENER proceeded to assess the project's situation. It concluded that the original arrangement implied an inefficient use of human and financial resources, as it required the establishment of working groups at the Federal and State levels and the involvement of an excessive number of entities. Also, it identified several factors of delay, including discrepancies among institutions on the selection of communities to be electrified (in Guerrero, for instance), budgetary complications associated to the large duration of consultancy activities, and the difficulty of building capacity at the community level.

41. To address these issues, SENER presented a project restructuring proposal to the Bank in order to simplify the project's complexity. This proposal incorporated CFE as the executing agency (which had recently developed a strong capacity on renewable energy due to close collaboration with the IIE during 2009-2011) of the main project component, i.e. the rural electrification sub-projects, while SENER would continue playing an oversight and coordination role.

42. The project restructuring was approved in October 2012, with the main objective of expediting the implementation of the project while at the same time remaining aligned with both National and World Bank's objectives. To such end: (i) CFE (the State vertically integrated utility) was designated as the operator of the main Component 2: Sub-projects; and (ii) the project's focus was narrowed to a single and, allegedly, more reliable photovoltaic technology in the form of centralized solar farms, a technology that CFE had already tested in 4 previous CSF pilot projects in Nayarit under the flagship program *Bandera Blanca*, which started in 2011. Accordingly, CFE became responsible for (i) the selection of sites to be electrified, (ii) the social and environmental assessments in accordance with the Manual of Environmental Good Practices (developed in partnership with the World Bank), (iii) putting into place mitigation measures, (iv) sub-projects design, (v) the procurement and consultation processes, and (vi) the ownership, operation and maintenance of the installations. Upon restructuring, the Project aimed at electrifying 36 out of a total of 86 communities under the Federal Program *Bandera Blanca*.

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would submit also their resignation; and (iii) all of the activities agreed upon during the previous mission (mid-2010) had been frozen.

43. SENER remained as the implementation agency in charge of the project's overall coordination, monitoring and reporting. In addition, NAFIN was appointed as the project's financial agent and the Ministry of Social Development (SEDESOL) was expected to be responsible for supporting local governments and localities in their liaison with the project. However, SEDESOL's support did not materialize since CFE considered that its own social units were capable of carrying out the required liaison activities, as it was indeed the case in those *Estados* where the project was ultimately implemented.

44. The incorporation of CFE as the main responsible of technical aspects for the restructured project through a collaboration agreement with SENER, implied a major change in the project's business model, moving towards a simpler and more traditional arrangement that de-emphasized private sector participation and dissolved a set of implementing bodies that were no longer needed, e.g. the Federal and State Implementation Teams (FIT and SITs, respectively), and the State Project Implementation Committees (SPICs). There were also significant changes in the project's scope (and budget) and in its financing plan, as: (i) the total cost was increased from US\$ 98.5 million to US\$ 121.8 million; (ii) Components 1 and 4 (TA for regulation-policy on off-grid rural electrification and tariff setting as well as productive uses, respectively) were dropped from IBRD/GEF financing and were to be funded exclusively through GoM sources; (iii) Component 3 (rural energy TA) was dropped; and (iv) Component 5: Project management, was reduced considerably. While the last two changes implied significant savings associated to a greater operational capacity brought into the project by CFE, removing World Bank financing from the Productive Uses component weakened the Bank's leverage in this crucial activity.

45. The changes made in the implementation arrangements marked a turning point in the project's track record. CFE's direct involvement as the main operator (as opposed to its previous marginal role subject to technical advice and execution of projects as requested by States) provided a much-needed momentum that continued until the closure of the project. The strengthening of UREP, a project implementation unit established within SENER to prepare and manage development projects, and the effective procurement and financial oversight of NAFIN, complemented CFE's role, which was facilitated by the fact that the Government had recently created the Fund for the Energy Transition and Sustainable Use of Energy (FOTEASE for its acronym in Spanish) –as planned in the original project- which served as the pre-financing entity for all rural electrification sub-projects (whose eligible expenses would be later reimbursed by both loan and grant proceeds) and whose use was later replicated for two other Bank-financed energy projects (the Large-Scale Renewable Energy Development Project, P077717 and the Efficient Lighting and Appliances Project, P106424), and also paved the way for subsequent interventions in the energy sector in Mexico. Overall, the Government showed a strong commitment to the project that was manifested in the support given to all the Federal entities involved. Consequently, the project's overall performance –in terms of physical progress, disbursements and compliance with social and environmental safeguards– showed a gradual improvement that justified Moderately Satisfactory ratings for PDO, GEO and IP during the last eighteen months of implementation. Most important, the Bank-supported component of the project succeeded in meeting its 2012 target of providing electricity to 36 communities within a particularly tight timeframe.

46. However, implementation was not free of difficulties. The first bidding for solar farms took much longer than expected –a slippage of about one year– requiring a set of iterations from the preparation of the bidding documents to the Bank's no objection, as World Bank procurement guidelines proved to be a new challenge to CFE's branch responsible for rural electrification. Though this first experience constituted a valuable learning process that facilitated a smoother execution of subsequent bids, these were always characterized by over-optimistic planning that

placed excessive pressure on contractors and supervisors, which was aggravated in some cases due to heavy rain events during the raining season.

47. **Restructuring trade-offs.** As mentioned, the major restructuring of 2012 focused on making the project implementable while at the same time remaining aligned with GoM's and World Bank's objectives. This restructuring process brought a set of trade-offs and compromised other objectives. In practice, it reduced the project's emphasis on productive uses of electricity, excluded private participation in the development of a sustainable market for the provision of energy in rural areas, and weakened the project's economic viability, as the economics of the new technology option (CSF) was not subject to an economic analysis such as the one made at appraisal<sup>16</sup>.

48. The original scope of the project encompassed interventions in the following States: Chiapas, Guerrero, Oaxaca, Veracruz and possibly Puebla. That is, it focused on several Southern States with a strong presence of indigenous peoples and a high degree of poverty or a low human development index. Upon the project restructuring in October 2012, the Bank and the Government agreed on a universe of 86 locations to be electrified (36 directly funded by IBRD/GEF resources and 50 funded by the Government): 45 communities in Chiapas, 2 in Chihuahua, 1 in Coahuila, 24 in Durango, 2 in Nayarit and 12 in Oaxaca. However, shortly after the approval of the restructuring CFE informed the Bank that both Chiapas and Oaxaca were dropped as potential beneficiaries due to social tension in both provinces, in addition to a historic opposition in those states (particularly in Chiapas) to Government-funded projects in some areas or Municipalities (it should be noted that this was a demand-based project, i.e., the community should request and support the project, and it should actually donate a piece of land for the CSF). The States that actually benefited by the project were Baja California Sur (1 community), Chihuahua (2 communities), Coahuila (2 communities), Durango (27 communities), Guerrero (1 community), Nayarit (5 communities), San Luis de Potosí (1 community) and Sonora (1 community)<sup>17</sup>. Despite the fact that Oaxaca and Chiapas were no longer considered, the project managed to reach a number of indigenous communities, as indigenous people can be found in 18 of the 40 benefitted localities, including 4 localities in Nayarit which were intended to be financed by IBRD/GEF resources but which were not completed on time to be deemed as eligible for Bank support. In every case, the targeted communities were extremely remote and can be categorized as "last-mile" communities, with extremely difficult conditions in terms of logistics of installation and servicing (for illustrative purposes, the supervision team had to be flown by helicopter to one of the communities from the nearest commercial airport, and had to be driven for almost 12 hours to another community from the nearest paved road). Those same access conditions represented a major challenge for the contractors when mobilizing all the required equipment for the construction of the CSFs, and which were aggravated during the rainy season. In many ways, the project represented a pilot exercise both for the Government and for CFE in their attempts to achieve 100% electrification, and made evident the significant challenges to effectively reach the last ~2% of population still without electricity access.

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<sup>16</sup> It should be noted that, although expensive, the CSF alternative for electrifying remote communities was almost 40% cheaper than conventional electrification, as demonstrated by simplified analyses carried out by CFE as per SHCP's guidelines for approving investment projects. Given CFE's legal mandate to electrify 100% of the population, CSF proved to be a better alternative than the conventional, grid-extension solution.

<sup>17</sup> Annex 2 includes the list of all benefitted communities.

49. The change in technology implied some modifications in the eligibility criteria for sub-projects<sup>18</sup>. While the selection of sub-projects was always based on a community demand approach, after the project was restructured, it focused more on practical top-down considerations geared towards the commercial viability of the sub-project<sup>19</sup>. CFE signed agreements with State and Municipal governments in which the local commitment in financing the sub-project was specified. Reportedly, the financing of the distribution system followed a three-thirds approach, i.e. that CFE, the State and municipal/local governments contributed in equal parts.

50. In regard to the project's economic viability, the new and single technology (CSF) chosen upon the project's restructuring provided a much larger capacity per household and, hence, the potential for greater benefits. These benefits, however, have to be compared to two additional factors: (i) a greater unit cost of the CSF option; and (ii) most important, the likelihood that new, and predominantly low-income households, would not reach a level of electricity consumption commensurable to the higher capacity they were provided, at least for the first few years of operation (i.e. significantly beyond the closing date). The full impact of this intervention would have to be assessed not immediately after project closing but few years later, once the communities fully understand the potential of the new infrastructure especially for productive uses.

51. The restructuring of October 2012 succeeded in readjusting the implementation arrangements for CSF construction and operation. However, both the Bank and the Government through CFE gave top priority to the infrastructure component due to the extremely tight framework, while the promotion of productive uses of electricity was carried out through scattered efforts by social specialists with CFE or the CDI in selected communities. The lack of a harmonized, structured approach for promoting productive uses of electricity, including institutions with proven track record such as FIRCO, was another trade-off of such restructuring. Yet, different field supervision missions assessed the initial efforts to make use of the new infrastructure for productive and social purposes, such as: (i) lighting for extended use in those communities where schools are found, (ii) development of local reading groups, (iii) acquisition of coolers for livestock vaccines, and for fishing production, (iv) improvement of craftsmanship production processes, (v) water pumping for agricultural purposes, (vi) revamping of mechanical and carpentry workshops, among others. Potential productive uses identified by the beneficiaries are, among the most important: internet supply for productive, communication and educational purposes, and water pumping for continuous drinking-water supply. In one of the benefitted communities (*Potrero de la Palmita*, in Nayarit), the community is already requesting a three-phase supply to install a water-treatment facility, which could contribute both to a sustainable use of resources and to create few jobs in the community. All of the above activities should eventually lead to a better quality of life of those communities benefitted by the project. In particular, internet access could be replicated in all the benefitted communities and could have an exponential effect on the development of productive uses, since beneficiaries would have full access to information related to all federal and local entrepreneurship programs.

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<sup>18</sup> For example, the original eligibility criteria established that localities had to be more than 10 Km away from the grid. This was replaced by 40 Km, a more reasonable criterion considering the mini-grid nature of the new technology option.

<sup>19</sup> Besides the 40Km criterion, other considerations were a minimum number of residents (100), undispersed populations, presence of accessible roads and that most residents should lack any type of electricity.

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

52. At negotiations, a set of Key Performance Indicators (KPI) was agreed upon and incorporated into the project's implementation plan. This set, which included eleven DO indicators and seven intermediate results indicators, constituted an adequate framework for the monitoring of the project's progress and outcomes. However, the scope of the results framework adopted at project design included the expected outputs of the whole rural electrification program of the GoM, as opposed to the contribution of the Bank-supported component. Extending the scope of the DO from a "*project*" to a "*program*" concept, and reflecting this in the M&E framework, introduced a misleading factor, since the project's results were to be measured against a set of targets that were, partially, beyond the scope of the established implementation arrangements. In fact, of the 47,195 households to be electrified according to the project's original plans (as approved), less than half were expected to be in locations supported by the Bank.

53. While most of the intermediate targets, including a baseline impact evaluation assessment, were complied with during the initial years of implementation, progress on the DO results indicators was almost negligible. The resulting restructuring effort of 2012 brought substantive changes in the project scope and activities that justified the revision of seven performance indicators, as well as dropping other seven indicators (including two intermediate results indicators) that were no longer relevant or consistent with the new delivery model. A comparison of the original and revised performance indicators and further explanation of the changes made is presented in Table 2.2, Annex 2. As mentioned, the most noticeable change was a reduction of the number of households to be electrified, which came together with a better quality of supply (a nearly tenfold increase in the electricity capacity per household). Whereas such project restructuring offered the opportunity of undertaking further amendments, the above mentioned "*project*" vs. "*program*" problem remained unchanged, since at the time of restructuring in October 2012, the Government's flagship electrification program *Bandera Blanca*, which included both conventional and non-conventional projects, was still in place and the Bank-supported project was expected to contribute to such a program. However, after the change of federal administration in December 2012 (and as it is usually the case when a new administration takes over), this federal program changed and was split into two parts, the first one including conventional electrification coordinated by SEDESOL (Contributions for the Social Infrastructure Fund<sup>20</sup>), and the second one encompassing the non-conventional projects (CSF), which was given less attention by the new administration. Nonetheless, the Bank was not informed on a timely manner that the CSF part of *Bandera Blanca* had been put on hold in practical terms, and it only became evident few years later.

54. The monitoring of the Project in the field was undertaken by CFE, entity that issued Monitoring Reports on the construction progress of the solar farms. A SCADA system installed in each locality will provide a remote supervision of the solar farm's technical operation. SENER and NAFIN participated also in the monitoring of the project's progress. M&E activities were rated marginally unsatisfactory during the last ten months of implementation in account of the late and incomplete information provided by the responsible agencies on the KPIs. Considerable delays in the submission of information continued during the preparation of the ICR, which resulted in a 4-month extension to the delivery date. Such delays were explained by the fact that centralized CFE staff had to coordinate with several local *Divisiones*, and also by the fact that another energy reform (promoted by the federal administration in 2013 and which effectively separated CFE vertically and horizontally and transformed it into a productive state company, or *Empresa Productiva del Estado*) drove CFE into a profound internal restructuring.

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<sup>20</sup> Contributions for the Social Infrastructure Fund, FAIS for its acronym in Spanish.

55. In regard to the Bank's role in this subject, the Bank supervision effort was sustained throughout the entire implementation period, including the issuance of 17 ISRs, i.e. as an average one every 5.5 months, the continuous monitoring and support through constant supervision missions to Mexico City, specialized support of the local office during the last three years of implementation, and 2 field visits towards the end of the implementation period (for a total of 5 communities visited). The MS ratings for Progress towards achievement of PDO and GEO, as well as for the overall implementation in the final ISR (Seq. 17, October 30, 2015) were based on the fact that 40 farms (i.e. the Project's share of Bandera Blanca plus 4 additional farms) were either in operation or nearly completed, which implied that other associated project targets, such as avoided emissions and energy consumption both for residential and productive uses, were also on track to be achieved, and also based on the expectation that the sub-projects of the sixth and seventh bids were going to be completed by Project closing (something that did not materialize), and also on the expectation that CSF projects under *Bandera Blanca* could have been completed either in parallel to the project or during the ICR preparation, which did not materialize either.

## 2.4 Safeguard and Fiduciary Compliance

### A. Safeguards.

56. The project triggered five safeguards: Environmental Assessment (OP, BP 4.01), Natural Habitats (OP, BP 4.04), Forests (OP, BP 4.36), Physical Cultural Resources (OP, BP 4.11) and Indigenous Peoples (OP, BP 4.10). Overall, the implementation experience regarding safeguards was positive with S and MS ratings. The project closed with an overall MS rating for safeguards. The main shortcoming was the lack of a systematic reporting mechanism on CFE's side, which was eventually resolved during the final stage of ICR preparation.

57. **Environmental:** At appraisal the project was assessed as a Category B, condition that remained unaltered after its restructuring. Overall, the project's environmental impact was considered to be minimal, given the type of renewable energy technologies that were proposed. Rather, it was expected that the project would reduce the negative impact of traditional energy sources (e.g. diesel, fuelwood) that would be replaced by a renewable energy source, as well as contribute towards the reduction of CO<sub>2</sub> emissions. So far, the implementation experience confirms these assumptions, since an initial sample of 10 communities was used to confirm the displacement of carbon-intensive sources of energy, which was later confirmed for all benefitted communities by local CFE *Divisiones* through periodic supervision visits. Narrowing the technology choices to a single one –i.e. photovoltaic– simplified the handling of its impact which is reduced mainly to a possible pollution associated to inappropriate disposal of batteries. For this purpose, detailed measures were incorporated into the project's Environmental Manual and were attached to the bidding documents.

58. **Social:** At appraisal, the project was regarded as an indigenous people development initiative and kept its indigenous focus upon the project restructuring (which was challenging to achieve after Chiapas and Oaxaca dropped out, but with still indigenous people benefited in 18 out of 40 communities electrified by the project). Project preparation included a systematic social assessment, comprehensive analysis of the social context, baseline information, a review of stakeholders dynamic and consultations to assess positive and negative effects of the project as well as an action plan to ensure that the interests of indigenous peoples were addressed appropriately. In general, no negative social impacts were expected at this stage with the exception of possible conflicts between stakeholders. To address this problem it was proposed to design a conflict resolution mechanism. The fact that the sub-projects (both at appraisal and after restructuring) had

to be supported by the communities greatly reduced the risk of conflicts.

59. Compliance with the Indigenous People safeguard (OP, BP 4.10) was rated Satisfactory during most of the implementation phase, with the exception a one-year period –from December 2013 to December 2014–, when it was downgraded to MS due to CFE’s delay in submitting evidence of compliance with the said safeguard or evidence that beneficiaries were supportive of the project. Joint supervision missions were effective in identifying problems and getting direct feedback from the beneficiaries. CFE submitted satisfactory evidence of social safeguards compliance during the ICR preparation.

60. One of the project’s main development objectives was to increase access to efficient and sustainable energy services in predominantly indigenous rural areas of Mexico. Despite the fact that Oaxaca and Chiapas dropped out of the project, indigenous people were benefited in eighteen of the forty municipalities covered by the project (14 of the 36 supported by World Bank financing, and 18 out of 40 if communities for bids 6 and 7 are included)<sup>21</sup>.

## **B. Financial Management.**

61. During the preparation of the project the Bank carried out a Financial Management Assessment (FMA) aimed at identifying any weaknesses and ensuring that FM arrangements would have an appropriate level of transparency to facilitate oversight and control while also support a smooth implementation. The FMA concluded that NAFIN had the required capacity to deal with the activities to be carried out by the project. Hence, it was agreed that NAFIN would support SENER and the participating States in these activities<sup>22</sup>. Overall FM risk was considered to be Substantial.

62. The FM challenge was simplified upon the restructuring of 2012, as project administration was centralized. NAFIN and SENER signed a collaboration agreement that formalized NAFIN’s role in these matters.

63. Overall, FM performance was positive, being rated between satisfactory to moderately satisfactory during the active implementation period. Centralization of project administration in the hands of qualified and experienced staff led to satisfactory results. The Project consistently provided timely and reliable financial information. Audits did not identify sensitive issues and unqualified opinions were submitted. Though there were moderate FM shortcomings, these never prevented a timely and reliable provision of information nor were a cause of any delays.

## **C. Procurement.**

64. At project appraisal it was determined that SENER did not have the structure and organization to handle procurement operations. For this reason NAFIN, a more experienced entity, was designated as the agency in charge of resources administration and procurement. Also, an important capacity building component was considered at the State level to ensure an appropriate and smooth implementation. Upon the restructuring of 2012, CFE became responsible for procurement activities for the main Component 2: Sub-projects, under the overall coordination of the Project Implementation Agency in SENER. According to this new arrangement, the only

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<sup>21</sup> As estimated by CFE using information from INEGI and CDI, and also from consultancies carried out under the TA component.

<sup>22</sup> During project implementation, NAFIN –which assessed by FM specialists as adequate at approval- was substituted by BANOBRAS.

procurement activities carried out directly by SENER were the technical assistance services of small value. CFE's broad experience in managing projects, its capacity and organization were considered appropriate for a much-needed speed up.

65. From late 2012 to project closing the rating for the procurement performance of the project oscillated between moderately satisfactory to moderately unsatisfactory. Once the project was restructured, procurement was a main constraining factor, the main problem being the considerable delays suffered during the first bidding process. Problems causing the initial delays were: (i) lengthy discussions on technical issues (e.g. selection process of beneficiaries) and environmental safeguards; (ii) clarifications on World Bank guidelines; (iii) the fact that CFE's procurement procedures were substantially different from the Bank's; (iv) difficulties in addressing the bidding documents with CFE sub-national divisions; and (v) staff changes in SENER as a new administration took office in late 2012. Once the first bidding process was completed and lessons were learned, the following bidding processes were more efficient. However, procurement was not free of problems. While the project closed with a MS procurement rating, two of the last three bidding processes could not be completed on time mostly due climate-related phenomena and, hence, had to be funded through GoM resources<sup>23</sup>. Consequently, around US\$ 6 million of the IBRD loan and GEF grant (which became available only due to a significant depreciation of the Mexican currency against the USD throughout 2013 and 2014) remained unused and were eventually cancelled. Nonetheless, project's share of Bandera Blanca, i.e. 36 benefited communities, was completed on time.

## 2.5 Post-completion Operation/Next Phase

66. The project financed rural electrification sub-projects and technical assistance activities to strengthen the policy/regulatory framework and to promote productive uses of electricity. The policy oriented TA that was completed on time and fully funded by the GoM (contrary to the original financing plan) does not require explicit post-completion measures since it has been absorbed by SENER and CFE, and the regulations and mechanisms developed are in active use. On the other hand, the sustainability of the electrification sub-projects and productive uses components are linked.

67. **Rural Electrification Sub-projects:** The project has succeeded in installing Centralized Solar Farms in forty locations distributed among eight states (36 financed through IBRD-GEF proceeds and 4 more financed by the Government<sup>24</sup>). These farms will be operated within a stable institutional framework defined by the participation of CFE as owner and operator of all the installations. The use of a sound and proven technology –backed by suppliers' guarantees that include the replacement of defective equipment–, as well as the experience and technical capability of CFE, ensures the correct technical operation of the farms. There are, however, some financial uncertainties that could compromise the sub-projects' financial viability in the medium to long term. These uncertainties are associated to: (i) households' low level of tariffs and electricity consumption; and (ii) the need to replace costly batteries after a period of about fifteen years. While operating costs of the solar farms are very low, CFE's revenues from their operation are also low as, reportedly, many households have been paying between 20 to 30 Mexican Pesos per month (i.e.

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<sup>23</sup> The last extension of the project's closing date (March 2015) was approved with the purpose of allowing CFE to complete three additional bidding processes, i.e. bids 5, 6 and 7. However, only bid 5 was completed on time for WB funding, while farms corresponding to bids 6 and 7 are still under construction and nearly completed.

<sup>24</sup> Ibid

around US\$ 2; also, the electrified locations are using less than 10 percent of the plant's installed capacity) during the initial months of operation. Hence, CFE is engaging in an activity that, although very small compared to the utility's overall finances, would imply an operational subsidy. The financial burden on CFE could be more significant in the long term, when the batteries and power inverters of most installations will have to be replaced. It is estimated that such replacement could imply a cost as high as US\$7 million, a figure that, unless it is covered from other sources, would compromise the sustainability of the project. Financial support to CFE to cover such deficit is being considered. A likely option is a recently established fund to support the electrification of rural communities (*Fondo de Servicio Universal Eléctrico*).

68. **Technical Assistance to Increase Productive Uses of Electricity:** The objective of this component was to promote a more intense use of electricity and support community entrepreneurs to increase the number of community projects with high developmental impact, i.e. to improve the financial viability of the Rural Electrification Sub-projects and enhance the welfare of the beneficiary communities. This component became more important upon the 2012 restructuring of the project since the new technology adopted offered more electricity capacity per household. However, activities have lagged behind thus causing uncertainty on the component's likelihood to yield the desired results. At project closing, 12.7 percent of the project target had been achieved in terms of the new social/productive activities developed and 4.9 percent in terms of the incremental increase in electricity consumed –MWh/year–. To tackle this problem, CFE relied on the services of specialized consultants to identify potential productive activities and promoting their development in selected rural communities. Although the infrastructure in 40 communities is in place and has a tremendous potential for developing new productive activities and/or improving some of those already established, it will take few years before the impact of the project can be fully assessed (as it is the case for rural electrification efforts worldwide).

69. The Government has expressed an interest on pursuing a follow up operation building on the important lessons learned from the project and taking advantage of the created and strengthened institutional capacity. A key element of the second project would have to be the inclusion of the promotion of productive uses to enhance the sustainability potential of the project, which could be addressed by incorporating the Ministry of Agriculture, Livestock, Rural Development and Fishing (SAGARPA) into the project design and implementation. Initial discussions have revolved around using the 40 communities benefited under the project as a pilot exercise for a potential new operation of national scope.

### **3. Assessment of Outcomes**

#### **3.1 Relevance of Objectives, Design and Implementation**

##### **Rating: High**

70. The project's objective of increasing access to efficient and sustainable energy services to predominantly indigenous rural areas remains highly relevant in Mexico, and the current administration (through different instruments of public policy such as the National Development Plan, sectorial strategies, the Electric Industry Law, among others) maintains as priorities addressing the needs of those who have no electricity as well as developing renewable energy. The project's objective was fully consistent with the WB's CPS for the period FY 2008-2013, which focused on strategic areas such as environmental sustainability and supporting government efforts to integrate climate change considerations into its infrastructure and social programs; these strategies continue to be high priority areas in the current CPS for Mexico and are fully aligned with WB's goals of ending extreme within a generation and boost shared prosperity, and are also

aligned with GEF-6's Climate Change Mitigation Focal Area Strategy. Despite the impact of the changes introduced by the restructuring of 2012, such as the reduction of the project's emphasis on the participation of private sector as an important element of a strategy for electricity provision in rural areas, the project's objectives were and remain **highly relevant**.

71. The project's design reflected an appropriate understanding of the development priorities, as evidenced by the components originally proposed, and was also consistent with the Bank's energy strategy and corporate goals, i.e. supporting the country's poverty reduction effort, promoting renewable energy and addressing the electricity gap. Project design was thoroughly informed by numerous assessments which identified ongoing mechanisms at subnational level for rural electrification, and also identified potential risks for implementation. The original project included TA resources to address some of the most important institutional challenges and also included a component to review the legal and regulatory framework. Overall, the project design was also **highly relevant**.

72. Although early implementation was delayed mostly due to institutional and financial constraints that could not be overcome, the joint effort of the GoM and the Bank in restructuring the project in 2012 set a positive turning point in the project's performance while retaining the original objectives and the project's alignment with national and World Bank poverty reduction goals. After project restructuring in 2012, supervision efforts successfully supported the Government for launching and completing seven bidding process (5 of them were completed in time to be financed by the Bank), and for thorough supervision of environmental and social safeguards. However, different supervision teams oversaw the project-versus-program dilemma in the results framework, and also processed a major restructuring package without an updated economic analysis, which although was not mandatory at the time, could have informed both the Government and the Bank on the potential risk of overprice observed at closing. Overall, project supervision is rated **Substantial**. The combined rating for relevance of objectives, design and implementation is **high**.

### **3.2 Achievement of Project Development Objectives and Global Environment Objectives**

73. In assessing the outcomes of the project it is important to note that the targets that were established at appraisal, and subsequently revised during the first restructuring, were based on a project scope that covered the entire rural electrification program of the GoM. This "**program**" went beyond the project component that was supported by the World Bank (IBRD loan and GEF grant – the "**project**") that accounted for only one fourth of the "**program**". This dichotomy between "**program**" and "**project**" caused two M&E problems: (i) since the project's implementation arrangements focused only on the Bank-supported component, it was not possible to monitor the progress made by those parts that were not funded by the Bank; and (ii) the Bank had a limited leverage, if any, on the implementation of this large component. While the project was able to achieve major results, it suffered throughout implementation from (i) a lack of proper distinction between program targets and project targets, and (ii) an inadequate results framework. In an effort to mitigate these shortcomings, targets corresponding to the "**project**" were incorporated into the three final ISRs (Seq. 15, 16 and 17). Annex 2: Outputs by Component, presents the targets for both cases. Also, outcome assessment (including an ex-post economic evaluation) was completed considering progress after project restructuring in 2012, since practically all disbursements were done after such restructuring. Consequently, a split evaluation was not necessary.

## **Project Development Objective**

### **Rating: Modest**

74. The objective of the project was to increase access to efficient and sustainable integrated energy services in predominantly indigenous rural areas. In spite of a very slow start caused among other reasons by institutional constraints, a complex project implementation scheme (common in rural electrification efforts world-wide), a major sector reform and difficulties for making use of IBRD and GEF resources, the project had a strong finish and succeeded in benefiting indigenous population in 18 out of 40 communities (including the last 4 communities which were not completed on time to be funded by IBRD/GEF resources).

75. Compliance with the performance indicators associated to the PDO is presented in Annex 2. Six of the seven indicators correspond to the PDO and one (indicator four) to the GEO. Compared to the “*project*” targets, results were, in balance, positive as the project achieved a satisfactory performance for four of the six indicators (achievement of 75% or higher). The exception was the productive uses component, which lagged behind (indicators five and six) and was beginning to show some progress at the moment of project closure. In the final ISR (Seq. 17, October 30, 2015), the supervision team justified a Moderately Satisfactory rating for Progress towards achievement of PDO based on the fact that at the time 40 farms (i.e. the Project’s share of Bandera Blanca) were either in operation or nearly completed, with the direct implication that other associated project targets, such as incremental increase of electricity consumed for productive uses (PDO indicator five) and new social/productive activities and micro-business developed (PDO indicator six), were also on track to be achieved. However, it was only during the ICR preparation that CFE provided actual data on every indicator (as opposed to the estimations reported in the final ISR), when it became evident that the number of new social/productive activities and micro-business developed was significantly lower than expected (as well as the associated energy consumption). Since the MS rating could no longer be supported by strong performance of all six PDO indicators, and taking into account that the formal scope of the project (through all its phases) and its related targets were those of a national-level program which did not progress as expected, a **Modest** rating is given.

## **Global Environmental Objective Outcome Rating**

### **Ratings: Modest**

76. The global environmental objective of the project was to achieve reduction of greenhouse gas emissions through the use of renewable energy in rural areas for the provision of electricity. The achievement of this objective is measured by indicator four (emissions reduction), which shows that the project satisfactorily met the target (117 percent) when assessed against the Bank supported component. Considering this positive result and the perception that the sustainability of the outcome is not at risk, a Moderately Satisfactory rating could have been chosen. However, and as it was the case with the rating for the PDO, the fact that the formal scope of the project through all of its phases and its related targets were those of a national-wide program which did not progress as expected, a **modest** rating is given.

## **3.3 Efficiency**

### **Rating: Modest**

77. In spite of a very slow start, the project was conducted efficiently during its last years of operation. The technology option chosen at the restructuring of the project is proving to be sound and reliable. However, these achievements came at a higher-than-estimated costs that cast serious doubts on the model’s sustainability.

78. An ex-post economic evaluation of the project yielded the following results. The economic internal rate of return for the solar farms is 0.94 percent and its net present value (NPV) is estimated to be a negative US\$ 6.8 million, for a 4 percent discount rate (and negative US\$ 14.5 million for the 12 percent discount considered at appraisal). While these results are based on a forecast for future energy consumption that could be perceived to a certain extent conservative, the scale of the economic losses and results of a sensitivity analysis (Annex 3) indicate clearly that the project was inefficient in delivering its outcomes. These negative results are explained by the fact that the technology adopted was too expensive when compared against the number of households connected and the level of electricity consumption of these households, and also by the fact that each CSF had to be equipped with sophisticated communication systems for remote operation and control. CSF overprice is also explained by the chosen design for the battery banks, which were expected to prevent power outages in the absence of solar radiation during two full days (during ICR preparation, CFE reported that design could be optimized by reducing the capacity of the banks for only one full day of back-up power). It should be noted that the ICR ex post analysis uses the same parameters as the original appraisal analysis so deviation of the outcomes are better visible and comparable. Those parameters included “benefits from savings of expenditures for traditional energy sources” as well as “increased electricity consumption”. Nevertheless, there are important additional benefits the original analysis could have taken into account, such as environmental benefits due to GHG reductions, which would have significantly increased the economic return of the Project. This was included as lessons learned under the respective section of this ICR.

79. In addition, looking at the least cost options for energizing the communities under the Project, the CSF alternative, although expensive, still represented the least cost option. Based on simplified analyses carried out by CFE as per SHCP’s guidelines for approving investment projects, the CSF option for electrifying remote communities was almost 40% cheaper than conventional electrification through grid extension. In sum, given CFE’s legal mandate to electrify 100% of the population, CSF proved to be a better alternative than the conventional, grid-extension solution. Hence, the project is rated **Modest**.

### **3.4 Justification of Overall Outcome and Global Environment Outcome Rating**

#### **Rating—Overall Outcome: Moderately Unsatisfactory**

80. A **Moderately Unsatisfactory** rating is assigned based on a weighted balance of those outcomes which were achieved and those which fell short. On one side, there are two positive reasons: the confirmed **high** relevance of the project’s objectives (including the GEO), and its positive, **substantial** development outcomes (4 of 7) when compared against the project’s component that was supported by the World Bank (i.e. the “*project*”). However, this positive performance is offset by two factors: (i) the fact that through all its phases, the PDO results indicators referred to the whole Government’s rural electrification program (the “*program*”) that, besides the Bank-supported component, did not achieve much progress during the implementation of the project (only 4 pilot projects completed); and (ii) the project’s low level of efficiency (rated as **modest**), as reflected by the ex-post economic analysis.

81. In regard to the effects of the project restructuring, it is noted that the project is rated against the revised outcomes since practically all disbursements were done after the restructuring of 2012.

#### **Rating—Global Environment Outcome: Moderately Unsatisfactory**

82. A **Moderately Unsatisfactory** rating is assigned for the Global Environmental Outcome for the reasons explained in section 3.2.

### **3.5 Overarching Themes, Other Outcomes and Impacts**

83. The main overarching theme is the project's impact on indigenous people, which is addressed in section 2 (2.2 Implementation – restructuring trade-offs and 2.4 Safeguard Compliance). Although the project's emphasis on indigenous people was maintained after the restructuring process of 2012, the fact that Oaxaca and Chiapas dropped out of the project represented a major challenge to reach indigenous communities. However, indigenous people have benefited from the project in 18 of the 40 localities (including the last 4 communities corresponding to bids 6 and 7 which were not completed on time to be financed by the Bank).

84. Another theme worth mentioning is the view of most participants that the project has been particularly useful in improving inter-institutional relations, as the coordination among the public institutions involved in the implementation of the project has improved dramatically, i.e. between SENER, NAFIN and CFE.

### **3.6 Summary of Findings of Beneficiary Survey**

85. Annex 5 summarizes the findings of surveys on beneficiaries carried out so far, in ten of the 40 localities. These reflect the direct and indirect benefits of electrification as perceived by beneficiaries –which confirm global experience–, interest/concerns about productive uses of electricity, and some inconveniences experienced during the initial months of operation, mostly associated to the conditions of the service (e.g. billing, outages).

86. Overall, the benefits of electrification outweigh the concerns of households. These benefits, that reveal an important social and economic value include: considerable savings in traditional energy sources, better public services (school technology, health infrastructure), better and cheaper access to communications, improved retail businesses, the potential for specific productive uses (e.g. carpentry, mechanic workshops) and water pumping, increased productivity during night hours and improved security due to public lighting.

## **4. Assessment of Risk to Development Outcome and Global Environment Outcome**

### **Rating—Risk to DO: Substantial**

87. As noted in section 2.5, the Centralized Solar Farms will be operated within a stable institutional framework defined by the participation of CFE as owner and operator of all the installations. The use of a sound and proven technology backed by suppliers' guarantees, as well as the experience and technical capability of CFE, ensures the correct technical operation of the farms. There are, however, financial uncertainties that could compromise the sub-projects' financial viability in the medium to long term. These uncertainties are associated to: (i) households' low level of tariffs and electricity consumption; and (ii) the need to replace costly batteries and power inverters after a period of about sixteen to seventeen years. CFE is engaging in an activity that, although very small compared to the utility's overall finances, would imply an operational subsidy. While it is expected that the high cost of replacing the batteries of all installations would be covered by an electricity fund, delays in the implementation of the productive uses component could increase the project's impact on CFE finances and, most important, could diminish the benefits to the beneficiary communities. Though late, CFE is taking action in this regard. Another risk for the sustained operation of the CSF is the uncertainty associated to the recent vertical and horizontal separation of CFE due to the new regulatory framework for the Mexican energy sector, which involves the creation of new business units with specific duties and accountabilities. It is still to be defined whether rural electrification will remain a priority for CFE and whether rural electrification will be dealt with in a centralized manner (which proved to be effective for the implementation of the restructured project).

### **Rating—GEF: Low**

88. The sustainability of the project’s global environmental outcomes relies on the correct technical operation of the farms, which is safeguarded by the use of a sound technology backed by CFE’s operational capacity and suppliers’ guarantees.

## **5. Assessment of Bank and Borrower Performance**

### **5.1 Bank Performance**

#### **(a) Bank Performance in Ensuring Quality at Entry**

##### **Rating: Moderately Satisfactory**

89. The project’s development objectives proposed by the Bank were an appropriate response to country’s needs and were fully compatible with the GoM’s rural policies and priorities. Preparatory work was supported by sound technical and social and environmental ex-ante assessments and a thorough economic analysis. Also, the five project components included in the original design encompassed the inputs necessary to fulfill the PDOs, given the selected organizational structure. The project design was consistent with the GoM’s decentralization policies and was informed by a thorough assessment completed by Intermediate Technology Consultants in November 2005 which identified different institutional arrangements for rural electrification already in place in different *Estados* (States or Provinces), and which included a proposal on suitable alternatives for successful implementation of the project. The team adequately identified the risks of the participation of a large number of Federal, Municipal and Community entities –and some operationally weak– that had to coordinate the selection, preparation and implementation of sub-projects, as well as the lack of –or very limited– operational experience among some of the institutions that were to assume a leading role during the execution of the project (the original design allocated financial resources to address these two shortcomings). However, the combination of institutional constraints at the Federal level, the complexity of the project (which is common in rural electrification efforts), the sector reform of 2008 and the lack of coordination in the Federal Government to make use of loan and grant proceeds, resulted in an unsatisfactory performance during the initial years of implementation, and eventually led to the project restructuring of October 2012, which represented a turning point in the project’s performance.

#### **(b) Quality of Supervision**

##### **Rating: Moderately Satisfactory**

90. During project implementation, the Bank maintained a constant presence in the country with one or two supervision missions per year to Mexico City and two site visits towards the end of project implementation, and the support of local specialized staff after the restructuring of October 2012. As mentioned, the initial period of implementation faced several obstacles associated with major institutional constrains, as well as an undefined government commitment due to political cycles, limited operational capacity of SENER, and constant rotation both in Government and Bank staff (a total of 5 Team Leaders from approval to the restructuring process of October 2012, and some of them without strong background in rural electrification).

91. In a joint effort with government agencies, the Bank proceeded to restructure the project and succeeded in re-establishing a workable delivery model. Although this major restructuring brought a set of trade-offs, as explained in section 2.2 Implementation – restructuring trade-offs, it succeeded in providing electricity access to 40 extremely-remote, last-mile communities, which had a tremendous impact on the quality of life of the beneficiaries, including health, security, social

and economic improvements.

92. Fiduciary and safeguard aspects were dealt with diligently, although with some delays in procurement. Adequate resources were allocated, in quantity and quality, throughout the implementation period. Overall, the Bank demonstrated the capacity and flexibility to react positively to major problems and take corrective measures, and to maintain a constructive engagement with one of the Bank's most sophisticated client countries.

### **(c) Justification of Rating for Overall Bank Performance**

#### **Rating: Moderately Satisfactory**

93. Taking into account preparation and supervision ratings, an overall rating of **Moderately Satisfactory** is assigned.

## **5.2 Borrower Performance**

### **(a) Government Performance**

#### **Rating: Moderately Satisfactory**

94. The Government maintained its commitment to the project through great part of its execution, and showed a decisive support after the restructuring of October 2012. It showed a strong commitment to the development of renewable energy and rural electrification through specific pieces of public policy, and took the necessary measures to restore the viability of the project through a major restructuring that corrected many of the initial obstacles. The energy sector reform implemented during the initial years of project implementation became a factor of delay exogenous to the project, but supported rural electrification and the development of renewable energy in the long run. Government's performance revealed important shortcomings during the initial years of the implementation period, starting with a significant delay in reaching project effectiveness (18 months), but which were eventually overcome through project restructuring. Initial budget restrictions (amount and lack of multiannual availability) were resolved through the use of FOTEASE as a pre-financing entity which proved to be highly effective not only for PSIE but also for other Bank-funded projects in Mexico. The minor role assigned to CFE at project preparation can be directly attributable to a government policy that was consistent with a justified decentralization agenda. However, even in the absence of such a government policy, at the time of project preparation CFE had neither the flexibility nor the expertise on renewable energy (other than geothermal) to pursue rural electrification in a systematic way and thus CFE's minor role was justified at that time. Despite the fact the Government's share of Bandera Blanca did not progress as planned and CFE focused on the CSF financed by the IBRD and the GEF, it is expected that the Government will resume rural electrification through CSFs either under a follow-up intervention with the World Bank or through resources from the *Fondo de Servicio Universal Eléctrico*, as outlined in national priorities on poverty alleviation and rural electrification which have been maintained throughout different federal administrations. The lessons learned from the project will be extremely useful as the Government keeps seeking a 100% electrification rate either in pursuing full coverage through CFE or through private sector participation, depending on whether rural electrification remains as a mandate for CFE, as explained in Section 4. Assessment of Risk to Development Outcome and Global Environment Outcome.

## **(b) Implementing Agency or Agencies Performance**

### **Rating: Moderately Satisfactory**

95. Although SENER experienced budget and staff constraints during a long initial period, it managed to build a core of qualified team (UREP) that supervised the project diligently. This role was appropriately supported by NAFIN's rigorous financial oversight, which was extended also to the areas procurement and the compliance with safeguards. UREP ended up supervising other two Bank-funded projects in the energy sector in Mexico, i.e. the Large-Scale Renewable Energy Development Project (P077717) and the Efficient Lighting and Appliances Project (P106424), which are now closed, a third project under implementation, i.e. the Sustainable Energy Technologies Development for Climate Change Project (P145618), and a fourth project soon to become effective, i.e. the Municipal Energy Efficiency Project (P149872).

96. CFE's incorporation as the operator of Component 2 was instrumental for the overall recovery of the project's performance and in establishing a workable delivery model, once the financial mechanism through FOTEASE was in place and CFE had acquired expertise on renewable energy in the late 2000's after close collaboration with the IIE. CFE assumed competently its role in the selection of sites, social and environmental assessments, the design sub-projects, as well as the procurement and consultation processes. There were, however, limitations in its performance, mostly associated to the late or incomplete reporting on safeguards' compliance and a significant delay in completing the first bidding process. Also, CFE's weaknesses in post-completion monitoring and the late submission of information became a main constraint for preparation of the ICR. Nonetheless, all these shortcomings were addressed and resolved during ICR preparation.

97. Overall, procurement activities and the management of safeguards revealed a learning process whereby all agencies participated.

## **(c) Justification of Rating for Overall Borrower Performance**

### **Rating: Moderately Satisfactory**

98. Taking into account the ratings for the Government and the Implementing Agency, an overall rating of **Moderately Satisfactory** is assigned.

## **6. Lessons Learned**

99. *Rural Electrification is by nature a complex challenge that requires designing a practical delivery mechanism while at the same time considering legal and institutional frameworks in place.* The leading implementing agency should be fully operational from the early stages of the project, including competent staff to deal with financial management, procurement and safeguard issues. The lack of sound implementation arrangements from the very beginning might entitle unnecessary delays that could result in the materialization of unforeseen risks, such as political cycles both at the federal and subnational levels, or sectorial reforms such as the energy reform that took place in 2008. If rural electrification is part of the mandate of several institutions and indeed all of them are to be included in the institutional arrangements, a clear role for each agency should be defined, and it should constantly be revised and updated if necessary. Rural infrastructure development and poverty reduction projects require strong capacity building, and the process of building such an institutional capacity and enhancing coordination is slow, especially in cases like Mexico, where there is a high number of Government agencies and stakeholders with legal mandates in the planning, decision making, financing and execution of rural development projects.

100. ***It is critical to have a mechanism in place to transfer loan and grant resources effectively to finance program activities from the very beginning.*** Without this precondition, projects cannot be implemented and activities can derive in an inefficient use of human resources. In the case of Mexico, it has been demonstrated that without a fund managed by the counterpart, a project cannot be effectively delivered.

101. ***The promotion of productive uses of electricity is an essential component of rural electrification that helps enhancing its economic benefits and supports the financial viability of the operation.*** Promoting productive uses is particularly important when the technology chosen (such as CSF) offers greater capacity and, hence, the potential for a higher level of electricity consumption. Best practices indicate that a productive uses effort should be implemented in parallel with the physical installations, incorporated into the project as a ‘pilot’ to draw lessons from and to be followed by the operator. Failure to do so may jeopardize the project’s economic viability.

102. ***A full economic analysis is essential when the restructuring of a project implies a significant change in the delivery mechanism and technology choices.*** When a new technology is incorporated into a project, this should be supported by an economic analysis in compliance with appraisal guidelines. Such an analysis would have been particularly useful in confirming the economic viability or optimizing the new design of the project, since in this project the restructuring entailed a switch towards a technology that offered greater capacity and potentially, greater benefits, but at a higher costs. In particular, the Bank and the Government should closely work to agree on different actions that meet client’s demands but at the same time comply with normal due diligence (even if it is not formally required, as it was the case of this project at the time of its restructuring process).

103. ***The design of a project’s results framework and performance indicators should be fully consistent with the project’s scope and objectives, and be particularly careful in selecting targets that are within the control of the project.*** Selecting targets that are beyond the scope of a project and, hence, beyond the control of its implementation arrangements –e.g. targets of a nationwide program that exceeds the scope of the project in question–, incorporates a distortion into the monitoring and evaluation process that would yield negative results of no value. In those cases where the Bank and the Government agreed on implementing a project in the context of a federal program, close attention should be paid to monitor also the appropriate development of such a program, and quickly adjust the scope of the project through a restructuring process should federal priorities change. This might represent a significant challenge during project preparation in many countries, since having World Bank support could be more attractive in terms of internal acceptance for specific federal programs.

104. ***The selection criteria for communities to be benefited by a rural electrification project should be established with absolute clarity, and agreed among the parties involved, prior to project implementation.*** The absence of such criteria –that reflects the government’s policy on the subject– is often the cause of disputes, politicizing of the selection process, and considerable implementation delays.

105. ***Mini-grids based on centralized solar farms (CSF) have proven to be a sound and reliable technology to supply small isolated communities. However, poor economic results bring up questions about the model’s replicability.*** If Mexico aims to pursue this mini-grid approach, significant efforts will have to be made to reduce costs as much as possible. Besides the economic potential of promoting productive uses of electricity (as mentioned above), there is room for improvement in reducing design costs. Areas to explore are the revision of technical standards, in particular the optimal dimensioning of battery banks. Learning from the Mexican experience during

the implementation of this project could have enormous replicability effects in other countries of Latin America (such as Colombia), as many Latin-American countries face similar challenges in terms of reaching the last-mile communities for 100% energy access.

106. *Realistic planning: supplying electricity in remote areas often entails addressing complex technical and logistical challenges that should not be underestimated.* Sound preparatory work is essential in ensuring an effective project implementation and avoiding over-optimistic planning. While an early delivery of electricity enhances benefits, setting over-optimistic deadlines may jeopardize the quality of the output and/or cause additional transaction costs associated to renegotiations and contract amendments. In this regard, project extensions/restructuring should be based on an objective assessment of outstanding activities so as to fully utilize the loan proceeds without additional extensions (i.e. further transaction costs). In particular, closer collaboration between the Bank and the Government should be established to agree on realistic timelines that take into account, among others, a sound market for all CSF supplies, climate phenomena, and institutional capacity to supervise several procurement and construction processes running in parallel. In the case of this project, the extremely tight timeframe to carry out all the bidding processes for the 40 farms prevented both the Bank and the Government from quickly learning and adjusting from early lessons after the completion of the first five CSF. By the time when the first indications of a potential sub-optimal battery dimensioning became evident, bidding processes 2, 3 and 4 were already underway.

107. *Environmental benefits should be taken into account in the economic analysis.* Considering the nature of the intervention -which consists of moving communities from traditional energy sources to renewable energy- as well as the funding source (GEF), the reduction of GHG emissions should not be underestimated and its environmental benefits should be highlighted. In the original PAD, the GHG reductions were included as indicator in the Results Framework, but were not included in other appraisal due diligence, e.g. the economic analysis of the Project. Recognizing the tremendous environmental benefits of reducing GHG emissions both at national level and local level, in future projects of the same nature and especially those that are financed by environmental funds -such as the GEF- and whose overall Global Environmental Objective consists of reducing GHG emissions, environmental benefits should be taken into account at appraisal stage economic analyses.

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

### **(a) Borrower/implementing agencies**

Comments were received from SHCP, NAFIN, and UREP and were included in the main text. Additional contributions from NAFIN, UREP and SENER have been included in Annex 7.

### **(b) Co-financiers**

N/A

### **(c) Other partners and stakeholders**

N/A

## Annex 1. Project Costs and Financing

Table 1.1: Project Costs per Component – Estimates and Actual

Item	Costs (US\$ mil lion)	Project as per PAD					Restructured Project				
		GoM	IBRD	GEF	Priv.	Total	GoM	IBRD	GEF	Priv.	Total
<b>Component 1</b> – Regulation, Policy TA	<i>Estimate</i>	1.58	1.18	1.35	--	4.10	4.10	--	--	--	4.10
	<i>Actual</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	4.10	--	--	--	4.10
<b>Component 2</b> – Sub-Projects	<i>Estimate</i>	49.22	6.89	5.77	6.54	68.42	80.69	14.96	14.40	--	110.05
	<i>Actual</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	13.11	11.91	11.38	--	36.67
<b>Component 3</b> – rural energy TA	<i>Estimate</i>	4.31	2.81	5.13	--	12.46	--	--	--	--	--
	<i>Actual</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	--	--	--	--	--
<b>Component 4</b> – productive uses TA	<i>Estimate</i>	1.25	1.75	1.25	1.75	6.00	6.00	--	--	--	6.00
	<i>Actual</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	0	--	--	--	0
<b>Component 5</b> – Project Management	<i>Estimate</i>	3.64	2.38	1.50	--	7.51	1.04	--	0.60	--	1.64
	<i>Actual</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	0	--	0.54	--	0.54
<b>Front-end Fee</b>	<i>Actual</i>	--	--	--	--	--	--	0.04	--	--	0.04
<b>Total</b>	<i>Estimate</i>	60.00	15.00	15.00	8.49	98.49	91.83	15.00	15.00	--	121.83
	<i>Actual</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	17.21	11.95	11.92	--	41.08

*n.a.* = not applicable

## **Annex 2. Outputs by Component**

1. The table below presents the targets, as revised in the restructuring of 2012, and project results by the closing date. Results are compared both to the entire Government rural electrification program (the “*program*”) as well as to the World Bank supported component, i.e. the “*project*”. A comparison of the original and revised performance indicators is presented in Table 2.2. Table 2.1 clearly shows that the project satisfactorily met its targets in four out of seven indicators. However, in the absence of Federal support to the national program Bandera Blanca, program targets fell short.

2. In Table 2.1, project accomplishments include 40 farms under PSIE (36 financed by IBRD/GEF resources plus 4 corresponding to the last 2 bids whose construction was delayed and consequently were not eligible for IBRD/GEF financing and ended up being financed by FOTEASE), whereas program accomplishments include the same 40 farms under PSIE plus 4 pilot projects completed under Bandera Blanca, i.e. (i) Guaycora (Sonora), (ii) Guásima del Metate (Nayarit), (iii) Tierras Blancas del Picacho (Nayarit) and (iv) La Ciénega (Nayarit).

3. Table 2.3 shows all benefited communities under PSIE plus the 4 pilot projects under Bandera Blanca.

**Table 2.1: Project Outputs**

PDO Level Results Indicator	Unit of measure	Baseline	Target <sup>25</sup>		Actual (% accomplished)
			Prog.	Proj.	
<b>Indicator One:</b> Number of households (HH) electrified with RET (solar PV)	HH	0	Prog.	4,432	2,235 (50%)
			<i>Proj.</i>	<i>2,060</i>	<i>2,043 (99%)</i>
<b>Indicator Two:</b> Costs per new connection	US\$/HH	2,400		<b>1,097</b>	<b>1,535 (40% overprice)</b>
<b>Indicator Three:</b> New renewable energy capacity	kW	0	Prog.	6,205	2,357 (38%)
			<i>Proj.</i>	<i>2,880</i>	<i>2,134 (74%)</i>
<b>Indicator Four:</b> Emissions reduction	thousand tons CO2e/year	0	Prog.	241	139 (58%)
			<i>Proj.</i>	<i>112</i>	<i>131 (117%)</i>
<b>Indicator Five:</b> Incremental increase of electricity consumed for productive uses	MWh/year	0	Prog.	5,768	151 (2.6%)
			<i>Proj.</i>	<i>2,682</i>	<i>131 (4.9%)</i>
<b>Indicator Six:</b> Number of new social/productive activities and micro-business developed		0	Prog.	2,179	150 (6.9%)
			<i>Proj.</i>	<i>1,013</i>	<i>129 (12.7%)</i>
<b>Indicator Seven:</b> Total RET energy consumption per household	kWh/year	0	Prog.	2,077	799 (38%)
			<i>Proj.</i>	<i>966</i>	<i>816 (84%)</i>
<b>Intermediate Results</b>					
SENER/CFE operational		none			completed
Design of bidding documents		none			completed
Issuance of technical guidelines		none			completed
Baseline Impact Evaluation Assessment		none			completed
Medium-term Impact Evaluation Assessment		none			completed

<sup>25</sup> Targets revised during the Project structuring refer to the entire Government electrification “*program*” that aims at serving 86 locations. Since by the project’s closing date electrification efforts focused mostly on the World Bank supported component (i.e. the “*project*”, implemented in 40 locations), a second set of targets (in *italics*) is included to reflect more appropriately the accomplishment of the Bank’s support.

**Table 2.2: Original and Revised Performance Indicators**

<b>PDO Level Results Indicator</b>	<b>Original Target</b>	<b>Final Target Proposed in Restructuring</b>
<b>Indicator One:</b> Number of households (HH) electrified with RET (solar PV)	34,000	4,432
<b>Indicator Two:</b> Costs per new connection <sup>26</sup>	960	1,097
<b>Indicator Three:</b> New renewable energy capacity	6,289	6,205
<b>Indicator Four:</b> Emissions reduction	254	241
<b>Indicator Five:</b> Incremental increase of electricity consumed for productive uses	5,650	5,768
<b>Indicator Six:</b> Number of new social/productive activities and micro-business developed	1,000	2,179
<b>Indicator Seven:</b> Total RET energy consumption per household	Not applicable	2,077

4. All PDO Indicators were revised during the restructuring of the Project. Indicator One was reduced in order to reflect the project’s scope and technological changes. It is noted that while indicators Two through Five experienced relatively minor adjustments, indicator Six was increased by 118% and Indicator Seven was introduced. However, the increase in Indicator Six was not accompanied by the allocation of more resources or a greater emphasis on this area (productive uses of electricity).

5. The following five PDO indicators were dropped at the Project restructuring: (i) total number of households electrified – with all technologies; i.e. solar home systems, micro-hydropower, micro-wind generators that were excluded; (ii) income generation to Project beneficiaries due to increased productive/economic uses of electricity; (iii) number of private companies operating as service companies; (iv) amount of private equity invested in rural projects; and (v) number of extension agents trained. Also, the following intermediate results indicators were dropped: (i) design procedure for technology and service provider pre-qualification/certification; and (ii) successful ownership transfer of SHSs to households. With the exception of PDO (ii), all other indicators were excluded as a consequence of changes in technology and/or the exclusive public sector focus of the restructured project.

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<sup>26</sup> Target defined at restructuring excluded cost of the energy source.

**Table 2.3: Benefited communities under PSIE and Bandera Blanca**

No.	State	Municipality	Locality	Bid
1	Durango	Canelas	Mesa de Guadalupe	1
2	Durango	Santiago Papasquiario	Montoros	1
3	Durango	Santiago Papasquiario	Rincón de Huajupa	1
4	Durango	Santiago Papasquiario	Santa Cruz de Marcos	1
5	Durango	San Bernardo	División del Norte (Los Lobos)	1
6	Durango	El Mezquital	San Buenaventura	2
7	Durango	El Mezquital	Tepalcates	2
8	Durango	El Mezquital	Curachitos (Buenavista)	2
9	Durango	El Mezquital	Canoítas (Canoas Dos)	2
10	Durango	El Mezquital	Zancudo Uno	2
11	Durango	Santiago Papasquiario	La Sierrita	2
12	Durango	Ocampo	Ojos Azules (Campo Alegre)	2
13	Durango	Otáez	La Cieneguita	2
14	Durango	Otáez	San José de la Cruz	2
15	Coahuila	Sierra Mojada	San José de Carranza	2
16	Chihuahua	Aldama	Chorreras	3
17	Chihuahua	Ocampo	Basogachic	3
18	Coahuila	Ocampo	Boquillas del Carmen	3
19	Durango	El Mezquital	Ceja de Cebolleta	3
20	Durango	El Mezquital	Toyana	3
21	Durango	Tepehuanes	Ciénega de los Frailes	3
22	Guerrero	Atoyac de Álvarez	Piedras Grandes	3
23	Nayarit	Del Nayar	Potrero de la Palmita	3
24	San Luis Potosí	Tierra Nueva	Los Lobos	3
25	Sonora	Bacanora	El Encinal	3
26	Durango	Tepehuanes	La Graniza (El Tule)	4
27	Durango	Tepehuanes	El Dorador (Las Flores)	4

28	Durango	Tepehuanes	San Ignacio de la Sierra	4
29	Durango	Tepehuanes	El Conejo	4
30	Durango	Tepehuanes	El Tarahumar (La Atascosa)	4
31	Durango	Tepehuanes	El Gato de Arriba	4
32	Durango	Tepehuanes	Ciénega de Caballos (Las Brisas)	4
33	Durango	Tepehuanes	Santa Cruz de la Estaca	4
34	Durango	Santiago Papasquiaro	Soyupa	4
35	Durango	Topia	El Carmen	4
36	Baja California	Mulegé	Luis Echeverría Álvarez	5
37	Nayarit	Tepic	Zapote de Picachos	6
38	Nayarit	Del Nayar	El Ciruelar	6
39	Nayarit	Del Nayar	Aguamilpa	7
40	Nayarit	Santa María del Oro	El Caracol	7
1	Sonora	Bacanora	Guaycora	Pilot
2	Nayarit	Del Nayar	Guásima del Metate	Pilot
3	Nayarit	Del Nayar	Tierras Blancas del Picacho	Pilot
4	Nayarit	La Yesca	La Cienega	Pilot

## Annex 3. Economic and Financial Analysis

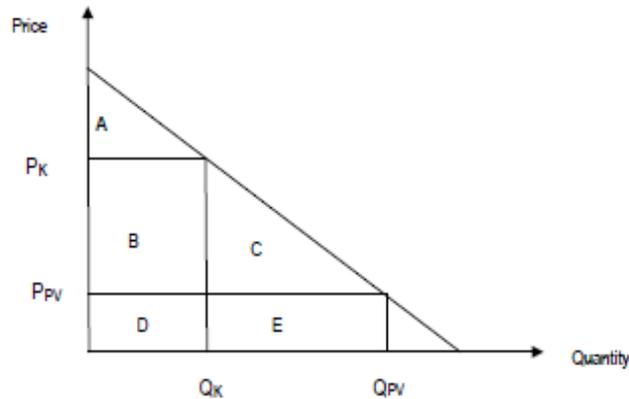
### (a) Economic Analysis

1. The economic analysis focuses on Component 2 – Sub-Projects, which accounts for 89 percent of the project’s total cost. The component comprises forty Centralized Solar Farms (CSFs) that provided electricity to 2,043 households, including the 36 CSFs supported by the World Bank plus four additional farms implemented with GoM funds. Since the CSFs technology was incorporated at the project restructuring of 2012, the present economic analysis does not replicate the analysis done for the PAD and, hence, is not directly comparable.
2. The economic internal rate of return for the solar farms is 0.94 percent and its net present value (NPV) is estimated to be a negative US\$ 6.8 million, based on a four percent discount rate considered appropriate for social projects.<sup>27</sup> At a discount of 12 percent, which was used during project appraisal, the NPV would be a negative US\$ 14.5 million. These results are based on a forecast for future energy consumption of 125 kWh per month per household, reached after three years of operation, which could be a conservative assumption for a mini-grid that does not have a significant capacity/supply constraint. A 20 percent increase in electricity consumption (up to 150 kWh per month) would yield an economic return of 1.94 percent and a negative NPV of US\$ 4.7 million. These results are consistent with the high costs of the CSF technology that reached an average of US\$ 10,190 per kW installed, and a cost per household connection of US\$ 13,259 including the solar plant and the distribution grid in each location.
3. **Costs:** The analysis includes the investment cost of US\$ 27.1 million for forty CSFs installed by the project, comprising the solar farms plus the mini-grid required for the distribution of electricity in each location. Project costs include also annual operation and maintenance expenses plus the reposition of batteries and power inverters after 16 and 17 years respectively. The economic life of the project is considered to be 20 years, although there is evidence that solar equipment could last longer. All costs are free of duties and taxes.
4. **Benefits:** CSFs provide two types of benefits: on one hand, they substitute the expense associated with traditional energy sources –i.e. lighting and communications devices, such as kerosene lamps, candles, diesel fuel and batteries– by solar panels whose running costs are practically negligible. Also, in this particular case there will be savings associated to the reposition of batteries of existing (small) solar panels that some households had installed earlier. In addition to the savings over traditional lighting and communications devices, the solar farms make available energy in quantity and quality comparable to a grid-connection, therefore, they bring additional welfare benefits to the beneficiaries. Benefits are estimated for a typical/average household. These are explained in the figure below that represents schematically the demand for electricity of a rural household:
5. When using traditional energy, households consume  $Q_K$  at price  $P_K$ , and the economic savings in traditional energy resources are given by areas B+D, which represent a minimum willingness to pay for the improved energy source. Once the consumer is connected to a solar mini-grid, demand increases to  $Q_{PV}$  (at price  $P_{PV}$ ) due the greater availability of a higher quality source. The benefits stemming from the additional energy are given by areas C+E. A straight-line

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<sup>27</sup> Based on the estimates for nine countries in Latin America for the rate at which society would be willing to trade present for future consumption (The Social Discount Rate: Estimates for Nine Latin American Countries. World Bank, June 2008).

approximation to the demand curve is used given the lack of quantifiable information regarding consumers' preferences.



6. The analysis considers the case of a single household connected to the solar mini-grid with the following characteristics based on the findings of surveys undertaken in different localities:

$Q_K$ : 435 kWh per year

$P_K$ : Savings in traditional energy (B+D): US\$ 369 per year; which yields a unit cost of US\$ 0.847/kWh

$Q_{PV}$ : 1,500 kWh per year (based on data of households recently connected to a grid, considering a gradual increase from 790kWh to 1,500kWh in three years)

$P_{PV}$ : US\$0.058 per kWh (average tariff paid by rural households)

7. The table below presents the flow of costs and benefits for the project's forty localities served by CSFs.

**Table 3.1 - PSIE Centralized Solar Farms Component – Cost and Benefits**

<b>PSIE - Economic Analysis</b> (thousand US\$)									
Year	HHS Connected	Capital Cost	Equip. Replac.	O&M	Total Cost	Avoided Cost	Add. Benefits 1/	Total Benefits	Net Benefits
0	2,043	27,088.0	0.0	0.0	27,088.0	0.0	0.0	0.0	-27,088.0
1	0	0.0	0.0	135.4	135.4	783.4	328.2	1,111.6	976.1
2	0	0.0	0.0	135.4	135.4	783.4	656.4	1,439.8	1,304.3
3	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
4	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
5	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
6	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
7	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
8	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
9	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
10	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
11	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
12	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
13	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
14	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
15	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
16	0	0.0	4,536.0	135.4	4,671.4	783.4	984.5	1,767.9	-2,903.5

17	0	0.0	2,516.0	135.4	2,651.4	783.4	984.5	1,767.9	-883.5
18	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,629.5
19	0	0.0	0.0	135.4	135.4	783.4	984.5	1,767.9	1,632.5
20	0	0.0	- 5,400.0	135.4	-5,264.6	783.4	984.5	1,767.9	7,032.5
								<b>NPV:</b>	<b>-9,814</b>
								<b>IERR:</b>	<b>0.94%</b>
<i>1/ Additional benefits associated to more and a better quality of energy source</i>									

**(b) Financial Analysis**

8. Given that the project supports the implementation of a social program that by nature subsidizes the provision of infrastructure services for poor rural communities, the PAD did not assess the profitability of the program nor included a financial analysis.

9. The incorporation of CFE as the owner and operator of the solar farms did not change the social character of the project. All assets financed by the World Bank have been transferred to CFE at no cost and it is expected that the only significant cost to be borne in the future, i.e. the replacement of batteries and power inverters, will be covered by a rural electrification fund established recently by law. That is, CFE's rural electrification program will be subsidized through the provision of all power generation assets at no cost and, during operation, through a rural electrification fund.

## Annex 4. Bank Lending and Implementation Support/Supervision Processes

### (a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
<b>Lending</b>			
Gabriela Elizondo Azuela	Senior Energy Specialist	GEE04	Task Team Leader
Charles Feinstein			
Jayme Porto Carreiro			
Tania Carrasco	Consultant		IPP Specialist
Jorge Wolpert	Consultant		Consultant
Alexandra Zenzes	Consultant		Foreign Affairs
Juan David Quintero	Consultant	GENDR	Senior Env. Spec.
Elena Correa	Consultant	GSU10	Senior Social Spec.
Alberto Didoni	Consultant		
Ernesto Terrado	Consultant		Energy
Luis M. Vaca-Soto	Consultant	GEE04	Procurement
Eduardo Villagrán	Consultant		Rural Energy Spec.
Victor Ordóñez	Senior Finance Officer	WFALN	FM Specialist
Efraim Jimenez	Consultant	OPCPF	Lead Procurement Spec.
Gabriel Penaloza	Senior Procurement Spec.	GGO04	Procurement Spec.
Daniel Farchy	Industry Specialist	CFGCC	JPA
Fernando Cubillos	Consultant	GEEDR	Consultant
Zayra Gabriela Romo Mercado	Senior Energy Specialist	GEE01	JPA
Karina M. Kashiwamoto	Language Program Assist.	LCC1C	Language Program Assist.
Felix Prieto			Sr. Procurement Spec.
Michael Jarvis	Consultant		Consultant
Paola C. Solidoro	Consultant		Consultant
Benjamín Santamaria	Consultant		Consultant
Ernesto Sanchez-Triana	Lead Environmental Spec.	GENGE	Sr. Environmental Engineer
<b>Supervision/ICR</b>			
David Reinstein	Senior Oil and Gas Spec.	GEEX1	Task Team Leader
Fowzia Hassan	Senior Operations Officer	GEE02	Operations Analyst
Fernanda Pacheco	Senior Program Assistant	GEE04	Program Assistant
Gabriela Elizondo	Senior Energy Specialist	GEE04	Consultant
Rodrigo Aragon Salinas	Consultant		Energy
Gabriel Penaloza	Senior Procurement Spec.	GGO04	Procurement Spec.
Sarah Martiny	Consultant		Environment
Maria Elena Castro	Consultant		Social
Juan Miguel Cayo	Senior Energy Economist		
Vladimir Jadrijevic	Consultant		Procurement
Juan Carlos Serrano	Senior FM Specialist	GGO22	FM Specialist
Alonso Zarzar	Sr. Social Scientist	GSU04	Senior Social Spec.
Cesar Arreola	Consultant	GCCCCF	Consultant Energy Spec.

**Supervision/ICR**

Roberto Gabriel Aiello			Task Team Leader
Ariel Yepez-Garcia			Energy Specialist
Karen Bazex	Senior Energy Specialist	GEE01	Energy Specialist
Alexandra Planas	Consultant		Consultant
Ernesto Terrado	Consultant		Consultant
Manuel Luengo	Senior Energy Specialist	GEE08	MDL Specialist
Jose Luis Calderon	Consultant	GEN04	Consultant Env. Spec.
Cizuka Seki	Consultant		
Luis Vaca-Soto	Consultant	GEE04	
Victor Ordenez	Senior Finance Officer	WFALN	FM Specialist
Dmitri Gourfinkel	FM Specialist	GGO22	FM Analyst
Guillermo Hernandez	Energy Specialist	GEE04	Task Team Leader
Karla Olguin	Consultant	GEEDR	Consultant Energy Spec.
Jeannette Estupinan	Senior FM Specialist	GGO22	FM Specialist
Diana Gabriela Jimenez	Program Assistant	LCC1C	Team Assistant
Nancy Montes de Oca	Team Assistant	LCC1C	Team Assistant
Beatriz Eugenia Gomez V.		LCC1C	Team Assistant
Farah Mohammadzadeh	Consultant	GEE08	Consultant Energy Spec.
Daniel Vinicio Molina	Consultant		Consultant Energy Spec.
Diomedes Berroa	Lead Specialist	OPSPF	Sr. Operations Officer
Janice M. Molina	Consultant	GENDR	
Michelle Keane	Lead Country Officer	LCC8C	
Karim Omar Lara Ayub	Operations Analyst	LCC1C	
Karina M. Kashiwamoto	Language Program Assist.	LCC1C	Language Program Assist.

**(b) Staff Time and Cost**

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
<b>Lending</b>		
FY05	21.45	61.93
FY06	14.28	39.44
FY07	17.77	49.00
FY08	21.83	50.31
<b>Total:</b>	<b>75.33</b>	<b>200.68</b>
<b>Supervision/ICR</b>		
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
<b>Total:</b>	<b>157.01</b>	<b>509.53</b>

## **Annex 5. Beneficiary Survey Results**

1. Early surveys conducted in ten of the forty localities where solar farms were implemented provided the following feedback on both positive and negative aspects associated to the provision of electricity.

On the positive side;

- Expectations of –or actual- better public services, such as improvements in technology in schools (computers, sound equipment, online education), better health infrastructure, government supported community development projects;
- Better/cheaper access to communications: cell phone charging, Internet;
- Jobs generated during construction offered attractive salaries, e.g. in civil works (men) and cooking (women);
- Improved retail businesses and the potential for better nutrition thanks to the access to refrigeration;
- Potential for carpentry and mechanic workshops;
- Potential for water pumping;
- Savings in traditional energy sources, e.g. candles, fossil fuels;
- Increased productivity during night hours;
- Improved security due to public lighting;

On the negative side;

- Absence of information/guidance on the opportunities for productive uses of electricity;
- Complains on the quality of the service on both the technical side (voltage fluctuation, security measures) and commercial (customer confusion/uneasiness about the billing and collection procedure), uncertainty on the cost of electricity;
- Uncertainty on how to contact CFE in case of power outages;
- Concerns regarding the lack of knowledge on the overall operation of the solar system;
- Power outages in one community;
- Delays in construction and commissioning of the solar plant;
- Delayed connection of public services (school) in one community.

## **Annex 6. Stakeholder Workshop Report and Results**

Not applicable.

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

*(The following paragraphs were submitted by NAFIN. Other comments submitted by SHCP, NAFIN and UREP-SENER have been included in the main text).*

1. Originally, the project was designed to support the strategies and actions for rural electrification established by the Ministry of Energy (SENER) and prioritized by the Government of Mexico. However, some institutional constraints, federal sector reforms and the original design contributed to a slow implementation progress, and therefore it was necessary to carry out a major restructuring process in 2012 with the combined efforts of the Government of Mexico and the World Bank. Such a restructuring maintained the original project objectives, i.e., (i) to increase access to efficient and sustainable energy services to the predominantly indigenous rural areas, (ii) to support efforts to reduce poverty in the country, (iii) to promote renewable energy, and (iv) to close the gap in electricity access for last-mile communities, as these objectives remained highly relevant for the Mexican Government.

2. It is important to mention that the synergies between all of the involved entities (SENER-NAFIN-CFE and World Bank) observed during the implementation of this project significantly contributed to an enhanced institutional capacity, particularly for procurement-related matters (the Bank's norms represented a challenge for the implementing and executing agencies, especially for the first tender process where initial lengthy technical discussions resulted in a delay of almost a year for awarding the contract).

3. NAFIN played an important role in project implementation and significantly contributed to the achievement of project objectives.

*(The following paragraph was submitted by UREP and it was a translated from Spanish).*

4. SENER (as the lead executing agency) made important and significant efforts to implement PSIE, such as the coordination of the restructuring process carried out in October 2012, which established the legal, technical, financial and operating framework to reactivate the physical and financial progress of the project. With the support of FOTEASE, CFE and UREP's Technical Assistance, different consulting services were hired and procurement processes of goods and works for the construction of all scheduled CSFs were completed during the period of 2014 - 2016. From SENER's perspective, financial and physical progress during those years was satisfactory.

*(The following paragraphs were submitted by SENER and were translated from Spanish).*

5. As the implementing agency of this Project, the Ministry of Energy was responsible for coordinating public policy efforts and for making federal resources available for the implementation of PSIE, which contributed to the national efforts to provide energy access to rural, last-mile communities (public policy instruments such as the Special Programme for the Use of Renewable Energy, or PEAER for its acronym in Spanish, include specific targets for the participation of renewable energy in electrification).

6. The GoM remains committed to achieve 100% of electrification, as demonstrated by (i) the creation of the Universal Electricity Access Fund (as mandated by the Electric Industry Law that was published in 2014), whose primary objective is providing electricity to marginalized

communities both in rural and urban areas (preferably through renewable energy projects), and (ii) its participation in the United Nations' initiative SE4ALL (Sustainable Energy for all).

7. The GoM has documented the numerous benefits of PSIE in each of the 36 benefited communities through different social and environmental assessments. The recently-installed infrastructure will contribute to the creation of local economies that could promote the integral development of beneficiaries through the joint effort of the Government (at all levels) and social institutions.

8. The Fund for Energy Transition and Sustainable Use of Energy (FOTEASE) was instrumental in the successful implementation of PSIE, since it allowed the Government to finance all project activities which were later reimbursed by the IBRD and the GEF. Overall, FOTEASE allocated approximately 400 million pesos to PSIE for the construction of 40 solar farms, including 36 whose eligible expenses were later reimbursed by the IBRD/GEF, and the last 4 in the state of Nayarit, whose construction was delayed and therefore were not eligible for reimbursement. Without the FOTEASE, PSIE (and other World Bank-supported projects in Mexico) could not have been implemented.

## **Annex 8. Comments of Co-financiers and Other Partners/Stakeholders**

Not applicable.

## **Annex 9. List of Supporting Documents**

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