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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT *AND/OR*
INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PAPER

ON A

PROPOSED ADDITIONAL LOAN

IN THE AMOUNT OF US$[50] MILLION

AND

A PROPOSED ADDITIONAL GRANT

IN THE AMOUNT OF US$5.79 MILLION

TO THE

UNITED MEXICAN STATES

FOR A

PRESEM Additional Finance for Energy Efficiency in Public Buildings
December 3, 2017

Energy & Extractives Global Practice
Latin America And Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective Dec 3, 2017)

Currency Unit =	
MXN18.28 =	US$1

FISCAL YEAR
January 1 - December 31

Regional Vice President:	Jorge Familiar Calderon
Acting Country Director:	Jutta Ursula Kern
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Antonio Alexandre Rodrigues Barbalho
Task Team Leader(s):	Janina Franco / Martina Bosi

ABBREVIATIONS AND ACRONYMS

AIA	Activity Initiation Agreement
BANOBRAS	*Banco Nacional de Obras y Servicios Públicos* (National Bank for Public Works and Services)
CFE	*Comisión Federal de Electricidad* (Federal Electricity Commission)
CO_2	Carbon dioxide
CONAGUA	*Comisión Nacional del Agua* (National Water Commission)
CONUEE	*Comisión Nacional para el Uso Eficiente de la Energía* (National Commission for the Efficient Use of Energy)
EE	Energy Efficiency
ENCC	*Estrategia Nacional de Cambio Climático* (National Climate Change Strategy)
ENE	*Estrategia Nacional de Energía* (National Energy Strategy)
EIRR	Economic internal rate of return
EnMS	Energy Management Systems
ESA	Energy Services Agreements
ESMAP	Energy Sector Management Assistance Programme
ESMF	Environmental and Social Monitoring Framework
FIDE	*Fideicomiso para el Ahorro de Energía Eléctrica* (Electricity Energy Savings Trust Fund)
FM	Financial Management
FOTEASE	*Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía* (Energy Transition and Sustainable Energy Use Fund)
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gases
GoM	Government of Mexico
GRS	Grievance Redress Service
ICB	International Competitive Bidding
IFR	Interim Financial Report
INAFED	*Instituto Nacional para el Federalismo y el Desarrollo Municipal* (National Federalism and Municipal Development Institute)
ISP	Implementation Support Plan
IRR	Internal Rate of Return
LEDs	Light-emitting Diode
LN	Loan
M&E	Monitoring and Evaluation
MB	Municipal Building
MEDEC	*México estudio de Disminución de Emisiones de Carbono* (Low-Carbon Development for Mexico)
MW	Megawatt
MWh	Megawatt-hour

MXN	Mexican Peso
NAFIN	*Nacional Financiera, S.N.C., I.B.D.* (National Development Bank)
NAMAs	Nationally Appropriate Mitigation Actions
NPV	Net present value
O&M	Operation and Maintenance
OM	Operational Manual
OO	*Organismos Operadores de Agua* (Water and Wastewater Utility)
PAD	Project Appraisal Document
PIU	Project Implementation Unit
PDO	Project Development Objective
PMR	Partnership for Market Readiness
PRESEM	*Proyecto de Eficiencia y Sustentabilidad Energética Municipal* (Municipal Energy Efficiency Project)
PRONASE	*Programa Nacional para el Aprovechamiento Sustentable de la Energía* (National Program for the Sustainable Use of Energy)
PV	Photovoltaic
SENER	*Secretaría de Energía* (Secretary of Energy)
SHCP	*Secretaría de Hacienda y Crédito Público* (Ministry of Finance)
SFP	*Secretaría de la Función Pública* (Ministry of Public Administration)
SIE	*Sistema de Información Energética* (National Energy Information System)
SL	Street Lighting
SW	Staff weeks
tCO2eq	Tons of carbon dioxide equivalent
TESOFE	*Tesorería de la Federación* (Treasury of the Federation)
TF	Trust Fund
TRACE	Tool for Rapid Assessment of City Energy
TWh	Terawatt-hour
UN	United Nations
UREP	*Unidad Responsable Ejecutora del Proyecto* (Responsible Project Implementing Unit)

BASIC INFORMATION – PARENT (Mexico Municipal Energy Efficiency Project - P149872)

Country	Product Line	Team Leader(s)		
Mexico	IBRD/IDA	Janina Andrea Franco Salazar		
Project ID	**Financing Instrument**	**Resp CC**	**Req CC**	**Practice Area (Lead)**
P149872	Investment Project Financing	GEE04 (9262)	LCC1C (447)	Energy & Extractives

Implementing Agency: Secretaría de Energía (SENER)

Is this a regionally tagged project?	
No	
[ ] Situations of Urgent Need or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects	Bank/IFC Collaboration No

Approval Date	Closing Date	Original Environmental Assessment Category	Current EA Category
08-Mar-2016	31-Oct-2021	Partial Assessment (B)	Partial Assessment (B)

Development Objective(s)

The objective of the project is to promote the efficient use of energy in the Borrower's municipalities by carrying outenergy efficiency investments in selected municipal sectors and contribute to strengthening the enabling environment.

Ratings (from Parent ISR)

	Implementation

	11-Jun-2016	13-Dec-2016	16-Jun-2017
Progress towards achievement of PDO	S	S	S
Overall Implementation Progress (IP)	S	S	MS
Overall Safeguards Rating	S	S	S
Overall Risk	S	S	S

BASIC INFORMATION – ADDITIONAL FINANCING (PRESEM Additional Finance for Energy Efficiency in Public Buildings - P165585)

Project ID	Project Name	Additional Financing Type	Urgent Need or Capacity Constraints
P165585	PRESEM Additional Finance for Energy Efficiency in Public Buildings	Restructuring, Scale Up	No
Financing instrument	**Product line**	**Approval Date**	
Investment Project Financing	IBRD/IDA	28-Feb-2018	
Closing Date	**Bank/IFC Collaboration**		
31-Oct-2021	No		
Is this a regionally tagged project?			
No			

[ ] Situations of Urgent Need or Capacity Constraints

[ ] Financial Intermediaries

[ ] Series of Projects

PROJECT FINANCING DATA – PARENT (Mexico Municipal Energy Efficiency Project - P149872)

Disbursement Summary (from Parent ISR)

Source of Funds	Net Commitments	Total Disbursed	Remaining Balance	Disbursed
IBRD	100.00	0.48	99.52	.5 %
IDA				%
Grants				%

PROJECT FINANCING DATA – ADDITIONAL FINANCING (PRESEM Additional Finance for Energy Efficiency in Public Buildings - P165585)

FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	100.00
Total Financing	100.00
Financing Gap	0.00

DETAILS

International Bank for Reconstruction and Development (IBRD)	50.00
Cofinancing - Other Sources (IFIs, Bilaterals, Foundations)	50.00
FRANCE: Govt. of [MOFA and AFD (C2D)]	50.00

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any other Policy waiver(s)?

[ ] Yes [✓] No

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
Janina Andrea Franco Salazar	Team Leader (ADM Responsible)		GEE04
Gabriel Penaloza	Procurement Specialist (ADM Responsible)		GGO04
Luis Barajas Gonzalez	Financial Management Specialist		GGO22
Andrea Maria Castro Astudillo	Team Member		GEE04

Arelia Jacive Lopez Castaneda	Social Safeguards Specialist	GSU04
Cesar Adrian Arreola Croda	Team Member	GEE04
Daniel Alvaro Diez	Team Member	GEE04
Diacono Raul Vera Hernandez	Environmental Safeguards Specialist	GEN04
Dorothee Georg	Team Member	GSU04
Francisco Rodriguez	Team Member	GGO04
Gabriela Grinsteins	Counsel	LEGLE
Iris Del Valle Oliveros	Team Member	GEE04
Jasneet Singh	Team Member	GEE03
Martina Bosi	Team Member	GEEES
Nancy Montes de Oca	Team Member	LCC1C

Extended Team

Name	Title	Organization	Location
Emilie Leclerc	Project Manager	AFD	
Pauline Larat	Project Coordinator	AFD	
Thomas Roulleau	Energy Project Manager	AFD	

MEXICO

PRESEM ADDITIONAL FINANCE FOR ENERGY EFFICIENCY IN PUBLIC BUILDINGS

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I. BACKGROUND AND RATIONALE FOR ADDITIONAL FINANCING

A. Country Context

1. **Mexico's economy continues to expand at a steady though moderate rate of growth**. The increase in Mexico's GDP over the past three years, 2014-2016, at an annual average of 2.4 percent was slightly below the annual average growth posted during the previous two decades, 1994-2013, of 2.6 percent. The non-oil economy expanded between 2014 and 2016 at the same average annual rate of 2.8 percent as observed over the previous two decades. Growth is expected to moderate to about 2.2 percent in 2017 and strengthen in the medium term to about 2.5 percent by 2019 as uncertainty with respect to NAFTA and the presidential elections (of July 2018) dissipate and gross fixed investment growth resumes. These rates of growth are only about half of the average growth observed in emerging market economies (5.3 percent between 1994 and 2016).

2. **Economic performance has been resilient in view of external shocks experienced in the past few years**. Mexico's economy endured several external shocks in the last few years including a sharp drop in oil prices with average oil prices down by 50-60 percent, an additional reduction in the volume of oil and gas production by 6 percent annually, international financial market volatility related to a normalization of monetary policy in advanced economies, and, uncertainty over the future of the U.S.-Mexico trade relation. Sensible monetary and fiscal policy responses to these shocks within an overall sound macroeconomic policy framework including a flexible exchange rate, an inflation-targeting monetary policy framework and a fiscal rule that ensures moderate public-sector deficits, maintained macroeconomic stability in recent years. Heightened fiscal consolidation efforts focus on expenditure cuts as the tool to stabilize public debt.

3. **Moderate economic growth over recent years has limited significant poverty reduction and improvements in shared prosperity**. The most recent estimation of official poverty - shows a decline in the percentage of people considered poor from 46.2 percent to 43.6 percent and extreme poor from 9.5 percent to 7.6 percent between 2014 and 2016. Access to health services, access to social security and food security were the non-monetary components that improved the most. Monetary poverty also declined as poverty rates at the well-being poverty line dropped from 53.2 percent to 50.6 percent while the rates at the minimum well-being poverty line dropped from 20.6 percent to 17.5 percent. Such a decline in monetary poverty has been driven by higher growth of incomes at the bottom of the income distribution.

4. **Mitigation climate change actions continue to be a national priority to President Peña Nieto's administration**. In September 2016, Mexico ratified and formally joined the Paris Climate Agreement, under which Mexico's first "Nationally Determined Contribution" commits the country "to reduce unconditionally 25 percent of its Greenhouse Gases (GHG) and Short-Lived Climate Pollutants emissions (below business-as-usual, BAU) for the year 2030."[1] Its commitment could increase up to a 40 percent on condition of international support. The National Climate Change Strategy (*Estrategia Nacional de Cambio Climático*, ENCC) is the guiding policy instrument that defines a range of actions to achieve these goals, including a renewed focus on efficient energy use and the transition into the development of sustainable cities and their buildings, where many of the energy sector emissions take place.

[1] Mexico First NDC, September 21, 2016. Available online at: *http://www4.unfccc.int/ndcregistry/pages/Party.aspx?party=MEX*.

B. Sectoral Context

5. **There are several key institutions in Mexico's EE sector, led by the Secretary of Energy (*Secretaría de Energía*, SENER).** SENER is the entity responsible for planning and formulating national energy policies, and is supported by regulatory and technical bodies, such as the National Commission for the Efficient Use of Energy (*Comisión Nacional para el Uso Eficiente de la Energía*, CONUEE). CONUEE drafts the National Program for the Sustainable Use of Energy (*Programa Nacional para el Aprovechamiento Sustentable de la Energía*, PRONASE) and is tasked with promoting the sustainable use of energy in all sectors and government levels by issuing guidance and providing technical assistance. The Electricity Energy Savings Trust Fund (*Fideicomiso para el Ahorro de Energía Eléctrica*, FIDE) – a private non-profit trust fund (TF) – provides technical and financial solutions for the deployment of energy efficient actions. To support the transition to clean and sustainable energy use, SENER set up the Energy Transition and Sustainable Energy Use Fund (*Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía,* FOTEASE)[2] that has become a key instrument to promote the use, development and investment of renewable energies and energy efficiency.

6. **In December 2013, the Government of Mexico (GoM) amended the Constitution to introduce an overarching reform of the energy sector**. The reform was part of a broader structural and institutional reform package, which aimed to modernize the Mexican economy and society and bolster long-term growth through increased efficiency and productivity. The energy reform provided the foundation for Mexico to tackle the three challenges identified under the National Energy Strategy (ENE 2013-2027): (i) energy security; (ii) sector sustainability; and (iii) energy efficiency.

7. **Mexico has designed a comprehensive legal framework to deliver a modern, reliable, and sustainable energy system.** It includes several key pieces of legislation, such as the: General Law on Climate Change, Law for the Development and Promotion of Biofuels, Law on Geothermal Energy, and Energy Transition Law. The Energy Transition Strategy of 2016 articulates a vision to deliver the clean energy agenda, and commits to very aggressive goals: (i) increase the contribution of clean energy in electricity generation from 20 percent in 2015 to 35 percent in 2024, 37.7 percent in 2030, and 50 percent in 2050; and (ii) reduce final energy intensity -including through enhanced energy efficiency- at an average annual rate of 1.9 percent in the period 2016-2030, and 3.7 percent in the period 2031-2050. The strategy establishes roadmaps to achieve these commitments in the energy and transport sectors.

8. **The energy sector has a significant role to play in Mexico's ability to meet the country's (GHG) mitigation goals through its Nationally Determined Contribution (NDC)**. In line with its emissions profile, Mexico's NDC expects the largest emissions reductions from the electricity sector (31 percent of BAU emissions of 202 $MtCO_2$ eq) and the transport sector (18 percent of 266 $MtCO_2$ eq).[3]

9. **The World Bank and Mexico have had a long and solid engagement in the energy sector, including through investment operations, convening services and advisory support for EE and other clean energy initiatives.** The Low Carbon Development for Mexico (MEDEC) study (FY09) contributed to the launching of several EE operations, such as the Low Carbon Development Policy Loan (FY11) and the Efficient Lighting and Appliances Project (FY10). The latter supported the preparation of two studies on EE opportunities in the education and health sectors,[4] and established a GEF-financed contingency facility for residential EE measures. Both the studies and the contingency facility have been key in informing

[2] FOTEASE has been used in Bank financed operations since 2009.
[3] Mexico First NDC, September 21, 2016. Available online at:
http://www4.unfccc.int/ndcregistry/pages/Party.aspx?party=MEX.
[4] The energy efficiency studies in the health and education sector were prepared in 2015-2016 with support from the GEF financing to the Bank's Efficient Lighting and Appliances Project. More information on these studies can be found in Annex 4.

the preparation of the AF loan and the AF GEF-funded grant. The Bank also supported SENER in piloting city energy efficiency diagnostics (with ESMAP and GEF[5] funding) in thirty-two municipalities using ESMAP's Tool for Rapid Assessment of City Energy (TRACE). This work[6] laid the groundwork for the design of the PRESEM, whose implementation mechanisms are now being proposed to be used for the proposed AF loan and grant.

10. **EE is a cost-effective way for public entities to better manage energy consumption and free resources for other pressing needs**. The tightening of government budgets (at the local and federal levels) and the need to continue increasing access to health-care and secondary education,[7] and to adequately serve the country's increasing population, all call for the targeting of EE interventions in such sectors. As schools and hospitals are the public buildings with the highest energy consumption in the country[8] and Mexican municipalities' highest expenses after salaries are street lighting (SL), water supply, and wastewater treatment,[9] energy efficiency improvements in these sectors would result in budgetary savings for public entities, which could be used to fund other priorities.[10] Energy savings potential of about 22 to 26 percent could be achieved in schools and of about 29 percent for hospitals (see Annex 4) and would also result in sizeable climate co-benefits in greenhouse gas emission reductions. Furthermore, improving EE in schools and hospitals can help improve comfort levels for patients, staff and students, expand services provided and create a demonstration effect on the viability of EE investments along with its co-benefits – especially in schools, where EE projects can be linked to education programs to raise awareness and increase understanding of clean energy and energy efficiency.

11. **EE opportunities in the municipal, public education and health sectors in Mexico have remained largely untapped** due to several barriers, which include a lack of information and awareness, low technical and implementation capacity, misaligned incentives, restrictive budgets and procedures and lack of access to financing for EE investments. Efforts to leverage private sector involvement have faced various hurdles, including the fact that energy savings are not retained in the following years budget.[11] Under the PRESEM scheme this would be overcome as explained below.

12. **The PRESEM is putting in place and piloting an innovative operational and financing mechanism for energy efficiency in public facilities.** If successful, this model can help change perceptions, address barriers and build confidence in energy efficiency as a sound economic investment. The AF would help the Mexican government broaden the reach of the mechanism to also demonstrate it can work in two other sectors, such as education and health public facilities. The use of Energy Service Agreements (ESA), by which beneficiaries receive the benefit of the EE investment without paying the up-front cost and then pay the energy service with the energy savings through the electricity bill, is helping tackle some of

[5] With financing from the GEF funds allocated to the Bank's Efficient Lighting and Appliances Project.
[6] Further information on the World Bank and Mexico engagement can be found in Annex 7.
[7] In 2014, public expenditures in the country's education and health sectors represented 3.7 and 2.7 percent of GDP respectively (World Bank 2016).
[8] Centro Mario Molina, Sustainable Buildings Sectoral Study, 2012.
[9] SL and water tariffs are among the highest public-sector services tariffs. Public-sector tariffs exist for three sectors only: (a) water pumping, (b) SL for Mexico City, Guadalajara and Monterrey, and (c) SL for the rest of the country. There is no public-sector tariff for public buildings. Even if special tariffs for SL and water supply and treatment exist, some operators have switched to medium voltage tariffs to reduce costs.
[10] Energy efficiency studies commissioned by SENER in 2015 estimate that there is an energy savings potential of 22 to 26 percent of total electricity consumption for schools and of about 29 percent for hospitals. Assessments carried out by FIDE, as well as others, have confirmed the existence of this significant EE potential.
[11] In discussions with the WB team, the IFC stated that because the energy savings cannot be retained in the following years budget allocation, it is difficult to develop ESCO schemes. However, in the case of the PRESEM, as the investment repayment is included in the CFE billing, this hurdle could be overcome. Under AF subcomponent 1b, the incorporation of measures that could tackle this barrier for private sector entry will be assessed.

the key barriers affecting the EE market in Mexico and promote the private sector. The ESAs intrinsically rely on private sector participation during project implementation (using energy auditors, energy services companies (ESCOs), manufacturers, and equipment installers). At the same time, the beneficiary has lower transaction costs and does not have to de have high technical and implementation capacity to identify, design, finance and monitor savings from EE investment projects. It also overcomes the access to financing, including up-front capital investment, which is later repaid in the electricity bill. If this model, which involves various stakeholders, can be made to work seamlessly and each stakeholder is comfortable with its role, then a case can be made that this mechanism has the potential to essentially become a sustainable model for supporting EE at scale throughout the country. With the experience, lessons, proof of concept and increased awareness of EE potential and benefits, the aim is to set the stage and support the elaboration of a sustainable market solution for national scale deployment.

13. The US$100 million Mexico Municipal Energy Efficiency Project (PRESEM, P149872) was approved by the World Bank's Executive Board on March 8, 2016 and became effective on September 23, 2016. The five-year operation is being implemented by the Secretary of Energy (SENER). The parent Project Development Objective (PDO) is to promote the efficient use of energy in the Borrower's municipalities by carrying out energy efficiency investments in selected municipal sectors and contribute to strengthening the enabling environment. The Project consists of two components: Component 1 – Policy development and institutional strengthening; and Component 2 – Municipal energy efficiency investments. The operation's closing date is October 31, 2021 and no closing date extension is deemed necessary to accommodate the proposed AF (please see Annex 6 for more details on PRESEM's status).

14. The Project is progressing, although disbursements have been slow in the first year, due to the inherent time and effort implications of putting in place a new and innovative mechanism involving multiple stakeholders. Significant efforts to date have been dedicated to working with the local governments (many of which have undergone municipal elections). This has contributed to delaying the process of rolling out the PRESEM in municipalities.

15. After having built the necessary foundation, disbursements are now expected to accelerate as a robust pipeline has been developed and lessons learned from the first pilots have been integrated into the Project's procedures. Ten municipal EE subprojects are currently under preparation under the PRESEM's Component 2 (Municipal EE investments). The bidding for a street lighting (SL) subproject for the Municipality of Leon has been launched, and two other bids are expected to be launched by end of January (a water pumping subproject with the water utility (OOA) in Huamantla, and the SL subproject for the Delegacion Miguel Hidalgo). The municipal buildings (MBs) subproject in the Municipality of Puebla suffered delays due to the earthquake in September and is now expected to be bid out in February. The additional 6 subprojects currently under preparation include: Mérida (MBs), Huajuapan (SL), Cozumel (SL), Pachuca (OOA), along with Morelia (OOA) and Reynosa (SL). In parallel, SENER is planning the first call for proposals for new subprojects in December. The parent project is expected to support over 20 subprojects with municipal entities until Project closing. Component 1, for policy development and institutional strengthening, is also advancing. A "diplomado" for municipal energy efficiency is in preparation with the University of the State of Mexico (UAEM), a training for energy and climate diagnostics and planning with the Climate Action for Urban Sustainability (CURB) tool is planned for December 2017, the terms of reference (TORs) for regional municipal energy efficiency workshops are underway, and draft ToRs are being prepared to develop a mechanism for the implementation of efficiency building codes in two municipalities.

16. Most project ratings are currently rated as "Satisfactory" (including "Progress towards achievement of PDO", "Overall Safeguards" and "Overall Risk"), while "Overall Implementation Progress" is rated as "Moderately Satisfactory". With a now much more robust investment pipeline and as the role of each institution and the procedures associated with

the PRESEM's financing and operating mechanism are now better established, implementation progress is expected to accelerate.

The Education Sector

17. Mexico's education sector is regulated by the federal Ministry of Education (*Secretaría de Educación Pública*, SEP) and is mostly decentralized, except for those schools administered directly by SEP and by the Federal Administration for Educational Services in the Federal District (*Administración Federal De Servicios Educativos del Distrito Federal*, AFSEDF). Mexico's education sector includes over 215,000 public schools spread across the country divided into three main levels, including a technical training certification category: (i) "*educación básica"* (basic education), which includes both primary ("*primarias*", for the first 6 years of children's education) and secondary schools ("*secundarias*", for grades 7, 8 and 9); (ii) "*educación media superior*" (high schools) for grades 10, 11 and 12 (including both general and technical high schools); and (iii) "*educación superior*" (colleges), which can include universities, technical colleges, and graduate level institutions. State governments manage most public schools in the country,[12] while SEP controls roughly 6,500 public schools, including 4,300 basic education schools in Mexico City (where the education sector has not been decentralized), and 2,200 high schools, colleges and technological institutes throughout the country. AFSDF manages the 4,300 basic schools (primary and secondary level schools located in 1,700 facilities)[13] in Mexico City. The remaining 2,200 schools are under SEP's direct management. The National Institute of Physical Infrastructure for Education (*Instituto Nacional de la Infraestructura Física Educativa*, INIFED) supports SEP and oversees maintenance and construction of schools.

18. Studies have pointed to the general lack of investment and maintenance in public schools over many years. According to the 2015 SENER-led studies on EE in schools and hospitals, the energy efficiency potential in Mexican schools (elementary and higher education) is estimated to be about 25 percent.[14]

19. SEP's centralized managed schools provide a good opportunity to pilot energy efficiency within the PRESEM's operational and financial mechanism. SEP's centralized payment system along with the absence of unmanaged outstanding debt[15] with the electric utility makes the SEP-managed schools well-suited for the operational and financing mechanism established under the PRESEM. In addition, SEP authorities have expressed interest in also using the opportunity offered through the proposed AF loan to do a more "integrated" EE upgrade project where the investments would generate EE improvements in the facilities, as well as contribute to increased safety and security. The AF loan would thus elaborate EE investment packages that seek to offer such integrated approach while maintaining a threshold of energy savings for each investment package. In addition, for each education facility considered for an EE investment under the PRESEM, a structural assessment would be required[16] – as an eligibility criteria – to ensure that the investments are undertaken in structurally sound facilities, thereby providing assurance of the sustainability of the investment.

[12] Of the 215,000 public schools in Mexico, roughly 200,000 cover basic education (primary and secondary levels).
[13] More than one school can be located in the same education facility.
[14] In July 2017, Dr. Irma Gomez, the SEP Oficial Mayor, informed that the mini pilot project in 2 public schools resulted in a reduction of energy efficiency consumption of 22 and 32 percent respectively, consistent with the results from the 2015 SENER studies.
[15] SEP has no outstanding debt with the electricity utility, CFE. It has an agreement in place with the electric utility CFE providing it with flexibility (i.e., more time of about 3 to 6 months) to effectuate the full payment of its electricity bills, with which SEP complies with. CFE confirmed that it has no unmanaged outstanding debt with SEP.
[16] The structural assessment could be performed where it is not available.

The Health Sector

20. The Mexican health sector includes more than 26,000 health facilities and is comprised of three major sub-systems: social security,[17] social protection[18] (together constituting the public component of the sector), and the private system. The Mexican health facilities are categorized in three levels: Level 1 includes the typically smaller community level general medicine clinic with only ambulatory services; Level 2 includes general hospitals with emergency, hospitalization and basic medical specialties;[19] and Level 3 include the hospitals of high specializations with greater capacity, and facilities that perform medical training and research. Individually, these last two levels also serve larger shares of the population.

21. The Ministry of Health (*Secretaría de Salud*, SSA) is the governing body at the public health policy level and oversees the country's public health system. The SSA is responsible for the social protection part of the country's health system and is also the operator, through the Coordinating Commission of National Institutes of Health (CCINS) of 28 mostly Level 3 hospitals.[20] These include several highly-specialized facilities, with training, research and medical care, that are accessible to all Mexicans, including the population without social security. The Mexican Social Security Institute (*Instituto Mexicano del Seguro Social*, IMSS) is a federal entity affiliated to the Ministry of Health, attending to Mexicans in salaried private (formal) employment and their families (about 50 percent of the population). Its budget represents about 45 percent of Mexico's total annual federal allocation for healthcare expenditures.

22. Although health outcomes in Mexico have improved significantly over the past several decades, they remain lower than those of comparable countries in Latin America and far below OECD averages. Among the challenges for Mexico's health sector is the provision of health coverage to its citizens (through the *Seguro Popular),*[21] and the necessary infrastructure to be able to attend to the demand for health services. Moreover, as the population increases, demand for health services is expected to continue to grow, putting further pressure on the sector.

23. The AF proposes to focus on public health Level 2 and Level 3 facilities given their greater energy consumption, higher energy bills and greater potential for energy efficiency. It would include the SSA and IMSS managed public health facilities. The IMSS-managed hospitals are deemed well suited for the PRESEM operational and financing mechanism, given: (i) the large size of some of its nearly 300 Level 2 and 3 hospitals;[22] (ii) its large electricity bill (about US$2.16 million per month); (iii) an attractive EE potential estimated at about 40 to 50 percent of hospitals' electricity consumption;[23] and

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[17] Social security schemes are compulsory for formal salaried workers, and different schemes cover different types of employment.

[18] *Seguro Popular* is the main pillar of the Social Protection System in Health (*Sistema de Protección Social en Salud*). It was designed to universalize health insurance by making coverage available to all citizens not covered by a social security scheme. The Seguro Popular benefits an estimated 40-45 percent of the population.

[19] Medical specialties include internal medicine, surgery, pediatrics, GCO, neurology, cardiology. These facilities need doctors and nurses with specialization.

[20] The SSA-managed hospitals represent a total of about 5,000 beds divided among 13 National Institutes of Health, 6 Federal Hospitals, 6 Regional Hospitals (Oaxaca, Ixtapaluca, Yucatán, Ciudad Victoria, Bajío, and Chiapas), 3 Psychiatric Hospitals, and several national centers (blood transfusion, and others).

[21] With the introduction of Seguro Popular in 2004, some 50 million Mexicans previously at risk of unaffordable health care bills have gained access to health insurance (OECD 2016).

[22] Some of the Level 2 and 3 hospitals are among the largest in Latin America. The IMSS network also includes 1,506 Level 1 medical units.

[23] As EE potential in hospitals can also be found within the use of fossil fuels (mostly used for steam generation), tapping such options would also be considered if they can be integrated within the PRESEM's ESA scheme (unlike electricity payments, there are no centralized systems for payments of hospitals' fossil fuel consumption).

(iv) the existence of a centralized electricity payment system with CFE[24] and no debt with the utility. As in the case of schools, a hospital's satisfactory structural safety assessment would be an eligibility condition for EE investments under the PRESEM AF loan.

24. The Government of Mexico (GoM) requested the Bank's support to improve energy efficiency (EE) in schools and hospitals in March 2017. Processing the loan as Additional Financing would increase the development impact of the PRESEM by consolidating and leveraging its model and expand it to finance EE in school and hospitals public facilities. The PRESEM model initially established to pilot the financing of energy efficiency improvements in specific municipal sectors (i.e., street lighting, water and waste water pumping, and municipal buildings) across the country, would now be expanded to other public buildings sectors, namely schools and hospitals, focusing on larger facilities typically located in urban centers.

25. Both public schools and hospitals can benefit from the operational and financing mechanism for EE investments established under PRESEM. The mechanism consists essentially of an energy efficiency fund operated by the Electricity Energy Savings Trust Fund, FIDE, (acting as a national Energy Service Company (ESCO) for the PRESEM Project) with tri-partite Energy Savings Agreements (ESAs) signed by SENER, FIDE and the beneficiary of the EE investment. Through the ESA, the beneficiary accepts the EE investment without paying its up-front cost, and agrees to pay, over time, for its associated energy services[25] through its electricity bill provided by CFE (see Annex 3). The main technical requirements to expanding the PRESEM mechanism to other public sectors, such as schools and hospitals are: (i) energy consumption and evidence of economic energy efficiency potential; and (ii) regular payment of energy bills and/or acceptable plan to repay any debt to CFE (financial discipline). The ESA would be signed with the relevant entity paying the energy bills and would involve the private sector in its implementation.

26. The parties agreed to process the request as an AF loan as: (i) public schools and hospitals have features similar to municipal buildings, which are covered by the PRESEM; (ii) the PRESEM already has developed agreement templates and institutional arrangement to work with different municipalities and water utilities, which can be adapted to public health and education institutions; (iii) Energy Service Agreements (ESAs), which constitute a key element of the PRESEM, do not need to be confined to municipalities and can be used as a mechanism to finance EE in the public sector more broadly; and (iv) incorporating schools and hospitals under the PRESEM as an AF (instead of a separate IPF) can create economies of scale, given the already elaborated institutional and financing agreements along with safeguards procedures, and lower overall transaction costs.

27. Moreover, the GoM and the Bank agreed to seize the opportunity to also incorporate loan resources from AFD, enlarging the operation's impact. The AF would support activities that scale-up the project by providing a US$[50] million loan, to be complemented by a joint co-financing for a US$[50] million AFD loan to finance EE investments in public schools and hospitals. AFD confirmed[26] the full support of its relevant business lines and funding availability within its budget

[24] The existence of centralized electricity payments will significantly reduce the burden and time needed for putting in place the institutional arrangements needed for the project's Energy Service Agreements. This is one of the lessons learned from the PRESEM experience with EE investments in municipalities where ESAs have to be established with each individual participating municipality or water utility: the approval processes and timeline for establishing the ESA differ and can be long. See Annex 3 for further details.
[25] The EE investment is paid upfront with loan resources, and the beneficiary pays monthly energy services for a fixed period of time (established through the ESA) equivalent to a portion of the investment cost; the other portion is covered by direct financial support of the federal government.
[26] In a letter to the World Bank Country Director for Colombia and Mexico, dated November 1, 2017.

envelope for Mexico. AFD has also confirmed that it accepts all the Bank's fiduciary and safeguard procedures and documentation.

28. The PRESEM PAD mentions the possibility of using GEF-STAR resources for the capitalization of a contingency facility for the repayment by the municipalities and municipal water utilities to help reduce their non-payment risk.[27] However, due to the different processing times of the GEF-STAR project cycle and the original PRESEM, it was not possible to prepare a blended operation. On March 1st, 2016, the Bank received a letter from Mexico's Secretary of Finance and Public Credit (SHCP) endorsing a GEF operation to support the creation of a contingency facility under PRESEM, which was confirmed on March 3, 2017. The Decision Meeting for the GEF-financed contingency facility took place on July 25, 2016. The GEF Council approved the operation in May 2017,[28] just two months after the GoM requested support for EE in health and education through an AF loan that would expand the scope of the PRESEM project.

29. Processing of the GEF Grant together with the US$[50] million AF loan resources as a single Additional Financing operation[29] helps minimize transaction costs, while allowing faster preparation and simplified processing procedures. All activities under the AF would be combined under one project during implementation, thereby helping lessen the transaction costs associated with preparation and implementation.

II. DESCRIPTION OF ADDITIONAL FINANCING

30. The proposed AF would support activities that scale-up the operational and financial mechanism of the parent project by providing: (i) a US$[50] million loan (to be complemented by a joint co-financing US$[50] million AFD loan) to finance EE investments in public schools and hospitals in the case of the AF loan; and (ii) a GEF-grant to capitalize a US$5.79 municipal energy efficiency contingency facility to partially cover the non-payment risks associated with Mexican municipalities and municipal water utilities.

31. The AF loan would increase the Project's scope by financing EE investments in the health and educations sectors – two key public sectors, where public expenditures represent 8.6 percent of GDP. New entities brought under the scope of the AF loan would include SEP and ASEDF in the public education sector; and the SSA and IMSS in the public health sector. It is estimated that the AF could support investments in about 900 schools and 35 hospitals with the use of ESAs under an aggregated approach. Further details can be found in Annex 2.

32. The proposed AF loan and grant are aligned with the Bank's Country Partnership Strategy (CPF) for FY14-19.[30] The AF would support Pillar I, 'Unleashing Productivity', by promoting enhanced public sector services and facilitating access to finance, and Pillar IV, 'Promoting Green and Inclusive Growth', by supporting the efficient use of energy and natural resources in two key public sectors.[31] The AF also supports the Bank's twin goals by helping modernize public schools and hospitals while enabling governments to redirect the budgetary savings associated with saved energy to other priorities, including social and economic development programs.

[27] See PRESEM Project Appraisal Document, page 7, paragraph 24.
[28] The PCN for this GEF-funded activity was held on July 2016, but a Decision Meeting could only be held after the approval of the resources in the GEF Council Meeting (May 22-25, 2017).
[29] As per OPCS guidance provided on October 31, 2017.
[30] Endorsed by the World Bank's Board of Executive Directors on December 12, 2013.
[31] See Annex 6 for more information on the Bank's energy and climate change engagement with Mexico.

33. All subprojects (including bundles of projects) in schools and hospitals would need to comply with the same eligibility criteria set forth for the parent project (i.e., same as for subprojects in municipalities and municipal water utilities), as outlined in Annex 3. In addition, schools and hospitals would be selected based on the following criteria:

a. Schools:
   i. Type: "*básica*" (primary and secondary education), "*media superior*" (high schools), and "*superior*" (technical colleges);
   ii. Current status: Facilities with inefficient lighting technologies, where no modernization or retrofitting significantly affecting lighting, cooling and/or heating has taken place in the last 10 years, and whose structural soundness has been confirmed;
   iii. Function/use: Education facilities used extensively, with priority to those with 2 daily shifts of students;
   iv. Other: PRESEM's criteria would be met at the aggregate level in the case of bundles of projects of education facilities.
b. Hospitals:
   i. Type: Second and Third level facilities;
   ii. Current status: Hospitals with inefficient lighting, heating/cooling, water heating technologies and where no modernization or retrofitting significantly affecting lighting, cooling and/or heating has taken place in the last 10 years, and whose structural soundness has been confirmed;
   iii. Function/Use: Public health facilities with a high consumption of energy for A/C equipment and other uses;
   iv. Other: PRESEM's criteria would be met at the aggregate level in the case of bundles of projects of health facilities

34. The US$5.79 million GEF grant would capitalize a contingency facility which could be triggered in the event a municipality or municipal water utility does not repay, for a period of 6 continuous months, its agreed energy service payment obligation set forth in the ESA schedule. The facility would only be used for the EE investments financed under PRESEM's Component 2 (Municipal EE Investments) as these are the entities that face non-payment risk – a major barrier for the financing of EE investments. The contingency facility would help ensure expected energy service payments are returned to FOTEASE, which in turn would reduce the risk of compromising the PRESEM's overall investments in municipal EE. This will help achieve energy savings and GHG objectives as well as help inform a better assessment of the risks associated with municipal EE investments, which could help attract future investments from different sources.

35. The GEF-supported contingency facility would allow SENER/FOTEASE to partially recover its investments. This would help ensure a continuous flow of funds to replenish the revolving fund (at FOTEASE) for energy efficiency investments, as envisioned by the PRESEM. The contingency facility would help establish confidence in the PRESEM mechanism and enable its continuous operation by: (i) smoothing out potential interruptions of repayment cash flow caused by complete or partial non-payments; (ii) helping inform a better assessment of the actual non-payment risks associated with agreements with municipal authorities; and (iii) demonstrating a functional risk mitigation mechanism, which could, in the future, help attract commercial financing for energy efficiency investments in public facilities through ESAs. It would be triggered after the protocol established to recuperate payments has been followed and has not resolved the situation.

36. The proposed AF and restructuring operation will directly benefit PRESEM project beneficiaries including the entities that would be participating in the project and those using the facilities. These would include national institutions (SENER, FIDE, CFE and CONUEE), municipal entities (municipalities and water utilities, including their citizens), organizations in the education and health sectors (SEP, ASEDF, SSA and IMSS), along with the staff, students and patients from the schools and hospitals where subprojects would be implemented.

37. The benefits associated with the EE investments would include efficient and lower energy use, reduced energy costs, creation of public budget space (to potentially fund other priorities), and improved quality of targeted energy services as well as comfort and safety, along with climate, co-benefits (i.e., an estimated 763 thousand tons of CO2 equivalent).

Climate Co-Benefits

38. The project's climate co-benefits amount to 100 percent of total financing, as confirmed by the Bank's Climate Co-benefits Assessment Team. All activities to be supported by the AF loan would offer mitigation co-benefits under the MDB List of Eligible Mitigation Activities (specifically under sections "*9.1: Support to national, regional or local policy, through technical assistance or policy lending*" and "*3.2: Energy efficiency improvements in existing commercial, public and residential buildings*").

Gender Aspects

39. In terms of gender action, the AF will support security with EE investments in the health and education sector, in particular through better lighting in schools, which can be particularly beneficial for girls and women.[32] The benefits associated with the EE investments would include efficient and lower energy use, reduced energy costs, creation of public budget space (to potentially fund other priorities), and improved quality of targeted energy services as well as comfort and safety co-benefits. In addition, under the new sub-component 1 (d), the project would support education and awareness raising activities that would link EE projects with school curricula and initiatives, such as "Mujeres en STEM,"[33] which seek to mentor young women in high schools and increase their interest in the science and engineering fields. Finally, the project would also support communication and engagement actions, including those tailored specifically for women. In addition, gender-sensitive citizen engagement would be an important aspect of the project, which will also promote social cohesion by ensuring equal opportunities to women and men to participate in capacity building activities, awareness raising, education and knowledge events regarding the efficient use of energy. SENER would ensure monitoring of the activities with a quantitative citizen engagement indicator and gender-disaggregated indicators.

A. Change in PDO

40. A clarification is proposed to the PDO (by adding "public facilities" and replacing "municipal sectors" with "public sectors") so that it reads as: "to promote the efficient use of energy in the Borrower's municipalities *and other public facilities* by carrying out EE investments in selected *public* sectors and *to* contribute to strengthening the enabling environment."

B. Restructuring of the PRESEM

41. The processing of this project paper would restructure the parent project[34] as follows:

[32] SEP authorities noted (July 2017) that this aspect of security and lowering incidence of violence in schools (which studies show is highest in dark spaces) was an important benefit they saw in this proposed AF project. In that same meeting, SEP officials noted that in many cases, it is girls who are the victims of violence in schools. For further details on the links between violence and high temperatures, please see: Hsiang, Solomon M., Marshall Burke, and Edward, Miguel. 2013. "Quantifying the Influence of Climate on Human Conflict." Science, 10.1126.
[33] Women in STEM (Science, Technology, Engineering and Math).
[34] The PRESEM Project currently consists of 2 components: Component 1 – "Policy development and institutional strengthening" (aimed at municipal entities); and Component 2 – "Municipal EE investments."

a. Addition of a sub-component (d) for policy development for EE in public education and health sectors under the existing Component 1 "Policy development and institutional strengthening" (total of US$8 million, of which US$3.5 million IBRD, US$3.5 million AFD, and US$1 million SENER). Sub-component 1(d) aims to enhance awareness and capacity, including through education and training activities aimed at staff and students, and contribute to the identification of measures needed to facilitate the realization of EE in the two sectors. Activities covered under this new sub-component would include capacity building, education, knowledge creation and dissemination, policy support and MRV development. It would also support activities targeting the energy and science education of girls;

b. Creation of "Component 3 – Investments in Schools and Hospitals" (total of US$133 million, of which US$46.38 million IBRD, US$46.5 million AFD, US$4.42 million SENER, and US$35.79 million beneficiaries through energy service payment via the electricity bill).[35] This new component would support cost-effective EE investments in public education and health sectors facilities, and include EE audits, structural assessments, feasibility studies, bidding documentation, and procurement of goods and works. Subprojects' eligibility and selection criteria, implementation arrangements and overall activities to be financed would follow those under the parent project, including those being restructured under this same paper (see Annexes 2 and 3);

c. Creation of "Component 4 – Municipal Energy Efficiency Contingency Facility," (total of US$6.08 million, of which US$5.79 GEF and US$0.29 SENER).[36] The contingency facility would be capitalized with GEF resources and its management costs would be covered by SENER. The contingency facility applies to Component 2 of the PRESEM and would partially cover the risk of default (partial and non-payment) from municipalities and water utilities having signed ESAs for energy efficiency investments in municipal SL, OOAs and MBs. The facility would be managed by FIDE's Financial Operations Subdirectorate, with support from SENER and CFE. Specific arrangements are described below and in Annex 3;

d. Modification of subprojects' eligibility criteria and the amount of direct financial support from parent project, based on the experience and lessons learned from its implementation. The minimum investment cost threshold for each subproject would now be set at US$200,000 (compared to the previous limit of US$1 million) as municipal buildings pilot projects have shown that potential energy savings[37] are lesser than expected due to lower than originally expected energy consumption. In addition, the maximum direct financial support would be of up to 70 percent, consistent for all types of subprojects. In its initial phase, the direct support towards the EE investments will help build confidence and secure buy-in from municipal and national authorities who typically lack experience with managing energy consumption and with energy efficiency investments, and who are unfamiliar with the PRESEM mechanism. It will also enable the inclusion of sustainability elements and more expensive clean technologies within the scope of the EE investments. The change in the maximum direct support would reduce the political risks associated

[35] The public health and education institutions would contribute through the energy service payments established in the ESAs.
[36] Excluding the Bank's US$0.55 million agency fee.
[37] Especially when no cooling or heating are involved, and hours of operation are low. Given that there was no experience on Municipal Buildings EE to build from during preparation, estimates included in the PRESEM PAD were taken from the experience from Mexican commercial retailer (Elektra) that had strong cooling consumption and long hours of operation.

with obtaining approval by not extending the ESA beyond one municipal administration. The level of direct support would be reassessed at Mid-Term Review, with the aim of lowering over time to increase sustainability and replicability.[38] In the case of public schools and hospitals, which are dependent on the federal government, the acceptable payback period associated with the energy service payments is expected to be less than 5 years (allowing education and health management entities to integrate lower energy bills in their planning, as per timeline of multiannual services processes); and

e. Update the results framework based on the proposed changes and the increased scope of the operation, to include "projected lifetime GHG emission reductions" as a PDO indicator, and new intermediate level indicator for EE interventions in public buildings (for public schools and hospitals).

42. The results framework would be updated based on the proposed changes and the increased scope of the operation. PDO indicators would include: projected lifetime energy savings and GHG emission reductions, number of ESAs signed, and framework to scale up EE in municipal sectors in the country. All energy savings and direct emission reductions would be estimated over a 20-year lifetime for schools,[39] hospitals, as well as MBs; while a 10-year lifetime would still be used for OOAs and 8 years for SLs.[40] Indirect GHG benefits (tCO2e), would be reported to GEF. An updated results framework is included as Annex 1.

43. The PDO level indicators now would be:

a. Projected lifetime energy savings (MWh) - (Core) – unchanged;
b. Number of Energy Services Agreements (ESAs) signed – unchanged;
c. Projected lifetime GHG emission reductions – (tCO2) (Tons/year) – new;
d. Framework to scale up municipal EE in the country – unchanged.

44. The new or updated intermediate level indicators include:

a. Public building sector interventions (number) – new;
b. Design of energy management systems (EnMS) for municipal street lighting, water and wastewater, municipal buildings, *schools, and hospitals* (number) – changed.[41]

45. For the proposed AF, an amended loan agreement, a new loan agreement, as well as a new grant agreement will need to be signed withthe United Mexican States, duly represented by SHCP. The amended loan agreement, new loan agreement and new grant agreement will have the same closing date as the parent project (October 21, 2021).

46. No closing date extension is deemed necessary to accommodate the proposed AF. As the AF operation does not entail a change in risk and relies on the use of already implemented and tested mechanisms (including ESAs), all

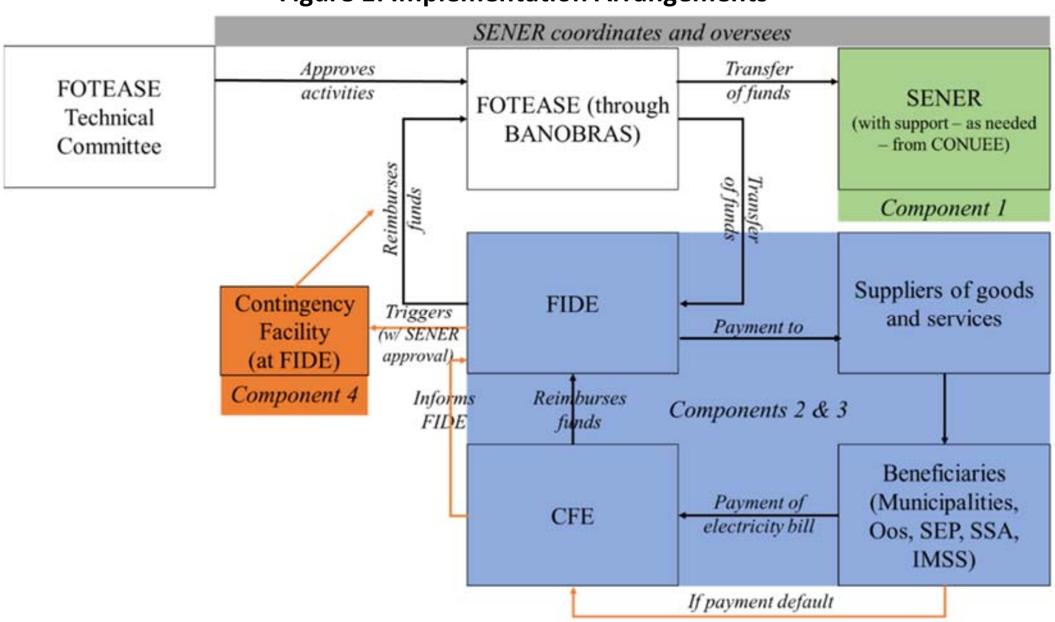
[38] As mentioned in the PRESEM PAD (p. 31), "the amount of direct support would vary by subproject and the criteria would be re-assessed by the SENER and the Bank during the project's Mid-term Review, based on implementation results."
[39] Because many times the ESAs need State Congress approval where there is an opposing political party, municipalities are preferring to avoid the political risk and have the subproject be completed under one municipal period.
[40] As PV systems have a lifetime of at least 20 years, while pumps and air conditioning equipment have a lifetime of 10 years and lighting has a lifetime of approximately 8 years.
[41] Consistent with the broader scope of the AF, this indicator would also have a broader scope (and thus cover health and education sectors as well).

subprojects and activities could be accommodated within PRESEM's existing timeframe. The fact that the health and education counterparts are strongly committed to the project, do not have any outstanding debts to CFE, and that SENER (as well as FIDE and CFE) has gained experienced and lessons learned from PRESEM's implementation would contribute to avoid delays in the pace of implementation. In addition, SEP and IMSS's centralized electricity bill paying systems would also facilitate deployment smooth processing. Finally, the technical assistance support expected to be provided by ESMAP and AFD funds to prepare a pipeline of subprojects before project launch would also contribute to a steady execution.

C. Change in Institutional Arrangements

47. The project would be implemented with the same institutional arrangements and within the same timeframe as the PRESEM. Overall coordination and implementation of new Components 3 and 4 would be under the responsibility of SENER and operated by FIDE. Within SENER, the General Directorate of Energy Efficiency and Sustainability (*Dirección General de Eficiencia y Sustentabilidad Energética, DGESE*) would be responsible for project implementation, and would be supported by the Responsible Project Implementing Unit for the PRESEM (*Unidad Responsable Ejecutora del Proyecto PRESEM, UREP-PRESEM*).[42] SENER would rely on UREP's in-depth experience with Bank-financed projects, and its core team of qualified staff to handle all procurement and financial management (FM) issues. UREP has sufficient technical, financial, procurement and safeguards capacity to also service the AF. SENER would also lead the implementation of new activities under Component 1 (in collaboration with CONUEE) and would prepare, launch and supervise the selection processes to develop the corresponding tasks. SENER would ensure that appropriate project implementation arrangements are in place and that all activities being developed, including those by FIDE, are done in accordance with project design and Bank procedures. Overall implementation arrangements are shown in Figure 1.

Figure 1: Implementation Arrangements



[42] UREP-PRESEM is a spinoff of the UREP created to support Bank-based projects, and currently specialized in managing the PRESEM. UREP has administered other projects, including the MX Efficient Lighting and Appliances project (Loan – LN – 7996, and its two related grants trust fund – TF – 98062 and TF98465), MX Integrated Energy Services (LN7501 and its related GEF Grant TF91733) and one stand along GEF grant (TF56781, Large-scale Renewable Energy Development Project).

48. "Component 3 – Energy Efficiency Investments in Schools and Hospitals" and "Component 4 – Municipal Energy Efficiency Contingency Facility" would be operated by FIDE, in collaboration with CFE and oversight from SENER. The AF would channel the IBRD loan, GEF grant, AFD joint co-financing and counterpart funds through the FOTEASE.[43] FIDE's capacity has been proven through the implementation of the PRESEM, the Bank-financed Efficient Lighting and Appliances Project (P106424 and P120654) and its own projects.[44] The Bank has provided capacity building in World Bank procurement and FM's guidelines to FIDE/SENER and would organize workshops during implementation, focusing on preparation of bidding documents, evaluation of economic and financial proposals and financial management. The SENER-FIDE Operator Collaboration Agreement, as well as the CFE Implementation Agreement would be amended to enable implementation of Components 3 and 4. FIDE's and CFE's incremental costs (as a percentage of investment costs) to support the implementation of Component 3 would remain unchanged from those already established in the parent project, totaling 10.93 percent of investment costs.[45] FIDE's incremental costs for technical work would be partially covered by the IBRD and AFD loans (see Annex 3 for further details). FIDE's incremental costs for managing the Contingency Facility would be fully covered by SENER.

49. Regarding Component 4, the contingency facility would be operated by FIDE's financial division, Financial Operations Subdirectorate (*Subgerencia de Operación Financiera*, SGOF), which is separate and independent from the operational division responsible for EE investments. To ensure a clear separation between its two roles, FIDE would manage the contingency facility's resources under a new account to be opened in a commercial bank (BANORTE) until the end of the Project.[46] The GEF resources would be channeled in a single tranche to FIDE through the FOTEASE. All the facilities' procedures would be included in the grant agreement to be signed between the United Mexican States, through SHCP, and the Bank. All procedures are developed in a new OM that will be annexed to PRESEM's amended OM.

50. The "default event" that would trigger the activation of the contingency facility would be when municipalities or water utilities fail to make their agreed energy service payment under the ESA for 6 continuous months (either total or partial amount of 6 monthly or 3 bimonthly electricity billing cycles, depending upon the type of contract signed with CFE), and such default is confirmed and approved by SENER.[47] FIDE has had experience with three other contingency facilities that covered between 15 and 10 percent of the total investments – percentages that were based on risk assessments, although only between 10 and 5 percent of the investments actually used the facility. Based on these risk assessments and experiences, a 10 percent coverage from the GEF contingency facility for each subproject was deemed appropriate. The Contingency Facility would work as follows:

a) Every week, FIDE would continue requesting to CFE to transfer the energy service payments from municipalities and OOAs paid through the electricity bill to the FIDE.

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[43] The FOTEASE has been used since 2009 in Bank-financed operations., most recently the PRESEM. Further details as well as a chart depicting flow of funds can be found in Annex 3.
[44] FIDE has more than 10 years of experience implementing EE projects with industries, buildings, households and municipalities.
[45] Total incremental costs would amount to 10.93 percent of investments total costs: FIDE's would represent 9.7 percent of the investment, and CFE's would be 1.20 percent. These costs would represent 2.25 percent of the beneficiary's estimated energy service payment obligation.
[46] FIDE's selected institution, BANORTE, needs toto follow the World Bank's external audit, fraud and anti-corruption guidelines. The applicable policies would be included in the bank account agreement.
[47] SENER would also check compliance with and confirm that the agreed procedures were followed by FIDE and CFE in order to trigger the contingency facility.

b) CFE would transfer the resources and report to FIDE if a beneficiary did or did not pay in the electricity bill the full amount of the committed energy service payments under its ESA (signed among the beneficiary, SENER and FIDE).
c) In the case of a total or partial default, FIDE would start "administrative procedures" as soon as it is informed of the ESA terms' breach. FIDE would contact the beneficiary and insist by different means that it pay its contractual obligation. In cases where the municipality or water utility does not pay for its electricity consumption as well, CFE would also follow-up with that beneficiary.
d) If, after six months, the beneficiary still has not paid back its energy service payments, FIDE would inform SENER of such default and request approval to trigger the contingency facility.
e) Once SENER confirms that procedures to obtain the missing energy service payment have been followed and confirms the default, FIDE would trigger the contingency facility and start "prejudicial proceedings." The contingency facility would cover all due contributions for a 6-month period, up to a limit of 5 percent of the total resources available in the facility. If after 6 months the beneficiaries continue to default on their agreed energy service payments, the contingency facility would continue covering these as long as the due contributions did not reach the 5 percent limit.
f) FIDE would send the resources paid by the contingency facility back to FOTEASE, following the normal mechanism. If a beneficiary ends up making its energy service payments after the triggering of the facility, those resources would be kept in the facility.
g) If after twelve months the beneficiary still has not made its due energy service payments, FIDE would start "judicial proceedings" to try and recover them.
h) Any funds remaining in the contingency facility by project closing would be transferred to FOTEASE to settle any balances and/or to finance additional energy efficiency projects. The remaining funds will cover first the oldest due energy service payments.

D. Change to Components, Costs and Disbursement Estimates

51. The addition of sub-component 1(d), the creation of the new components 3 and 4, the financing to be provided by AFD, and the changes in eligibility and support criteria would increase the size of the overall operation, as shown below.

Table 1. Change to Components and Costs

Current Component Name	Proposed Component Name	Current Cost (US$M)	Proposed Cost (US$M)	Action
1. Policy development and institutional strengthening	1. Policy development and institutional strengthening	7.00	15.00	Revised to include subcomponent 1.d (USD$ 8 M)
2. Municipal energy efficiency investments	2. Municipal energy efficiency investments	148.75	134. 93	Revised
-	3. Investments in Schools and Hospitals	-	133.09	New
	4. Municipal Energy Efficiency Contingency Facility		6.08	New
Fees		0.25	0.83	Revised
Total		**155.75**	**290.03**	

52. The disbursement estimates include actual disbursements made so far and those expected for both the existing and AF loan, as well as the GEF grant.

Table 2. Disbursements Estimates (including all sources of Financing)

Fiscal Year	YR0	YR1	YR2	YR3	YR4	YR5	YR6
Annual	1.00	2.00	13.00	31.00	54.00	42.00	17.00
Cumulative	1.00	2.00	14.00	45.00	99.00	140.00	157.00

III. KEY RISKS

53. No significant additional risks are expected to affect the proposed AF. The extension of the PRESEM to two new public sectors, which have lower non-payment risks than municipalities and municipal water utilities, would rely on existing institutional and financial mechanisms and would be carried-out by entities with a track record of implementation of Bank-financed projects. During the PRESEM project preparation and implementation, the Bank has assessed and found adequate the procurement, financial management, safeguards-related capacities of SENER and FIDE. Including new sectors would not modify previous project assessments as implementation arrangements would rely on the mechanisms created and tested by PRESEM and activities would still be led and implemented by SENER and FIDE. In addition, the proposed contingency facility would result in important, tangible economic, financial benefits by reducing the non-payment risks associated with municipalities and municipal water utilities, enhancing the likelihood of securing the full financing to implement the PRESEM as planned. In addition, restructuring PRESEM's direct support levels would limit the payback period associated with energy service payments under the ESAs to one municipal administration and thus help reduce the project's political risks associated to changes in municipal administration.

54. Furthermore, SENER, FIDE and CFE's increased familiarity and experience with ESAs and the operational aspects of the PRESEM would help minimize any risks associated to including new partners from the health and education sectors. In addition, as SEP and IMSS centrally manage the electricity payments from all their facilities, this would further decrease the risks associated with dealing with multiple counterparts for project implementation. Both entities are reliable CFE clients: IMSS does not have any debt with CFE (and even tries to pay consumption in advance), while SEP and ASEDF always settle any outstanding amount within six months.[48] SSA also has centralized payments for a sub-set of the health facilities it oversees.

55. The proposed joint co-financing with AFD could imply a risk of delay if its internal approvals for financing are not completed on time. This risk is being mitigated with close cooperation with AFD during preparation to conduct both WB and AFD due diligence processes. AFD's milestone confirming financing will take place at their December 2017 Credit Committee meeting. In addition, this project has been identified as critical to meet AFD's overall targets and plans in Mexico, as expressed by AFD's Mexico Country Director in his November 1, 2017 letter to the Bank.

56. The current risk ratings for PRESEM would thus be maintained.

[48] SEP and ASEDF have even signed an agreement with CFE on how to proceed if a payment is due.

Table 3. Risk Ratings

Risk Category	Rating
1. Political and Governance	Moderate
2. Macroeconomic	Low
3. Sector Strategies and Policies	Low
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary	Substantial
7. Environment and Social	Low
8. Stakeholders	Low
9. Other, Crime and violence	Moderate
OVERALL	Substantial

IV. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

57. The new activities proposed will have a clear development impact and generate economic and financial benefits at both the local and national levels. IBRD's support provides strong value added to Mexico's overall EE agenda, by mobilizing additional resources. These include the original US$100 IPF, the AF loan, the GEF grant, co-financing from AFD, and counterpart funding in part unleashed due to the Bank's facilitation of innovative financing mechanisms for EE.

58. The economic and financial analyses only consider Components 2 and 3.[49] Together, the two components included account for 92 percent of IBRD financing.

59. The economic analysis uses cost estimates for investment and operation and maintenance (O&M)[50] based on similar projects. Costs are adjusted to reflect economic values, excluding taxes and subsidies. Benefits are estimated based on savings to users. The main (quantified) economic benefits from EE investments is the economic value of the saved energy, including the associated reductions in GHG emissions, as well as savings in O&M expenditures in the case of public lighting. The main economic costs are the capital investments and works. Based on the analysis performed, all subprojects are economically viable.

60. The main financial benefit of the EE investments, as assessed for the original PRESEM investments, is the reduction in the beneficiaries' energy bill. The financial costs of EE investments are the capital investments. Direct support is provided to ensure that the length of subprojects' payback periods for the energy service payment are limited to one

[49] The assessment of economic benefits associated with Components 2 and 3 are likely to be underestimated, given the analytical constraints associated with benefits that cannot be measured in monetary terms (e.g., improved comfort, learning environment and safety, to mention a few) and/or where information is not readily available.
[50] O&M savings apply to the SL sector only, as savings in O&M are difficult to quantify for buildings (municipal, schools or hospitals) and water and wastewater sector.

mayoral terms (for SLs, OOAs and MBs) or to five years (for schools and hospitals). The analysis shows that all subprojects are viable according to this definition (with inclusion of proposed direct support)

61. Additional analyses were conducted to reflect the AF's Component 3 focused on schools and hospitals, which are summarized in Table 2. As the current project paper is also restructuring the parent project, expected results of SL, MB and OOA subprojects have also been updated based on lessons learned from implementation and are shown in Table 2. The changes to the original PRESEM subprojects do not affect overall outcomes and conclusions of the original analyses. Further details can be found in Annex 5.

62. Expected direct emission reductions for each subproject type – over their respective lifetimes[51] – measured in tons of carbon dioxide equivalent (tCO2e) are included in Table 2, together with the overall results of the economic and financial assessment. The full financial and economic analysis is in Annex 5.

Table 4. Economic and Financial Appraisal Summary

Subproject type	# of sub projects	Without direct support		With direct support				Direct GHG ERs (tCO2e)
		EIRR (%)	Total cost (USD$ M)	Direct support (%)	Financial NPV (USD$ M)	FIRR (%)	Payback (yrs.)	
Street lighting	16	8%	70,000,000	70%	51,900,00	48%	2.10	222,000
Water utilities	8	27%	28,800,000	70%	29,232,000	54%	1.86	256,700
Municipal buildings	8	8%	2,847,100	70%	615,400	34%	3.07	20,000
Schools	4 (900 fac.)	10%	51,975,200	70%	37,983,600	28%	3.71	240,900
Hospitals	6 (35 fac.)	10%	51,321,100	70%	49,682,800	39%	2.63	394,800
TOTAL	**42**	**12%**	**204,943,400**	**70%**	**$117,513,800**	**40%**	**2.40**	**1,134,400**

Note: NPV = Net Present Value; EIRR= Economic Internal Rate of Return; FIRR = Financial Internal Rate of Return

B. Technical

63. The AF would support activities that extend and scale-up the Project through the financing of EE investments in schools and hospitals, and by creating a municipal energy efficiency contingency facility that would help to partially cover the non-payment risks associated with municipal entities. The loan resources would increase the Project's scope by financing EE investments in two important public sectors with a high energy consumption and a good potential to generate energy savings, furthering the Project's objective to promote the efficient use of energy. Such investments would also help public authorities maintain or enhance energy services at a lower cost, generating budgetary savings. The contingency facility would mitigate the risk associated with municipal default for FOTEASE, a major barrier for the adoption of energy efficiency investments in Mexico.

64. The project would rely on the utilization of known and proven technologies and methodologies that do not present challenging construction or operational situations. Subprojects would be implemented in accordance with internationally

[51] For this analysis, the economic life of each subproject type is as follows: 8 years for SLs, 10 years for OOs, and 20 years for MBs, schools and hospitals. Further details can be found in the GHG emission reductions assessment, which is part of the project files.

and accepted technical standards with support from Bank staff and other experts as needed. Technologies, technical parameters, key design features and estimated costs for each component have been proposed by FIDE, SENER, and will be discussed with SEP/INIFED for schools, and SSA/IMSS in the case of hospitals. Decisions to pursue EE investment in specific schools and hospitals will include confirmation of their structural soundness, (if no recent structural assessment is available, project funds would be used to conduct such assessment). Preparation of the technical specifications, evaluation of the bidding processes, contractual negotiations and supervision would be done by FIDE as operator of Component 3 with oversight from SENER and supported, as necessary, by the Bank. At the same time, GEF support to capitalize a contingency facility under Component 4 would reduce non-payment risk, and help ensure FOTEASE receives committed energy service payment amounts so it can support planned subprojects.

65. SENER has developed the capacities necessary to coordinate and supervise the project activities, as proven by the ongoing implementation of PRESEM and previous operations. FIDE has a track record of its capacity to procure and install technologies similar to those to be used in schools and hospitals, as well as those currently being considered under the PRESEM (with EE investments in municipal buildings having similarities with hospitals and particularly schools). FIDE has in-depth knowledge of specifications, procurement, installation, financial management and O&M. FIDE has also gained relevant experience with the utilization of contingency facility mechanism in other projects (including the Efficient Lighting and Appliances operation). No key technical challenges are foreseen; however, support from experts (from the Bank and elsewhere) would be sought as needed.

66. The use of existing operational and financing mechanisms (created under PRESEM) would facilitate preparation and implementation. The restructuring would facilitate the preparation of subprojects by changing eligibility criteria based on lessons learned from the preparation of the first pipeline of subprojects. Pilot subprojects[52] show that electricity consumption in municipal buildings can be considerably lower than those originally expected, especially when no cooling/heating is involved, and hours of operation are limited. The AF would be internalizing those insights to develop more realistic estimations of the average size of subprojects, as well as to implement an enhanced initial screening of proposed MB sub-projects. The restructuring would also include changing the amount of direct financial support all subprojects may receive so that the length of the payback period for the ESA payments would be brought down to one municipal administration period) for municipal subprojects,[53] and under 5 years for schools and hospitals. The maximum direct financial support would be of up to 70 percent, consistent for all types of investments, and would be subject to revision during the mid-term review, with the aim of decreasing the level of direct support.

C. Financial Management

67. Implementation arrangements are expected to be similar to those in the existing project. Procurement Regulations for IPF dated July 2016 will apply for the additional finance (Subcomponent 1d and Component 3). From a financial management perspective, the activities for the AF are incremental; that is, they are new activities that do not overlap with the original loan.

68. The Fiduciary Risk for the Project is Substantial. As described earlier, no significant additional risk factors are expected to arise by incorporating to the Project Components 3 (Investments in Schools and Hospitals) and 4 (Municipal Energy Efficiency Contingency Facility). Energy Efficiency Investments in Schools and Hospitals would be subject to the

[52] Especially those developed in municipal buildings in the Municipalities of Los Cabos and Puebla.
[53] This is deemed necessary as the ESAs may need State Congress approval, which increases the risk of the subproject becoming a political instrument for the different/opposing political parties.

same institutional and financial management mechanisms in place for Component 2 (Municipal Energy Efficiency Investments). Further details on financial management and procurement arrangements can be found in Annex 3.

D. Procurement

69. Component 3 and Subcomponent 1d under the Additional Finance would perform under the WB Procurement Regulations (effective since July 2016), while Component 2 under the parent Project would do under the WB Procurement Guidelines. The current Cofinancing Agreement between the World Bank and AFD would serve as the framework to enable all the contracts to be jointly co-financed with AFD loan resources on pari-pasu basis. AFD confirmed that it would follow all the World Bank's procurement and fiduciary procedures. Capacity training on the World Bank's Procurement Regulations would be provided to SENER, FIDE, AFD in January 2018.

E. Social and Environmental (including Safeguards)

70. The parent project and the proposed AF are classified as Safeguards Risks Category B. The AF has the same environmental ratings (B) and triggers the same safeguards as described in the PRESEM PAD (OP 4.01, OP 4.11 and OP 7.50). The existing environmental and social safeguards framework[54] has been assessed as fully adequate for this AFs and a draft has been updated to reflect the two new sectors. Overall safeguards rating of the main project is Satisfactory.[55]

71. The proposed AF does not trigger any of the social safeguards policies. OP 4.10 (Indigenous Peoples) is not triggered as all subprojects are carried out in urban municipalities. OP4.12 (Involuntary Resettlement) is not triggered as subprojects are carried out on already existing infrastructure.

72. The proposed project has an environmental risk Category B because it is unlikely to result in significant negative impacts. The project triggered the Environmental Assessment (OP/BP 4.01). The project is designed to generate positive environmental impacts through the mitigation of emissions and thus a contribution to the combat to climate change and benefits for the Mexican population. An Environmental Framework was prepared by the borrower for the initial project to meet the OP 4.01 standards and a draft has been updated to reflect the AF. The Physical Cultural Resources policy (OP/BP 4.11) has been triggered because the project could potentially involve the financing of investments in historical MBs. No other environmental safeguards policies (Protected Areas, Pest Management, Forests or Natural Habitats) are triggered.

F. Other Safeguard Policies (if applicable)

73. The policy regarding Projects on International Waterways—OP/BP 7.50—was triggered by the parent project and management approved an exception to the Riparian notification on September 28, 2015. The activities under the proposed AF would not include water efficient investments in rural agricultural schools. In consequence, as no subproject that requires the use or pollution of international waterways would be eligible for financing under the AF, no new RVP approved notification exception would be required.

[54] Available on-line at: *https://www.gob.mx/sener/documentos/marco-de-gestion-ambiental-y-social-mgas-del-proyecto-eficiencia-y-sustentabilidad-energetica-en-municipios*.
[55] Further details can be found in Annex 3.

V. WORLD BANK GRIEVANCE REDRESS

Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit *http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service*. For information on how to submit complaints to the World Bank Inspection Panel, please visit *www.inspectionpanel.org*

VI. SUMMARY TABLE OF CHANGES

	Changed	Not Changed
Change in Project's Development Objectives	✓	
Change in Results Framework	✓	
Change in Components and Cost	✓	
Change in Disbursements Arrangements	✓	
Change in Procurement	✓	
Change in Implementing Agency		✓
Change in Loan Closing Date(s)		✓
Cancellations Proposed		✓
Reallocation between Disbursement Categories		✓
Change in Safeguard Policies Triggered		✓
Change of EA category		✓
Change in Legal Covenants		✓
Change in Institutional Arrangements		✓
Change in Financial Management		✓
Change in APA Reliance		✓
Change in Implementation Schedule		✓
Other Change(s)		✓

VII. DETAILED CHANGE(S)

PROJECT DEVELOPMENT OBJECTIVE

Current PDO

The objective of the project is to promote the efficient use of energy in the Borrower's municipalities by carrying outenergy efficiency investments in selected municipal sectors and contribute to strengthening the enabling environment.

Proposed New PDO

The objective is to promote the efficient use of energy in the Borrower's municipalities and other public facilities by carrying out EE investments in selected public sectors and to contribute to strengthening the enabling environment.

RESULTS FRAMEWORK

Project Development Objective Indicators

Projected lifetime energy savings
Unit of Measure: Megawatt hour(MWh)
Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	2,493,000.00	Revised
Date	01-Feb-2016	17-Nov-2017	31-Oct-2021	

Number of ESAs signed (Number)
Unit of Measure: Number
Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	0.00	2.00	35.00	Revised
Date	01-Feb-2016	17-Nov-2017	31-Oct-2021	

Projected lifetime GHG emission reductions (tCO2)
Unit of Measure: Tones/year
Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	1,134,400.00	New
Date	01-Feb-2016	17-Nov-2017	31-Oct-2021	

Intermediate Indicators

Projected lifetime GHG emission reductions (tCO2eq) (Tons/year)
Unit of Measure: Number

Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	463,405.00	Marked for Deletion
Date	01-Feb-2016	04-May-2017	31-Oct-2021	

Sub-projects designed (number)
Unit of Measure: Number
Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	0.00	6.00	38.00	Revised
Date	01-Feb-2016	18-Nov-2017	31-Oct-2021	

Public buildings interventions
Unit of Measure: Number
Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	8.00	New
Date	18-Nov-2017	18-Nov-2017	31-Oct-2021	

Design of energy management systems (EnMS) for street lighting, water and wastewater, municipal buildings, and public buildings (number)
Unit of Measure: Number
Indicator Type: Custom

	Baseline	Actual (Current)	End Target	Action
Value	0.00	0.00	5.00	Revised
Date	01-Feb-2016	04-May-2017	31-Oct-2021	

COMPONENTS

Current Component Name	Current Cost (US$, millions)	Action	Proposed Component Name	Proposed Cost (US$, millions)
Policy development and institutional strengthening	7.00	Revised	Policy development and institutional strengthening	8.00
Municipal energy efficiency investments	148.75	No Change	Municipal energy efficiency investments	148.75

	0.00	New	Energy Efficiency Investments in Schools and Hospitals	133.00
	0.00	New	Municipal Energy Efficiency Contingency Facility	6.08
TOTAL	**155.75**			**295.83**

DISBURSEMENT ARRANGEMENTS

Change in Disbursement Arrangements

Yes

Expected Disbursements (in US$, millions)

Fiscal Year	2017	2018	2019	2020	2021	2022
Annual	0.50	15.00	30.00	40.00	45.00	19.50
Cumulative	0.50	15.50	45.50	85.50	130.50	150.00

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Latest ISR Rating	Current Rating
Political and Governance	Moderate	Moderate
Macroeconomic	Low	Moderate
Sector Strategies and Policies	Low	Low
Technical Design of Project or Program	Substantial	Substantial
Institutional Capacity for Implementation and Sustainability	Moderate	Moderate
Fiduciary	Substantial	Substantial
Environment and Social	Low	Low
Stakeholders	Low	Low
Other	Moderate	Low
Overall	Substantial	Substantial

LEGAL COVENANTS – PRESEM Additional Finance for Energy Efficiency in Public Buildings (P165585)

Sections and Description
CFE Implementation Agreement Description: The Operator’s obligation to enter into an agreement with the CFE (the CFE Implementation Agreement) under terms and conditions acceptable to the Bank, setting forth their respective roles and responsibilities regarding the implementation of Part 3 of the Project.
Safeguards Aspects Description: The Borrower, through the SENER- shall, and shall cause the Operator through the Operator Collaboration Agreement to, carry out the Project in accordance with the ESMF.

VIII. ANNEX 1: RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY : Mexico
PRESEM Additional Finance for Energy Efficiency in Public Buildings (P165585)

Project Development Objectives

Project Development Objective Indicators

Action	Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
Revised	Name: Projected lifetime energy savings		Megawatt hour(MWh)	0.00	2,493,000.00	SENER, FIDE	SENER, FIDE, FOTEASE progress reports	Biannual
Description: This indicator projects lifetime energy savings directly attributable to the project, converted to MWh. The baseline value is expected to be zero.								
Revised	Name: Number of ESAs signed (Number)		Number	0.00	35.00	SENER, FIDE	SENER, FIDE, FOTEASE progress reports	Biannual
Description: This means the number of agreements to be signed with municipalities, water utilities, SEP, IMSS and SSA to implement subprojects.								
No Change	Name: Framework to scale up municipal		Text	No framework	Framework accepted by the SENER	SENER, FIDE	SENER, FIDE, FOTEASE progress reports	Biannual

	energy efficiency in the country							
Description: This is a framework, to be accepted by SENER, under which plans to scale-up energy efficiency in the country are made and sought.								
New	**Name:** Projected lifetime GHG emission reductions (tCO2)		Tones/year	0.00	1,134,400.00	Biannual	SENER, FIDE and FOTEASE progress reports	SENER and FIDE
Description: This indicator measures lifetime GHG emission reductions directly and indirectly attributable to the project, converted to tCo2. The baseline value is expected to be zero. It registers all projected lifetime emission reductions at the time when the subproject is implemented.								

Intermediate Results Indicators

Action	Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source / Methodology	Responsibility for Data Collection
No Change	**Name:** Default rate of municipalities (%, average rate of non-payment over total outstanding loan balance)		Percentage	0.00	10.00			
Description: This indicator measures the aggregate default rate of municipalities and water utilities in which an energy efficiency investment is being implemented. The default rate will be estimated by dividing actual repayment by beneficiaries against aggregate repayment obligations established through ESA's in any given year. The baseline value for this indicator will be zero.								
Revised	**Name:** Sub-projects designed (number)		Number	0.00	38.00			

Description: This indicator measures how many sub-projects were prepared, including those that were not financed by the Project. The baseline is expected to be zero.								
No Change	**Name:** Street light interventions (number)		Number	0.00	16.00			
Description: This indicator measures how many street lighting interventions are financed by the Project. The baseline is expected to be zero.								
No Change	**Name:** Water and wastewater interventions (number)		Number	0.00	8.00			
Description: This indicator measures how many water and wastewater interventions are financed by the Project. The baseline is expected to be zero.								
No Change	**Name:** Municipal building interventions (number)		Number	0.00	8.00			
Description: This indicator measures how many public buildings interventions are financed by the Project. The baseline is expected to be zero.								
New	**Name:** Public buildings interventions		Number	0.00	8.00			
Description: This indicator measures how many interventions in public schools and hospitals are financed by the project. The baseline is expected to be zero.								
No Change	**Name:** Capacity-building, and outreach activities implemented (number)		Number	0.00	25.00			

Description: This indicator measures how many capacity building, outreach and training activities are financed by the Project. The baseline should be zero.

Revised	Name: Design of energy management systems (EnMS) for street lighting, water and wastewater, municipal buildings, and public buildings (number)		Number	0.00	5.00			

Description: This indicator measures how many energy management systems are designed. The baseline should be zero.

No Change	Name: Participants in consultation activities during project implementation (number)		Number	0.00	1,000.00			
No Change	Participants in consultation activities during project implementation - female		Number	250.00	400.00			

Description: This indicator measures the level of community engagement in project implementation.

Target Values

Project Development Objective Indicators

Action	Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
Revised	Projected lifetime energy savings	0.00	0.00	131,270.00	437,800.00	780,000.00	855,000.00	289,000.00	2,493,000.00
Revised	Number of ESAs signed (Number)	0.00	0.00	4.00	8.00	14.00	6.00	3.00	35.00
No Change	Framework to scale up municipal energy efficiency in the country	No framework	-	-	Finalization of terms of reference for preparation of analysis	-	Presentation of framework and discussions	-	Framework accepted by the SENER
New	Projected lifetime GHG emission reductions (tCO2)	0.00	0.00	59,000.00	197,000.00	366,800.00	386,400.00	125,200.00	1,134,400.00

Intermediate Results Indicators

Action	Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
No Change	Default rate of municipalities (%, average rate of non-payment over total outstanding loan balance)	0.00	0.00	15.00	15.00	10.00	10.00	10.00	10.00

Revised	Sub-projects designed (number)	0.00	0.00	11.00	22.00	38.00	0.00	0.00	38.00
No Change	Street light interventions (number)	0.00	0.00	2.00	4.00	8.00	2.00	0.00	16.00
No Change	Water and wastewater interventions (number)	0.00	0.00	1.00	2.00	3.00	2.00	0.00	8.00
No Change	Municipal building interventions (number)	0.00	0.00	1.00	2.00	2.00	2.00	0.00	8.00
New	Public buildings interventions	0.00	0.00	1.00	1.00	2.00	3.00	1.00	8.00
No Change	Capacity-building, and outreach activities implemented (number)	0.00	5.00	10.00	15.00	20.00	25.00	0.00	25.00
Revised	Design of energy management systems (EnMS) for street lighting, water and wastewater, municipal buildings, and public buildings (number)	0.00	0.00	0.00	1.00	2.00	2.00	0.00	5.00
No Change	Participants in consultation activities during project implementation (number)	0.00	200.00	400.00	600.00	800.00	1,000.00	0.00	1,000.00
No Change	Participants in consultation activities during project implementation - female	250.00	25.00	30.00	30.00	35.00	35.00	0.00	400.00

IX. Annex 2: Detailed Description of Sub-component 1(d) and Component 3

1. SENER has requested the Bank's support to expand and enhance the development impact, and mitigate non-payment risks of the PRESEM through an additional financing loan and GEF grant. The AF loan would finance energy efficiency (EE) investments in additional public sectors, namely education and health. This AF would be complemented by a US$[50] million joint co-financing from the French Development Agency (*Agence Française de Développement*, AFD). The loan resources would leverage the experience gained with the development and implementation of its innovative operational and financing scheme for energy efficiency (EE) investments in the public sector by expanding its reach beyond municipal street lighting (SL), municipal buildings (MB) and municipal water utilities (OOA) to two important public sectors with a high energy consumption and high potential for energy efficiency: health and education. The project would lead to benefits for the Mexican authorities, by rationalizing expenditures without compromising the service quality, through lower operating costs of participating public schools and hospitals, in addition to the energy savings and associated reductions in greenhouse gas emissions, contributing to meeting energy sector and climate change goals. The AF GEF grant would create and fund a municipal energy efficiency contingency facility that would help to partially cover the non-payment risks associated with Mexican municipalities and municipal water utilities.

2. The loan and grant objectives are aligned with the parent project's development objective (PDO) which would be expanded to adequately capture the enhanced scope of the project. No change would be made to the overall design, though additional implementation arrangements would be included to incorporate health and education sectors and to create the contingency facility, following PRESEM's already developed processes and legal agreements.

3. Concurrently, this project paper also serves as a restructuring to:

a. Clarify the PDO to better reflect its enhanced scope by adding "public facilities" and replacing "municipal sectors" with "public" to now read as "to promote the efficient use of energy in the Borrower's municipalities *and other public facilities* by carrying out EE investments in selected *public* sectors and *to* contribute to strengthening the enabling environment;"

b. Add a sub-component (d) to the current Component 1 of Policy Development and Institutional Strengthening, to cover the capacity building, knowledge creation and dissemination, policy support and MRV-type activities supporting greater EE in schools and hospitals to be funded by the AF loan resources;

c. Create "Component 3 – Investments in public schools and hospitals" covering the EE investments financed by the AF loan resources;

d. Create "Component 4 – Municipal Energy Efficiency Contingency Facility" which will include the Global Environment Facility (GEF) funded contingency facility to partially cover the non-payment risks associated with municipalities and municipal water utilities;

e. Update subprojects' eligibility criteria for investments, and modify the direct financial support levels, based on lessons learned during preparation and implementation of the PRESEM.

f. Update the results framework based on the proposed changes and the increased scope of the operation.

4. No significant additional risks are expected to affect the proposed AF. The AF would expand the PRESEM to two new public sectors which have a lower risk than municipalities and municipal water utilities (currently covered by the PRESEM), would rely on institutional and financial mechanisms created and tested by the PRESEM and would be carried-out by entities with a track record of implementation of Bank-financed projects. During the PRESEM project preparation and implementation, the Bank has assessed and found adequate the procurement, financial management, safeguards-related capacities of SENER (the overall project coordinator with responsibility for the project's implementation) and FIDE (the operator for the project's energy efficiency investments). As a result, the addition of two new sectors would not modify previous assessments of the project. In addition, the proposed GEF-funded contingency facility would decrease the risks associated with non-payment from the municipalities and municipal water utilities. Finally, changing direct support levels would lower the political risks associated with municipal investments, as it would result in shortening energy service investments' payback periods to one municipal administration.

5. Details on the new activities considered under subcomponent 1.d and Component 3 are presented below (for further details on Component 4, please see Annex 3).

Subcomponent 1.d: Policy Development and Institutional Strengthening for Schools and Hospitals

6. This subcomponent (total US$8 million, of which US$1 million SENER, US$3.5 million IBRD and US$3.5 million AFD) would strengthen the enabling environment for EE in the health and education sectors and contribute to the identification of potential subprojects that could feed into a pipeline beyond the project's lifespan. It would support raising awareness and enhancing capacities in public schools and hospitals, as well as developing and adapting tools and systems to facilitate as well as encourage better integration of energy considerations into education, as well as planning and management efforts. The component would finance activities under the following areas: (i) EE awareness-raising in schools and hospitals; (ii) capacity building and training on energy management systems (EMS) in hospitals and large schools; (iii) integration of clean energy and EE in education programs (including those targeting specifically girls); (iv) sector-wide policy support, including assessment of options to scale-up activities piloted under this operation with a view to transition to a more commercial, sustainable program; and (v) project monitoring, evaluation, and management activities.[56] Activities in these categories would include, among others, the following:

(i) EE awareness-raising and education in schools and hospitals:
   i. *Communication, dissemination and outreach strategies and activities* to raise awareness of energy efficient behavior and the potential and value of implementing EE measures in schools. Activities to be financed could include: communication activities with and for the education sector; multimedia items adapted for students and schools' as well as hospital staff; education materials for education institutions; and dissemination of lessons learned, good practices, and relevant experiences.

(ii) Capacity building and training in hospitals and large schools:
   i. *EE diagnostics and baseline analyses,* to assess energy use and identify energy saving priority areas in large schools and hospitals. This activity can provide input for education programs, as well as help build a pipeline of priority subprojects to support national scale deployment of the operation; and
   ii. *Capacity-building activities,* including municipal EE capacity-building programs for energy managers, independent energy auditors, and entities' staff (including CONUEE, SEP, SSA, IMSS, among others) and other

[56] See the project's updated OM for more details.

key players, to enable the continuous management and deployment of the program (and beyond the project's lifetime).

(iii) Education programs integrating clean energy and EE:

i. Development/expansion of school curriculum integrating clean energy, including practical training and demonstration projects in high schools and technical colleges.
ii. Dedicated efforts to target and integrate girls/women through initiatives such as "Mujeres en STEM" (Women in Science, Technology, Engineering and Math) which seek to mentor young women in high schools and increase their interest in the science and engineering fields.

(iv) Sector-wide policy support:

i. *Study to assess* options to scale-up activities piloted under this operation with a view to transition to a more commercial, sustainable program for national-scale deployment;
ii. *Preparation of other relevant outputs* such as: manuals, analyses, and handbooks on EE measures in schools and hospitals; as well data collection to monitor subprojects and activities.

(v) Project monitoring, evaluation and management:

i. *Monitoring of energy performance and measurement, verification, and reporting frameworks* for covered sectors. This task can include the preparation of relevant markets' studies that can help build the case for the development or enhancement of standards and norms;
ii. *Impact assessment and evaluation studies*. Activities to be financed would include baseline generation for impact assessment and analysis of project progress, and midterm evaluation analysis and ex-post assessments, including impact evaluation;
iii. *Project management activities*, including subproject supervision and travels; equipment; safeguards-related processes and documents; and other operational activities defined in the project's Operational Manual (OM).

7. All activities under this component would be led and executed by the SENER with substantial technical support from CONUEE (SENER's technical EE arm), given its experience working with schools and hospitals on EE policy, capacity building, and energy certification and management systems.

Component 3 – Energy Efficiency Investments in Schools and Hospitals

8. This Component (total US$133.09 million, of which US$4.42 million SENER, US$35.79 million beneficiaries – through payment of portion of energy services –, US$ 46.38 million IBRD, and US$46.50 million AFD) would support cost-effective EE investments in schools and hospitals. It is expected that these activities would demonstrate the value of EE investments as a means of reducing energy consumption and CO_2, and lowering schools' and hospitals' energy expenditures while maintaining or enhancing quality of service. In the case of schools, the project would also bring lighting levels up to comply with the relevant Mexican labor and safety norms.[57] If such upgrade results in greater energy consumption compared to current energy use (although lower than if the upgrade did not take into account energy efficiency) in some schools, education authorities will be requested to authorize the increased energy consumption

[57] Enhancing lighting levels in schools will contribute to providing a better learning environment, as well as help contribute to a safer environment within the school. This has been raised by the SEP Oficial Mayor as an important benefit from the project. The project would ensure lighting is brought in line with the standard on lighting conditions in work environments (NOM-025-STPS-2008) set by the Ministry of Labor and Social Welfare, which aims to provide a safe and healthy environment in the accomplishment of the tasks of workers.

associated with greater lighting service levels and thus higher energy service payments over time. On an aggregated basis, however, the bundling of EE investments in schools will be such that energy savings overall (for the entire bundle) would comply with the project's energy savings requirements of at least 20 percent – and SEP would still benefit from overall reduction in its centralized electricity bill.

9. The PRESEM is putting in place and piloting an innovative operational and financing mechanism for energy efficiency in public facilities. If successful, this model can help change perceptions, address barriers and build confidence in energy efficiency as a sound economic investment. The AF is helping the Mexican government broaden the reach of the mechanism – originally confined to municipal EE – to now also demonstrate it can work in different public facilities (not only municipal) by supporting a pilot program targeting EE in health and education installations.[58] The use of Energy Service Agreements (ESA) is helping tackle some of the key barriers affecting the EE market in Mexico. As ESAs allow beneficiaries to receive the benefit of the EE investment without paying the up-front cost – a key barrier in both municipalities and in health and education ministries – and then pay the energy service with the energy savings through the electricity bill, transaction costs are reduced and facilitates participation of municipalities and ministries. If this system, which involves a number of stakeholders, can be made to work seamlessly and each stakeholder is comfortable with its role, then a case can be made that this mechanism has the potential to transition to a sustainable model for supporting EE in public facilities at scale throughout the country. With the experience, lessons, proof of concept and increased awareness of EE potential and benefits, the aim is to set the stage and support the elaboration of a sustainable market solution for national scale deployment.

10. While the PRESEM and AF pilots will be targeting EE in public sector facilities, they will also involve the private sector in the project implementation, such as energy auditors, private energy services companies (ESCOs), manufacturers, and equipment installers. Activities under this component would be operated by the FIDE, with support from the CFE and SENER.

11. Activities to be financed under Component 3 include, among others: (a) the preparation of feasibility studies, energy audits, baseline studies, structural safety assessments, subproject designs, and bidding documents for the implementation of identified priority investments (with a bundled approach and including improvements to schools, such as enhanced lighting levels and new electrical wiring);[59] and (b) the acquisition and installation of items necessary to implement the agreed EE measures. Given the importance of ensuring the sustainability of the EE investments, Component 3 would also finance structural assessment studies (where these are not available) and confirming the building structural soundness would be an eligibility criteria.

12. Investments costs would be covered by: (a) direct support through the IBRD and AFD loans (the share of investment cost that the beneficiary entity will not have to repay); and (b) beneficiaries' payment of energy services (initially supported by the SENER through the upfront financing of the EE investments).[60] The entities eligible for EE

[58] At the time of preparing the AF ($100 million through IBRD and AFD financing), the estimated energy savings achieved through the EE investments in schools and hospitals were in the order of 1.6 GWh (over a 20-year period), along with GHG reductions of about 700,400 tCo2 equivalent.
[59] This means trying to aggregate in the same bidding processes, goods, installation and works for several subprojects, beneficiaries and/or technologies, as a way to achieve economies of scale, in particular in the case of schools. It is expected such bundled approach would be further relevant under the AF given the small energy consumption (and EE potential) particularly in individual education facilities (as compared to hospitals).
[60] The funds associated with the loan(s) part of the project (IBRD and AFD funds) would not be returned to the FOTEASE, whereas any counterpart funds (i.e., the payment of energy services) will be returned.

investments under component 3 would be public health or education sector facilities administered by SEP, SSA and IMMS, where electricity payments are centralized, or large hospitals (under SSA's responsibility) that comply with the eligibility and selection criteria (detailed in Annex 3).

13. The first pipeline of subprojects is being prepared with ESMAP support. This ESMAP-funded activity is expected to support detailed energy audits and also assess related improvements to ensure the sustainability of EE investments (e.g. electric wiring). The ESMAP funds would also be used to perform structural assessments of schools and hospitals where necessary to ensure the sustainability of the EE investments. Data and information collected from this exercise would also serve to update and refine assessment of overall energy savings potential from public schools and hospitals. The results will help subsequent rapid implementation of the loan by providing essential input for to the preparation of the executive subproject designs and bidding documentation, so they can be ready by mid-2018.

14. Each subproject (or bundle of sub-projects) considered for financing under Component 3 would consist of one or more technology intervention and would need to meet energy savings and economic rate of return (EIRR) eligibility criteria. The specific technologies that could be included in the subprojects, but are not limited to, the following:

a. Schools: lighting systems (including dimmers), air conditioning systems, photovoltaic systems, cool roofs, heat pumps, and; and electrical wiring.

b. Hospitals: lighting systems (including controls), air conditioning systems, steam generation systems, photovoltaic systems, solar water heaters, heat pumps and co-generation, and insulation.

X. Annex 3: Summary Description of Institutional Arrangements

A. Project Institutional and Implementation Arrangements for Component 3

1. Overall coordination and implementation of the AF would be the responsibility of SENER. Within SENER, the General Directorate of Energy Efficiency and Sustainability (*Dirección General de Eficiencia y Sustentabilidad Energética*, DGESE*)* would be responsible for project implementation, and would be supported by the PRESEM Responsible Project Implementing Unit (*Unidad Responsable Ejecutora del Proyecto*, UREP-PRESEM).[61] SENER would rely on the UREP's in-depth Bank-financed projects implementation experience, and its core team of qualified staff to handle all procurement and financial management (FM) issues. UREP, benefitting from lessons learned from the implementation of the parent Project, has sufficient capacity in technical issues, safeguards compliance, and monitoring, among other specialties to also increase the scope of its activities to cover EE in schools and hospitals.

2. The implementation of subcomponent 1.d (policy development and institutional strengthening in schools and hospitals) would be led by the SENER, with support from CONUEE, while Component 3 (Energy Efficiency Investments in Schools and Hospitals) would be operated by FIDE, with support from CFE and oversight from SENER. The project would channel the AF IBRD loan and counterpart funds through the FOTEASE.[62]

3. SENER would ensure that appropriate project implementation arrangements are in place and that all activities being developed by other stakeholders – mainly the FIDE – are done in accordance with project design and Bank procedures. SENER's responsibilities are detailed in the PRESEM's updated Operations Manual (OM) and include, among others, the following:

a. Project management, implementation, and supervision;
b. Coordination with other federal- and state-level entities, as needed, including SEP (in the case of schools) and SSA or IMSS (for hospitals);
c. Developing communication plans and reaching out to stakeholders;
d. Presenting the project and its activities to the FOTEASE for funding allocation and approval;
e. Ensuring that the FIDE has access to resources to implement investments;
f. Monitoring of the project's implementation (preparing progress reports and IFRs, managing data collection databases and following up on project indicators, monitoring the operation's financial progress);
g. Fiduciary responsibilities: Procurement (preparation and launching of bidding processes for activities under Component 1 (including project management), and overseeing those to be conducted by the FIDE under Component 2 and 3), FM (FM reporting, independent financial audits, and so on);
h. Supervising and ensuring safeguards' compliance; and

[61] UREP-PRESEM is a spinoff of the UREP created to support Bank-based projects, and currently specialized in managing the PRESEM. UREP has administered other projects, including the MX Efficient Lighting and Appliances project (Loan – LN – 7996, and its two related grants trust fund – TF – 98062 and TF98465), MX Integrated Energy Services (LN7501 and its related GEF Grant TF91733) and one stand along GEF grant (TF56781, Large-scale Renewable Energy Development Project).
[62] The Energy Transition and Sustainable Energy Use Fund (*Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía,* FOTEASE) has financed renewable energy and energy efficiency investments, most recently the PRESEM. The FOTEASE has been used since 2009 in Bank-financed operations. A chart depicting flow of funds can be found in figure A.3.1 in the current Annex.

i. Preparing monitoring and reporting outputs and information necessary to track progress based on the indicators included in Annex 1 and elsewhere.

4. In addition to overall project coordination, SENER would lead the implementation of activities under subcomponent 1(d) This means that SENER would prepare, carry out the selection processes to develop the corresponding tasks and supervise their implementation.[63] The DGESE would be responsible for the technical work in close collaboration with CONUEE (and other federal institutions, as needed), such as preparing all documentation for the hiring of services, overseeing consultancies, and coordinating with public health and education authorities. UREP-PRESEM would also support the administrative processes, including the procurement of needed consultancies. The sub-component component would be supported by the loan and counterpart funding from SENER.

5. The activities under subcomponent 1(d) would be implemented as follows:

a. The Treasury of the Federation (*Tesorería de la Federación*, TESOFE), through SENER, transfers the resources allocated to the FOTEASE, according to the federal budget;
b. SENER proposes the planned activities to the FOTEASE's Technical Operational Committee for its approval;
c. After the FOTEASE's approval, SENER prepares all documentation for the hiring of services and procurement of needed consultancies; and
d. SENER hires and pay for any services or consultancies under Subcomponent 1(d)

6. FIDE would execute – as 'Operator' – the activities considered under Component 3, for which it would amend the existing agreement with the SENER (Operator Collaboration Agreement**)**. FIDE's capacity has been proven through the implementation of the PRESEM and the (now closed) Bank-financed Efficient Lighting and Appliances Project (P106424 and P120654) and its own projects. The entity has more than 10 years of experience implementing EE projects with industries, buildings, households and municipalities. The Bank has provided capacity building to the FIDE on Bank procurement, safeguards and FM's guidelines and would organize workshops during implementation, focusing on preparation of bidding documents and evaluation of economic and financial proposals.

7. FIDE's responsibilities are detailed in the project's OM and include, among others, the following:

a. Perform - and in the cases where outsourced, assess - the technical and economic feasibility of subprojects;
b. Support SENER and coordinate the Activity Initiation Agreement (AIA) and the Energy Service Agreement (ESA) with the beneficiaries and CFE;
c. Prepare, conduct and supervise the bidding processes relevant to the implementation of Component 2 and 3 and in accordance with the Bank's guidelines;
d. Make payments for services and goods, in accordance with the contract;
e. Coordinate and manage all information concerning subprojects' progress and report it to the SENER/UREP and provide updated information on project progress;
f. Monitor the implementation of subprojects' in every aspect, including physical, technical, legal, economic, financial, and environmental and social;
g. Communicate to the SENER/UREP any breach on the compliance of relevant inter-institutional agreements;
h. Reimburse to FOTEASE resources paid back by participating health and education entities (through the ESAs); and
i. Transfer resources to CFE for the incremental costs it will have incurred.

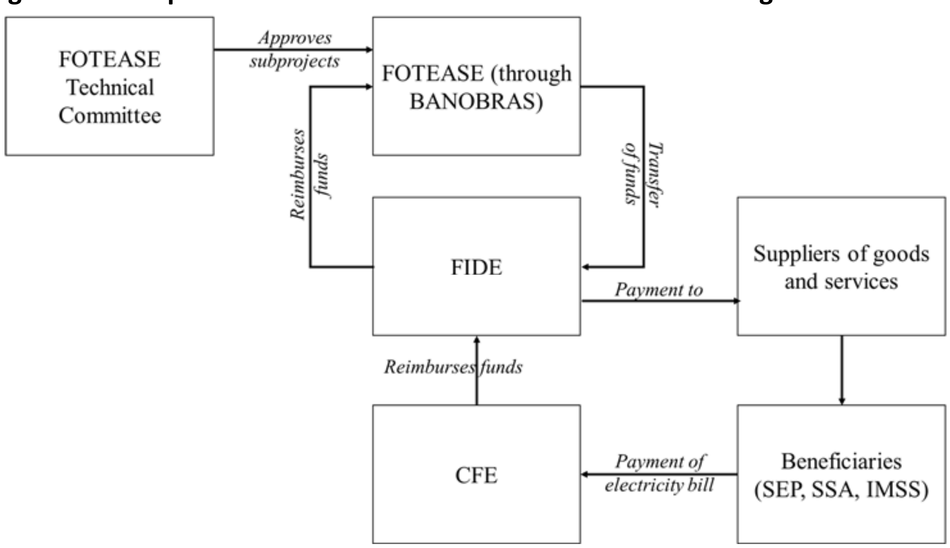
[63] For further details on these project activities, see Annex 2.

8. CFE would support project execution by metering (and thus recognizing and validating) any energy savings accrued from the implementation of EE investments. The utility would also help recover the contributions (i.e., energy service payments) from beneficiaries (as per ESAs) through the electricity bills and transfer those resources to the FIDE. The FIDE would subsequently transfer the funds received from CFE to FOTEASE which would reinvest them in EE investments. The incremental costs of FIDE and CFE would remain consistent with those already established under PRESEM; i.e., 10.93 percent of investments total costs, broken down as follows: 9.7 percent of the investment in the case of FIDE and 1.20 in the case of CFE, or 2.25 percent of the beneficiary's energy service payment obligation. FIDE's incremental costs related to technical work needed for subproject definition would be partially covered by the IBRD and AFD loans. Further details on these incremental costs can be found on table A.3.1.

9. The proposed mechanism for the implementation of Component 3 seeks to leverage Bank and joint co-financing from AFD to maximize sustainability of project results, as well as seize the benefits created by the PRESEM implementation arrangements. Detailed implementation arrangements replicate those already created under PRESEM and can be seen in figure A.3.1. These would be articulated around four inter-institutional agreements, all of which have been shared with and reviewed by the education and health counterparts:

a. A collaboration agreement between the SENER and the FIDE for the execution of Component 3: *the Operator Collaboration Agreement*;
b. An implementation agreement between the FIDE and the CFE to define parties' obligations, including CFE's activities during subprojects' preparation and implementation: *the CFE Implementation Agreement*;
c. An *Activity Initiation Agreement* (AIA) among the SENER, the FIDE, and beneficiaries (Secretaries or agencies with centralized energy payment systems, or large facilities), to start the evaluation and preparation of subprojects; and
d. An *ESA* among the SENER, the FIDE and the beneficiary institution to execute agreed subprojects. Detail on the ESA[64] is provided below.

Figure A.3.1. Operational and Financial Mechanism for Financing EE Investments



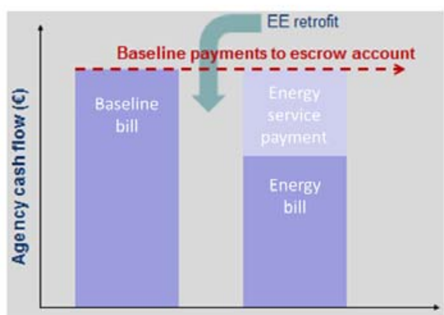
[64] ESAs were successfully tested and executed in Armenia (Armenia Energy Efficiency Project P116680) and Former Yugoslav Republic of Macedonia and are being replicated in a number of similar EE investments projects in Europe and Central Asia Region.

10. A key element of the operation's design is the use of ESAs (already introduced and utilized under PRESEM), which is an innovative mechanism to finance EE projects in the public sector. FIDE and SENER would enter into an ESA with a participating entity (preferably one with centralized electricity payment systems – such as SEP or IMSS), through which the beneficiary entity agrees to continue paying its energy consumption bills (a reduced amount due to the EE intervention), plus the energy service payment (to partially cover the EE investment costs) to the CFE. The ESA would be elaborated so that, taken together, both payments would equal (or be lower) than the old electricity bill the entity was paying.[65] FIDE would then prepare and bid out the subproject on the beneficiary's behalf. CFE would continue collecting the energy bill (a reduced amount due to the savings achieved through EE investments plus the agreed amount of energy service payment). CFE would send the beneficiaries' energy service payment to the FIDE, who would transfer the funds received from CFE to FOTEASE, which, in turn, would reinvest them in EE subprojects. Upon completion of agreed energy service payments, the beneficiary retains the energy savings.

11. An advantage of the proposed mechanism is that it would not place an undue burden on the beneficiary with which the ESA would be signed, as it would continue paying the usual amount for its electricity bill (and not require additional budget) and the implementation would be outsourced to a competent entity (FIDE). In addition, ESAs are typically viewed as a long-term contract obligation, similar to utility payments, and thus, the beneficiary would not incur debt, nor need an increase in public entities' budget allocations. The ESA can be made with flexible contract duration in the event the energy savings are a bit higher or lower than expected. Figure A.3.2 illustrates the ESA concept in further detail.

Figure A.3.2: Energy Services Agreements

Under an ESA, the EE financier (the FIDE) offers a full package of services to identify, finance, implement, and monitor EE projects for public clients. In other countries, the financier then subcontracts actual design and implementation to local Energy Service Companies (ESCOs). The client is required to continue to make its baseline energy bill payments into an account in the CFE, which are then used to pay its reduced bills and repay the investment and associated fees, until the contract period ends.



The figure on the right illustrates the basic idea of a client's cash flows under the ESA, with payments equal to its baseline energy bill. Such a scheme requires the agency to pay only what it is paying today without taking on associated investment risks. In some cases, the contract duration is fixed; in other cases, the contract can be terminated after an agreed level of payment has been made, which can encourage the client to save more energy.

For public sector clients, ESAs are generally not registered as debt, since they are generally viewed as long-term contractual commitments. Such a scheme provides major advantages to the client because it is relatively simple to carry out, does not require debt financing, and poses little risk. However, the public clients must show demonstrated energy bill payment discipline, have sufficient baseline data and have met basic internal levels of comfort (for example, heating/cooling).

[65] This will be the case unless there is an agreement to increase the energy service level (e.g., in the case of lighting in primary schools). Any increase (or decrease) to the electricity tariff is exogenous to this calculation and would need to be factored in, if and when it happens.

12. Component 3 would be driven through a managed process between SENER and SEP, SSA or IMSS. As such, it would rely on SENER's coordination capabilities and FIDE´s expertise to agree with SEP, SSA or IMSS on facilities to be incorporated into the project under a bundled approach, as long as each (aggregated) subproject met the eligibility criteria (detailed below). In the case of institutions with centralized electricity payments, individual interventions would be bundled to achieve PRESEM's eligibility criteria; large facilities could be treated as individual subprojects as long as they met these criteria as well.

13. Selection criteria to participate in the project is described in the updated project's OM and include:

a. General:
   i. Facilitating sufficient data input and identified EE potential in the subsectors covered and discussed in Annex 2;
   ii. Demonstrated financial discipline and no current payment deficits or agreed repayment schemes with the CFE and/or the FIDE; and
   iii. A letter of intent from the head of the beneficiary institution and a commitment to secure any approval (if applicable).

b. Schools:
   i. Levels: "*básica*" (primary and secondary education), "*media superior*" (high schools), and "*superior*" (technical colleges);
   ii. Current status: Facilities with inefficient lighting technologies, where no modernization or retrofitting has taken place in the last 10 years, and whose structural soundness has been confirmed;
   iii. Function/Use: Public education facilities used extensively, with priority to those with 2 or more shifts;
   iv. Other: PRESEM's criteria would be met at the aggregate level in the case of bundles of education facilities.

c. Hospitals:
   i. Levels: Second and Third level facilities;
   ii. Current status: Hospitals with inefficient lighting, heating/cooling, water heating technologies and where no modernization or retrofitting significantly affecting lighting, cooling and/or heating has taken place in the last 10 years, and whose structural soundness has been confirmed.;
   iii. Function/Use: Public health facilities with a high consumption of energy for A/C equipment and other uses;
   iv. Other: PRESEM's criteria would be met at the aggregate level in the case of bundles of health facilities

14. After selecting targeted facilities that fulfill these criteria, SENER and FIDE would sign AIAs with potential beneficiaries to start preparation of subprojects (including bundle of sub-projects). Once the subproject is screened to ensure its eligibility, ESAs would be prepared and signed, and FIDE would perform the feasibility analysis, including a detailed energy audit. FIDE may hire a certified consultancy to perform detailed energy audits and to executive subprojects for investments in technologies. In such cases, FIDE would oversee and review the work. On that basis, FIDE would propose subprojects to maximize its value to the beneficiary entity (for example, the highest NPV),[66] discuss subproject parameters with the ESA-signing entity, and negotiate final subproject parameters, to be agreed upon with the beneficiaries on the ESA. Once the ESA is signed by the three parties, FIDE would then prepare bidding documents.

[66] Later during implementation, performance-based contracting could be tested, where the bidder would be given greater flexibility to design a proposal resulting in the highest NPV.

15. To be financeable, prepared subprojects[67] would need to demonstrate acceptable levels of economic efficiency and energy savings, consistent with the parent project, as defined here:

a. At least 20 percent energy savings;
b. Economic internal rate of return (EIRR) of at least 7 percent (calculated excluding any direct support); and
c. Minimum subproject cost of US$200,000.

16. To reduce the risk of political changes in administration affecting beneficiaries' commitment to the repayment of the ESA and to ensure that an improved service could be provided (in the case of schools to meet the nation al lighting norm), a non-reimbursable direct support would be provided to participating entities. The direct support would now be up to 70 percent (of total investment cost), consistent for all types of subprojects (including those under the parent project), and would be dropping over time to allow for greater sustainability and replicability. This change would further reduce political risks as the direct support would now be established at a level enough to guarantee that payback can be done in no more than 5 years for schools and hospitals.[68] These changes should also allow to reduce risks linked to changes in the Federal Government. The amount of direct support would vary by subproject and the criteria would be re-assessed by the SENER and the Bank during the project's Mid-term Review, based on implementation results and with a view to reducing it, with a view to transition to a more commercial, sustainable program. The criteria are based on the results of economic and financial analysis of typical subprojects and of investments supported by the FIDE and would apply to the selection of all subprojects, unless otherwise agreed by the Bank.

17. Baselines, energy savings, and energy service payment schedules would be established and agreed upon in the ESA, after which the FIDE would launch the biddings. The value of the baseline would determine the energy savings and the amount of the energy service payment (representing a portion of the investment cost) to be borne by the beneficiary institution(s). This baseline would be established based on historical consumption and could be fixed throughout the subproject's lifetime. In addition, for energy savings to materialize, these would be recognized by the CFE, key partner in the project's implementation.

18. As some individual schools (and perhaps some hospitals) could have relatively low levels of energy use, and to limit transaction costs, a bundled approach will be sought as much as possible. For these cases in particular, the project would sign ESAs with institutions that centralize electricity bills' payments. These would include SEP, SSA and IMSS. The project would also finance stand-alone subprojects, only when sizeable enough to meet the eligibility criteria described above.

19. Energy service payments from beneficiaries would be used as a revolving fund. As previously mentioned, the participating entities' energy service payment amounts corresponding to energy savings (net of the FIDE's and the CFE's incremental costs) would be transferred back to FOTEASE to be reinvested in municipal EE activities, with the aim of creating a "*revolving fund*" for such investments. The resources to be transferred to FOTEASE would be earmarked for energy efficiency interventions, help achieve sustainability and leverage subproject's impacts, to help create a successful model that could continue to be replicated on a national scale and in other sectors.

20. The operational and financing mechanism proposed by the project has a strong potential to motivate partners to participate. The ESA presents two important advantages to public health and education sector institutions as they would:

[67] In the case of bundles of projects, the criteria would be assessed at the level of the bundle (as is the case for MB subprojects under the original PRESEM).
[68] And during one municipal administration period in the case of SL, OOA and MB subprojects.

(a) improve infrastructure and service delivery, with no additional energy costs and procurement/construction processes; and (b) not have to incur debt, nor have to count on additional budget allocations. The direct support, which is expected to be lowered over time, is an additional bonus, translating into a shorter energy service payment period and faster impact of energy savings in the beneficiaries' budget. In addition, the payment of energy services scheme allows SENER to leverage its investment and fund additional EE subprojects.

21. The "*incremental costs*" for the FIDE and the CFE remain constant as per those under the parent project. The total incremental costs would amount to 10.93 percent of subproject costs (consisting of 9.70 percent for FIDE and approximately 1.23 percent of the investment cost for CFE). These incremental costs would be partially covered by the loan and partially by counterparty funds. Table A.3.1 summarizes estimated costs per activity performed by FIDE and CFE.

Table A.3.1: FIDE's and CFE's Incremental Costs for the Project[69]

<table>
<tr><th></th><th>Stages of subproject</th><th>Activity</th><th>Amount</th><th>% (of subproject costs)</th><th>Source of financing</th></tr>
<tr><td rowspan="21">FIDE</td><td>Preparation</td><td>Feasibility analysis/executive subproject</td><td>2.05 USD M</td><td>2.00%</td><td>IBRD & AFD loans</td></tr>
<tr><td rowspan="7">Evaluation</td><td>Bill analysis and census</td><td rowspan="7">1.08 USD M</td><td rowspan="7">1.05</td><td rowspan="7">IBRD & AFD loans</td></tr>
<tr><td>Analysis of energy balance</td></tr>
<tr><td>Analysis of alternatives for energy savings</td></tr>
<tr><td>Definition of energy indices</td></tr>
<tr><td>Verification of estimates of consumption and savings potential</td></tr>
<tr><td>Finalization of technical analysis</td></tr>
<tr><td>Technical specifications and bidding documents</td></tr>
<tr><td rowspan="3">Monitoring, verification and reporting</td><td>Measurement of energy results</td><td rowspan="3">1.81 USD M</td><td rowspan="3">1.76</td><td rowspan="3">IBRD & AFD loans</td></tr>
<tr><td>Analysis of changes in the baseline</td></tr>
<tr><td>Reports/recommendations</td></tr>
<tr><td rowspan="2">Technical monitoring of implementation</td><td>Technical verification of installation of equipment</td><td rowspan="2">1.90 USD M</td><td rowspan="2">1.85</td><td rowspan="2">IBRD & AFD loans</td></tr>
<tr><td>Works and authorization of payment</td></tr>
<tr><td rowspan="7">Administration fees</td><td>Selection process</td><td rowspan="7">3.11 USD M</td><td rowspan="7">3.04</td><td rowspan="7">Counterpart (SENER)</td></tr>
<tr><td>Procurement process</td></tr>
<tr><td>Service fees (lighting, water, and so on.)</td></tr>
<tr><td>IT development</td></tr>
<tr><td>Formalization of contract</td></tr>
<tr><td>Monitoring of payment</td></tr>
<tr><td>Supervision visit</td></tr>
<tr><td colspan="2">FIDE Total</td><td>9.95 USD M</td><td>9.70</td><td></td></tr>
<tr><td rowspan="5">CFE</td><td colspan="2">User registration and control</td><td rowspan="4">0.81USD M</td><td rowspan="4">2.25 of beneficiary's repayment obligation</td><td rowspan="4">Counterpart (SENER)</td></tr>
<tr><td colspan="2">Billing process</td></tr>
<tr><td colspan="2">Delivery of receipts, account statements and collection</td></tr>
<tr><td colspan="2">Transfer of recovered resources</td></tr>
<tr><td colspan="2">CFE Total</td><td>0.81 M</td><td>1.20</td><td></td></tr>
<tr><td rowspan="5">CFE</td><td colspan="2">Public lighting census update</td><td>0.21 USD M</td><td>MXN 25.00 + VAT</td><td>IBRD & AFD loans</td></tr>
<tr><td colspan="2">Public lighting billing</td><td rowspan="3">1.02 USD M</td><td rowspan="3">2.25 of beneficiary's repayment obligation</td><td rowspan="3">Counterpart (SENER)</td></tr>
<tr><td colspan="2">Billing receipts and statements</td></tr>
<tr><td colspan="2">Administration fees</td></tr>
<tr><td colspan="2">CFE Total</td><td>1.23 USD M</td><td>1.20</td><td></td></tr>
</table>

[69] Assuming a 100 percent success rate.

22. The implementation of planned activities under Component 3 would follow the following sequence:

a. TESOFE, through SENER, transfers the resources allocated to FOTEASE, according to the federal budget;
b. SENER proposes to FOTEASE's Technical Operational Committee, for its approval, the transfer of resources to FIDE to analyze and finance potential interventions;
c. After its approval, FOTEASE transfers the approved resources to FIDE for the implementation of Component 3 activities;
d. FIDE prepares all documentation for the procurement of services and goods, and their installation, as considered under Component 3 activities, starting with detailed energy audits and/or baseline studies and continuing, if appropriate, to interventions;
e. FIDE collects the resources generated by energy savings from participating entities (and through CFE's electricity billing), reimburse CFE for its costs incurred during project implementation, and reimburse remaining resources to FOTEASE (after collecting the agreed incremental costs); and
f. In case of no payment or insufficient payment from participating entities, the municipality, CFE and FIDE discuss options- including adjustment to terms of the ESA.

B. Project Institutional and Implementation Arrangements for Component 4

23. The proposed "Municipal Energy Efficiency Contingency Facility" component would rely on the existing operational and financial capabilities under PRESEM. Overall coordination and Project implementation would still be the responsibility of SENER, through its General Directorate of Efficiency and Sustainable Energy (*Dirección General de Eficiencia y Sustentabilidad Energética)*, and would be supported by the Responsible Project Implementing Unit for the PRESEM (*Unidad Responsable Ejecutora del Proyecto PRESEM, UREP-PRESEM*). SENER would rely on the UREP's in-depth experience with Bank-financed projects, and its core team of qualified staff to handle all procurement and financial management (FM) issues. SENER would ensure that appropriate project implementation arrangements are in place and that all activities being developed by other stakeholders – mainly FIDE – are done in accordance with project design and Bank procedures.

24. FIDE would execute and manage – as 'Operator' – the contingency facility created through the parallel AF loan under Component 4, for which it would amend the existing implementation agreement with SENER.[70] FIDE's capacity has been proven through the implementation of: (i) PRESEM, (ii) IBRD and GEF-financed Efficient Lighting and Appliances Project (that included a guarantee facility for US$35 million, of which US$5 million came from GEF); and (iii) its own projects. The entity has more than 10 years of experience implementing energy efficiency projects with municipalities, although it had previously disengaged itself due to the municipalities' lack of financing capacity. The Bank has provided capacity building to FIDE on its procurement and financial management guidelines, and will organize capacity building activities during implementation, focusing on the creation and management of the contingency facility.

25. The contingency facility would backstop the default of municipalities or water utilities benefiting from the implementation of energy efficiency investments (under the parent project). Once the GEF grant becomes effective, the resources would be incorporated to the budget approved annually by the Congress. It will be established in the amended SENER-FIDE collaboration agreement that FIDE would keep and manage those resources under a new account to be opened in a commercial bank (BANORTE) until the end of the Project. GEF resources would be channeled to FIDE through the FOTEASE. All the facilities' procedures would be included in the OM that will be annexed to the parent project's

[70] FIDE subscribed the PRESEM collaboration agreement with SENER on August 15, 2016. FIDE and SENER are currently working on – and have already prepared – an amendment to such agreement to include the new activities discussed in this paper.

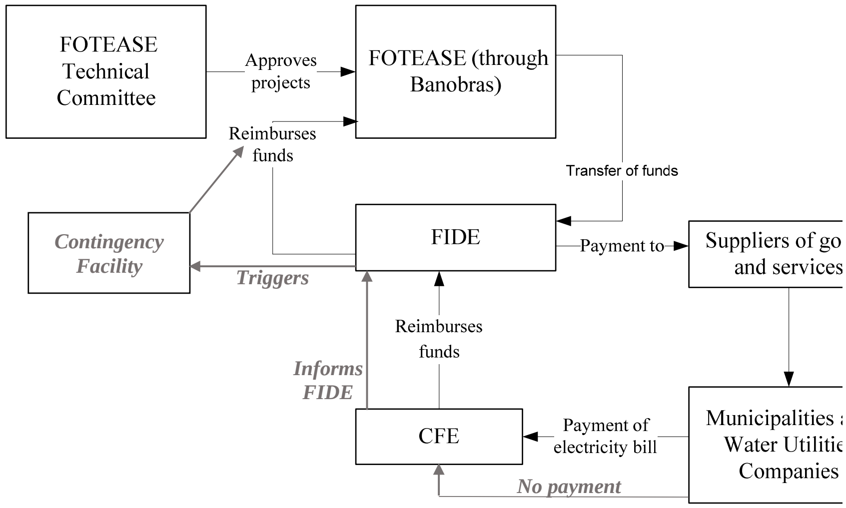
amended OM and in the Grant Agreement to be signed between the United Mexican States, through SHCP, and the Bank.

26. The "default event" that would trigger the activation of the contingency facility would be when municipalities or water utilities fail to make their agreed energy service payment under the ESA for 6 continuous months (either total or partial amount of 6 monthly or 3 bimonthly electricity billing cycles, depending upon the type of contract signed with CFE). SENER will verify compliance with the established protocol and approve the triggering of the contingency facility. FIDE has had experience with three other contingency facilities that covered between 15 and 10 percent of the total investments – percentages that were based on risk assessments, although 10 percent and 5 percent of the investments actually used the facility. Based on these risk assessments and experiences, a 15 percent coverage from the GEF contingency facility for total expected energy service payments was deemed appropriate.

27. The contingency facility would work as follows (Figure A.2.2):

a. Every week, FIDE would continue requesting to CFE to transfer the energy service payments from municipalities and OOAs paid through the electricity bill to the FIDE.
b. CFE would transfer the resources and report to FIDE if a beneficiary did or did not pay in the electricity bill the full amount of the committed energy service payments under its ESA (signed among the beneficiary, SENER and FIDE).
c. In the case of a total or partial default, FIDE would start "administrative procedures" as soon as it is informed of the ESA terms' breach. FIDE would contact the beneficiary and insist by different means that it pay its contractual obligation. In cases where the municipality or water utility does not pay for its electricity consumption as well, CFE would also follow-up with that beneficiary.
d. If, after six months, the beneficiary still has not paid back its energy service payments, FIDE would request SENER to trigger the contingency facility;
e. Once SENER confirms that procedures to obtain the missing energy service payment have been followed and confirms the default, FIDE would trigger the contingency facility and start "prejudicial proceedings." The contingency facility would cover all due energy service payments (for 6 continuously monthly or 3 bimonthly electricity bills), up to a limit of 5 percent of the total resources available in the facility. If the beneficiaries continue to default on their agreed energy service payments, the contingency facility would continue covering these as long as the total due energy service payments do not exceed the same 5 percent limit.
f. FIDE would send the resources paid by the contingency facility back to FOTEASE, following the normal mechanism. If a beneficiary ends up making its energy service payments after the triggering of the facility, those resources would be kept in the facility.
g. If after twelve months the beneficiary still has not made its due energy service payments, FIDE would start "judicial proceedings" to try and recover them. Any funds remaining in the contingency facility by project closing would be transferred to FOTEASE to settle any balances and/or to finance additional energy efficiency projects. The remaining funds will cover first the oldest due energy service payments.

Figure A.2.2. Operational and Financial Mechanism with Contingency Facility



28. The contingency facility would be supervised by SENER as mentioned above. This new instrument would be operated by FIDE's financial division, through its Financial Operations Subdirectorate (*Subgerencia de Operación Financiera*, SGOF), which is separate from the operational division dealing with beneficiaries. This would seek to ensure that it remains in FIDE's interest to convince beneficiaries in default to pay back, as an increased default rate would negatively affect the whole operation of the program, reducing FIDE's roles, activities and income. The operation, processes, results and financial position of the contingency facility would be reviewed during PRESEM's mid-term review.

29. The general flow of funds arrangements would be as follows:

a. SENER asks NAFIN to request the disbursement of the Contingency Facility funds;
b. NAFIN requests the funds' disbursement to the Bank;
c. The Bank deposits the resources to NAFIN;
d. NAFIN transfers the resources to TESOFE;
e. SENER receives from the TESOFE the funds approved for the contingency facility;
f. SENER transfers the funds received to the FOTEASE;
g. Within the FOTEASE, a Technical Committee evaluates and if applicable approves the creation of the contingency facility;
h. Based on the approval of the Technical Committee, the FOTEASE, by SENER's instruction, transfers the funds to FIDE for the creation of the facility;
i. FIDE – in its capacity of facility operator – receives the resources in the bank account created for the facility and operates it according to the rules established above;
j. FIDE requests SENER the payment of the expenses incurred for the operation of the contingency facility.[71]

30. All these procedures would be included in the grant agreement to be signed between the United Mexican States, through SHCP, and the Bank. Further procedures will be developed in a new Operational Manual (OM) that would be annexed to PRESEM's OM. Any remaining funds from the contingency facility would be utilized to further finance EE

[71] It is expected such costs will be similar to 5 percent of the contingency facility's total size.

investments in municipalities and water utilities by SENER/FOTEASE. Rules for using such resources are further defined in the facility's OM.

C. Financial Management

Fiduciary Risk

31. The Fiduciary Risk for the Project is Substantial. As described earlier, no significant additional risk factors are expected to arise by incorporating to the Project Components 3 (Investments in Schools and Hospitals) and 4 (Municipal Energy Efficiency Contingency Facility). Energy Efficiency Investments in Schools and Hospitals would be subject to the same institutional and financial management mechanisms in place for Component 2 (Muncipal Energy Efficiency Investments).

Financial Managements Arrangements

32. SENER, as the appointed implementing agency, would continue to be overall responsible for maintaining an adequate Financial Management system, and complying with FM arrangements, with the support of an instated Project Coordination Unit (the "UREP-PRESEM"). Adjustments on the FM arrangements in place include: (i) the Project's financial reports would incorporate additional financing, as well as counterpart funds to be provided for the Project under both Sub component 1 (d) and Components 3 and 4, (ii) the scope of the external audit would comprise additional funds and verify that counterpart funds are provided and applied for the Project, (iii) the Energy Savings Arrangements (ESA) to be signed by SENER, FIDE and the Education or Health agency (beneficiary), would incorporate adequate provisions to ensure that proper financial management mechanisms be maintained to control the Energy Investments financial information, and to permit access to pertinent files, documents and financial records for audit purposes.

33. As for the budgeting arrangements, the additional financing would follow arrangements in place for the parent project. Budget for the Project would be allocated by the Energy Sector, through the "*Fondo para la Transicion Energetica y el Aprovechamiento Sustentable de la Energía*" (FOTEASE).[72]

34. GEF Funds to be granted for the Project under Component 4 (Municipal Energy Efficiency Contingency Facility) would be managed by FIDE, which has demonstrated adequate capacity for managing these funds. Funds would be separately managed by FIDE and applied, under operational rules acceptable to the World Bank, as a mean to cover the risk of default by Energy Investments beneficiaries (municipal entities). Contingent Facility financial information would be incorporated in the Project's integral financial reports and statements and so periodically monitored and reported to the World Bank, accounting for the use and application of grant funds; the scope of the external audit would also comprise the Contingent Facility funds and audit procedures would be applied to verify management and application for the intended purposes.

35. As described earlier, FIDE has previous experience in implementing World Bank financed projects in which it has demonstrated adequate FM capacity. FIDE FM capacity was assessed and considered adequate for its role in implementing Component 2 under the current PRESEM Project (P149872), through which FIDE receives project funds, carries out procurement processes for municipal energy efficiency investments and makes payments to providers of

[72] No Federal Budget from the Education nor Health Sectors is to be provided for the Project, under the Additional Financing, only budget from the Energy Sector will be allocated, through the FOTEASE.

goods and services under the provisions of an Operator Collaboration Agreement with SENER, designed as part of the institutional arrangements for the execution of said Component.

36. In addition to its current role in the PRESEM, FIDE would manage the AF proceeds from the GEF to capitalize a contingency fund to partially cover non-payment risk from municipalities implementing energy efficiency investments. GEF funds would be administered by a separate unit from the operational department that implements energy efficiency investments, keeping energy efficiency investments operation and contingency funds management in separate and independent units, within FIDE. AF GEF funds would only partially cover non-payment for investments implemented in municipalities.

37. For the application of the contingent fund proceeds, FIDE would follow a set of specific collection, credit recovery and legal remedies similar to its own internal policies, adapted to the PRESEM and agreed with the Bank; these contingency fund management procedures would be incorporated in the Project's Operational Manual in terms acceptable to the Bank. In addition, for any application of contingent fund proceeds to cover non-payment would be previously notified to and approved by SENER, as an additional control for validation and approval of the application of GEF AF proceeds.

38. The Project's financial reports would incorporate and disclose GEF AF proceeds and applications made during the reported period, the Project's financial audit would cover total Project funds, including GEF AF proceeds, verification on the proper use of GEF AF proceeds.

39. At the end of the Project, remaining non-applied GEF AF proceeds would be transferred to the FOTEASE to be utilized in other energy efficiency projects.

Changes to Institutional Arrangements

40. Adjustments in the Project's institutional arrangements have been earlier described in previous sections, the main adjustments in the institutional arrangements for the Additional Financing being: (i) adjustments on the collaboration agreement currently in force between SENER and FIDE (Operator Collaboration Agreement, as defined in LN8594-MX), which would need to be amended in order to include specific provisions for implementing additional (public schools and hospitals) energy efficiency investments and also administering the Contingency Facility[73], and (ii) SENER and FIDE would enter into an ESA with public education and health institutions, for energy efficiency subprojects in schools and hospitals. The adjustments on these institutional arrangements would incorporate specific provisions on Financial Management, procurement and safeguards, in terms acceptable to the World Bank.

D. Procurement

41. AF procurement would be conducted per to the World Bank Procurement "Regulations for Borrowers under Investment Project Financing" dated July 1, 2016, for the supply of civil works, goods, consultants and non-consultant services. Procurement activities under Component 3 would be undertaken by FIDE and previously agreed with health and educational authorities following request for bids and in most of the cases a national market approach which would be detailed in the Operational Manual. The World Bank's Standard Procurement Documents would govern the

[73] Provisions for the 'Comision Federal de Electricidad' (CFE) to collect payments of electricity bills for financed investments in public schools and hospitals, as does currently for Municipalities Subprojects. Provisions to incorporate provisions for FIDE to administer and apply funds from the Contingency Facility, including adequate control, reporting and audit specific provisions.

procurement of World Bank-financed Open International Competitive Procurement which are not expected under this component considering the amount and complexity of the activities. When approaching the national market, as agreed in the Procurement Strategy for Development and Procurement Plan dated ______, only to contracts undertaken directly by SENER would the harmonized procedures and documents agreed by the Bank with the *Secretaría de la Función Pública* (SFP) and the Inter-American Development Bank would be used [To be confirmed]. These agreements do not apply to FIDE.

42. Procurement under Component 3 would be conducted by SENER and FIDE. The World Bank's Standard Procurement Documents will govern the procurement of World Bank-financed Open International Competitive Procurement. When approaching the national market, as agreed in the Procurement Plan, the harmonized procedures and documents agreed by the Bank with SFP and the Inter-American Development Bank would be used [To be confirmed].

43. It is expected that all the contacts would be financed in equal proportions between the IBRD and the AFD so the World Bank regulations and procurement arrangements in the project would apply to all contracts. It is important to state that agreements with the World Bank could not apply to contracts that have not World Bank financing.

44. SENER's and FIDE's procurement capacity assessment is being updated; in principle, the analysis concludes that both institutions have experience in dealing with Procurement activities. However, considering the large number of activities and the approach of the activities to be financed, it is expected that both institutions would need support from specialists in different areas; a dedicated and experienced Procurement Specialist will be hired to support Project's implementation. The Project Operational Manual shall include clear procedures and procurement methods that would apply under each one of the expected activities. The Manual would also include supervision and audit arrangements.

Procurement Arrangements

45. A Project Procurement Strategy for Development (PPSD) is being carried out and identified the appropriate selection methods, market approach and type of review by the World Bank, as follows:

46. Goods and Non-consulting services would be procured following Request for Bids, Request for Quotations and Direct Selection methods. Under Open International competitive procurement approach the Bank's Procurement Standard Documents would apply. When approaching the national market, the Open National Procurement approach using when possible the harmonized documents agreed by the World Bank with the SFP and the IADB would be used by SENER [to be confirmed].

47. Consulting services will be procured following Quality and Cost Based Selection, Fixed Budget Based Selection, Least Cost Bases Selection, Quality Based Selection, Consultant's Qualification Based Selection, Direct Selection and Individual Consultants methods. Under International Market Approach, the World Bank's Request for Proposals Standard document would apply. When approaching the national market, the harmonized Request for Proposals agreed by the World Bank with the SFP and the IADB would be used [to be confirmed].

48. Procurement under energy efficiency agreements would be conducted FIDE. The eligible expenditures would comprise investments in renewable energy and energy efficiency technologies, lighting systems (including dimmers), air conditioning systems, heat pumps, photovoltaic systems, cool roofs and electrical cabling in the case of schools and

lighting systems (including controls), air conditioning systems, steam generation systems, photovoltaic systems, solar water heaters, and co-generation and insulation in the case of hospitals.

Risk Mitigation Plan

Table A.3.2. Procurement Improvement Action Plan

Risks - Areas for improvement	Mitigation actions	When
A PPSD and a project procurement Plan	A comprehensive PPSD and a detailed Procurement Plan have been prepared.	Before Negotiations
Responsibilities related to the Procurement activities	The Project Operational Manual shall contain: A clear definition of the processes, roles, and responsibilities of the staff related to the implementation of the Procurement activities. - Supervision arrangements. - Audit arrangements	Before Effectiveness
Staff with expertise in procurement.	A Procurement Specialist with TOR acceptable to the Bank shall be incorporated to SENER and FIDE.	As agreed in the Procurement Plan
Most of the procurement activities would be implemented through FIDE	The agreements signed between FIDE and each one of the organized agribusiness beneficiaries shall include a statement in which the beneficiaries agree, that the procurement of civil works and goods would be carried out in accordance with the procedures set forth in the Operational Manual. Training to the beneficiaries shall be conducted by FIDE.	During project implementation

E. Environmental and Social

Introduction

49. This Project and its related AF are classified as Safeguards Risks Category B.

50. The existing environmental and social safeguards framework drafted for the initial financing has been assessed as fully adequate for this AF, given that the scope of planned investments in the new sectors is similar to that already considered under the parent project. As a result, this AF has the same environmental rating (B) and triggers the same safeguards as described in the PRESEM PAD (OP 4.01, OP 4.11 and OP 7.50).

51. The parent project's ESMF[74] has been updated to reflect the two new sectors and consultations were held on November 23rd, 2017. The updated draft ESMF also covers the norms and regulations for the two sectors now included in the Project and highlights issues of waste disposal (for lighting fixtures – such as mercury – and buildings – including asbestos); and health, noise and labors standards, in line with the EHS Guidelines. The ESMF would be updated if any additional technologies are considered during implementation.

[74] Available on-line at: *https://www.gob.mx/sener/documentos/marco-de-gestion-ambiental-y-social-mgas-del-proyecto-eficiencia-y-sustentabilidad-energetica-en-municipios*.

52. Overall safeguards rating of the main project is rated Satisfactory. The Bank's project team has carried out safeguards trainings for SENER and FIDE, and the latter has appointed an experienced staff member as overall safeguard coordinator for PRESEM's investment activities (Components 2), who will also oversee the safeguards standards for the AF (Component 3).

53. The updated ESMF will be published on the World Bank and SENER websites prior to appraisal stage of the AF.

Social Safeguards

54. The project does not trigger any of the social safeguards policies.

55. OP 4.10 (Indigenous Peoples) is not triggered. All subprojects are carried out in urban municipalities. There are indigenous peoples living in the urban areas, but not as defined by the World Bank Operational Polices (collective entities with attachments to ancestral territories).

56. OP4.12 (Involuntary Resettlement) is not triggered. Subprojects are carried out on already existing infrastructure, such as SL, water and sanitation structures, schools and hospitals, and existing MBs. As a result, the Project is not expected to require any involuntary land acquisition.

57. To foster further social education, sub-component 1.a would include activities on environmental education in schools. Furthermore, to foster social inclusion, the AF considers culturally appropriate labour rules for the workers in the project sites. Another benefit of this AF will be additional lighting in schools, benefiting girls through increased security. Moreover, a special emphasis is also put on the inclusion of women. As mentioned in this PAD, women will be integrated in capacity-training and the project implementation.

Environmental Safeguards

58. This project has an environmental risk Category B because it is unlikely to result in significant negative impacts. The aim of the PRESEM and the AF is to benefit the environment, reduce GHG emissions, energy consumption and benefit the overall Mexican population. Therefore, overall environmental impacts will be positive. No Category A subprojects would be supported by the parent project or the AF.

59. The project triggered the Environmental Assessment (OP/BP 4.01). The project is designed to generate positive environmental impacts through the mitigation of emissions and thus a contribution to the combat to climate change and benefits for the Mexican population. The project's adverse impacts are identifiable and easily mitigated with known management techniques.

60. An Environmental Framework had been prepared by the borrower for the initial project to meet the OP 4.01 standards and has been updated to reflect the AF. The ESMF includes an exclusion list for subprojects and considers the EHS Guidelines and best practices.

61. The Physical Cultural Resources policy (OP/BP 4.11) has been triggered because the project could potentially involve the financing of investments in historical education or health buildings The ESMF indicates that the national

cultural heritage laws should apply when investments take place on historic buildings (Art. 42 and 44 of the Federal Law on Monuments, Archeological, Artistic, and Historic Areas).

62. No other environmental safeguards policies (Protected Areas, Pest Management, Forests or natural habitats) are triggered by this project and AF given that its sub-projects would be implemented in existing facilities.

F. Other Safeguards Triggered

63. The policy regarding Projects on International Waterways—OP/BP 7.50—has been triggered by the parent project and management approved an exception to the Riparian notification on September 28, 2015. The activities under the proposed AF would not include water efficient investments in rural agricultural schools. In consequence, as no subproject that requires the use or pollution of international waterways would be eligible for financing under the AF, no new RVP approved notification exception would be required.

G. Monitoring and Evaluation

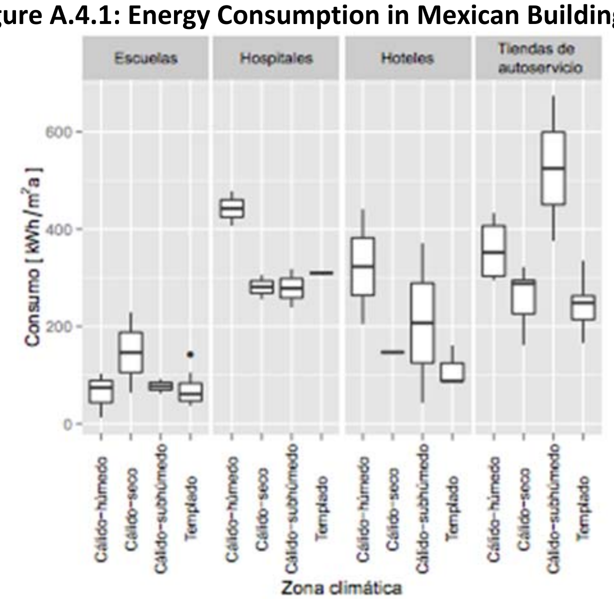
64. Monitoring and evaluation (M&E), supervision, and reporting tasks are essential to analyze progress, provide necessary corrective measures during implementation, and assess the operation's impact. In the case of the AF, SENER (through the General Directorate of Energy Efficiency and Sustainability and with support from the UREP-PRESEM) would continue bearing the overall responsibility for monitoring the project's results, as established in the PRESEM's PAD and in the AF Project Paper. In addition to the resources already allocated under Component 1, subcomponent 1(d) would include further fund M&E tasks.

XI. Annex 4: Sectoral Review of the Health and Education Sectors in Mexico

A. Introduction

1. EE is a cost-effective way for public entities to better manage energy consumption. The tightening of government budgets and the need to continue increasing access to health-care and secondary education[75] and to adequately serve the country's increasing population (including through upgrades of the country's public health and education installations, which have suffered from lack of maintenance) all call for the consideration of options and measures to enhance energy efficiency in the energy consuming public sectors. As schools and hospitals are the public buildings with the highest energy consumption in the country (Figure A.4.1) and given estimates of large untapped EE potential in Mexico' schools and hospitals,[76] energy efficiency improvements would result in budgetary savings for public entities, which could be used to fund other priorities. Furthermore, improving EE in schools and hospitals can help improve comfort levels for patients, staff and students, expand services provided and create a demonstration effect on the viability of EE investments along with benefits of EE – especially in schools, where EE projects can be linked to education programs to raise awareness and increase understanding of clean energy and energy efficiency and to also seize the opportunities brought by green jobs associated with EE investments.

Figure A.4.1: Energy Consumption in Mexican Buildings[77]



Source: Centro Mario Molina, Sustainable Buildings Sectoral Study, 2012

2. As was the case for the municipal public sector, EE opportunities in public health and education sectors in Mexico have remained largely untapped due to a number of barriers, which include a lack of information and awareness, low technical and implementation capacity, misaligned incentives, restrictive budgets and procedures and lack of access to

[75] In 2014, public expenditures in the country's education and health sectors represented 3.7 and 2.7 percent of GDP respectively (World Bank, 2016).
[76] Energy efficiency studies commissioned by SENER in 2015 estimate that there is an energy savings potential of 22 to 26 percent of total electricity consumption for schools and of about 29 percent for hospitals. Assessments carried out by FIDE, as well as others, have confirmed the existence of significant EE potential.
[77] 2012. Centro Mario Molina. Sustainable Buildings Sectoral Study.

financing for EE investments. Through the PRESEM's innovative operational and financing mechanism, which will cover the upfront cost of EE investments, combined with EE expertise of FIDE and SENER, as well as capacity building and awareness raising support, this AF is designed to help overcome the barriers that have been impeding energy efficiency in schools and hospitals.

B. The Education Sector

Context

3. Mexico's education sector consists of close to 260,000 education facilities catering to more than 36 million students. The majority of schools (83 percent) are in the public domain and attend to almost 87 percent of the country's student population. The education system is divided into three main levels plus training for professional crafts: (i) "*educación básica"* (basic education) which includes both primary ("*primarias*", for the first 6 years of children's education) and secondary schools ("*secundarias*", for grades 7, 8 and 9); (ii) "*educación media superior*" (high schools) for grades 10, 11 and 12 (including both general and technical high schools); and (iii) "educación superior" (colleges), an include universities, technical colleges, and graduate level institutions.

4. The sector is regulated by the federal Ministry of Education (*Secretaría de Educación Pública*, SEP), and is mostly decentralized. State governments manage most public schools in the country, while SEP controls roughly 10,000 public schools: 4,000 in Mexico City, where the education sector has not been decentralized, and 6,000 throughout the country (mostly technical high schools and colleges).

5. The SEP-managed schools located in Mexico City (which include primary and secondary level schools, as well as teacher's education facilities) are supervised by the Federal Administration for Educational Services in the Federal District (*Administración Federal de Servicios Educativos del Distrito Federal*, AFSEDF). The remaining 6,000 SEP schools are under the Ministry's direct responsibility through its Directorates for (i) Farming Technology Education, (ii) Industrial Technology Education, (iii) Work Training Centers; and (iv) Science and Technology of the Sea (*Dirección General de Educación Tecnológica Agropecuaria, Dirección General de Educación Tecnológica Industrial, Dirección General de Centros de Formación para el Trabajo,* and *Dirección General de Educación en Ciencia y Tecnología del Mar*. The National Institute of Physical Infrastructure for Education (*Instituto Nacional de la Infraestructura Física Educativa*, INIFED) supports SEP and oversees maintenance and construction of schools.

6. Studies have pointed to the lack of investment and maintenance in public schools over many years. In 2015, the government launched a national program to improve the quality of education facilities, "*Escuelas al Cien*" (*Certificados de Infraestructura Educativa Nacional*, National Education Infrastructure Certificates), focusing in the first instance in ensuring that the most schools have basic services, including water and sanitation, roofing, electricity and adequate lighting.[78] As the program has only targeted around 10,000 schools per year (out of the approximately 200,000 public basic schools in the country), more needs to be done to compensate years of neglect and to help manage costs. In terms of energy consumption, some key differences emerge between schools resulting from diverse characteristics (such as size of school and whether the school has one or two shifts per day), as well as climate zone and education level.

[78] See for example, March 31, 2016 press release from Government of Mexico announcing agreement with CFE that would bring electricity services, principally lighting, to all schools in Mexico. The Minister of education, Aurelio Nuno Mayer, stressed that within the framework of Escuelas al CIEN, electricity would reach the estimated 10.4% Mexican schools without electricity. (https://www.gob.mx/sep/prensa/comunicado-140-tendran-energia-electrica-todas-las-escuelas-del-pais-en-el-marco-del-programa-escuelas-al-cien-nuno-mayer)

7. According to the SENER 2015 study on Energy Efficiency in Basic-level Schools,[79] the national weighted average energy consumption of primary schools is estimated to be about 935 GWh per year representing an estimated annual energy bill of US$118 million (i.e., average of about $1,230 per primary school). In the case of secondary schools, the national weighted average energy consumption is estimated to be about 730 GWh per year representing an estimated energy bill of US$ 92 million per year (i.e., an average of approximately US$2,500 per secondary school). That same 2015 study estimates the energy efficiency potential in basic schools ("*primarias*" and "*secundarias*") is about 25 percent.[80] FIDE assessments indicate that the EE potential in technical high schools and colleges could reach 35 percent.

8. The project will focus on the SEP-managed schools as it offers a workable sample of schools under one same management that can be targeted by the loan. The loan funds are insufficient to address energy efficiency in all Mexican schools. At the same time, there is a need to roll-out a more aggregated and standardized approach to limit transaction costs per school and reach some scale (given the limited amount of investment potential in each school). The idea is that by focusing on SEP schools, it will help create such approach, which could be later deployed elsewhere. Moreover, electricity payments for the approximate 10,000 SEP-managed schools – which represented a consumption of about 8.5 GWh in 2017 – are centralized (with the electricity bill listing the consumption for each individual education facility), and SEP has an agreement in place with the electric utility (CFE) providing it with flexibility (i.e., more time) to effectuate the full payment of its electricity bills, as it is not always able to pay in full its monthly electricity bill due to budget rigidities/constraints. This centralized payment system along with the absence of unmanaged outstanding debt with the electric utility makes the SEP-managed schools well-suited for the operational and financing mechanism established under the PRESEM.

9. The interest of management of *Dirección General de Educación Tecnológica Industrial* (DGETI), responsible for technological and industrial education, in the elaboration and development of education and training programs on clean energy (including energy efficiency) and climate change, offers good opportunity for synergy and leverage of the AF's EE activities, through for example, practical training and demonstration projects, including targeting girls.

Schools' Characteristics and Current Situation

10. Of the roughly 4,000 schools managed by ASEDF (basic – primary and secondary – education centers in Mexico City), most are old and would greatly benefit from upgrades, including through energy efficiency. A majority does not comply with the Ministry of Labor's ("*Secretaría del Trabajo y Previsión Social*" mandatory regulations on lighting quality nor do they follow INIFED's (voluntary) guidance on energy use (which calls for the use of PV systems, solar water heaters and light colors in all buildings). The AF would consider about 600 ASEDF-managed elementary schools.[81] Further details can be found in Table A.4.2.

11. The remaining 6,000 SEP-managed schools are comprised of 4,000 technical high schools and 2,000 technical colleges, located throughout the country. Approximately half of these technical education facilities are located in humid and warm climate areas where energy consumption is higher, due in large part to the use of air conditioning (in contrast,

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[79] The study includes both private and public basic schools. Based on energy audits in a sample of schools, it extrapolates to the entire Mexican school population.

[80] In July 2017, Dr. Irma Gomez, the SEP Oficial Mayor, informed that the mini project in 2 public schools resulted in a reduction of energy efficiency consumption of 22% and 32% respectively, consistent with the results from the 2015 SENER studies.

[81] The AF would exclude schools participating in the "*Escuelas al Cien*" program and the schools that of government's list for reconstruction following the September 2017 earthquakes. These 2 initiatives are expected to touch about half of the city's public schools.

none of the elementary school in Mexico City use or require A/Cs). Overall, these facilities are, on average, about 40 years old, and have been built, particularly the public high schools, according to similar, modular, plans and designs. It is expected that the AF project would include EE investments in about 200 high schools (*media superior*) and 100 colleges (*superior*). Table A.4.2 showcases characteristics of SEP and ASEDF schools by climatic region.

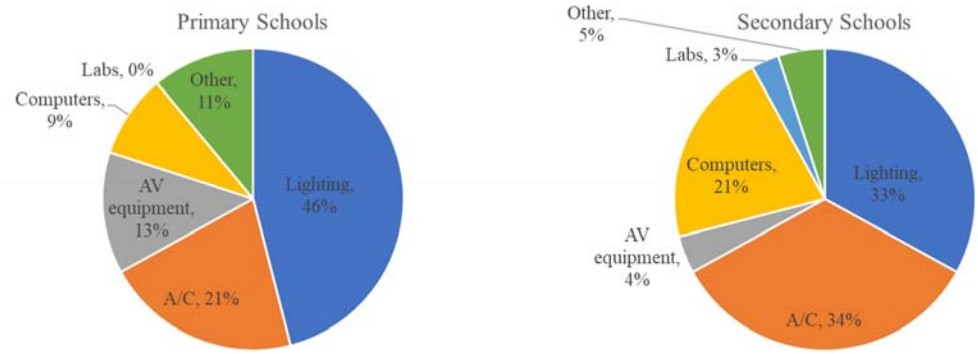
Table A.4.2: Universe of Public Schools to be considered under the Project by Climatic Region

	Schools (#)	**Buildings (#)**[82]	**Power consumption (kWh)**	**Power expenditures (MXN$)**	**% in warm climate regions**	**% in mild climate regions**
SEP schools	2,238	1,716	289,567,760	733,300,916	72	28
Technical high schools	1,794					
Technical colleges	444					
Average consumption per school			129,387	427,332		
AFSEDF schools	4,314	2,024	102,425,964	350,032,800	0	100
Basic (primary)	2,033	1,333				
Basic (secondary)	825	513				
Other	1,456	859				
Average consumption per school			**23,743**	**172,941**		
TOTAL	**6,552**	**3,740**	**391,993,724**	**1,083,333,716**	25	75

12. The largest EE opportunity in primary and secondary schools in Mexico City will be found in improvements to current lighting systems, based on FIDE's assessments (which confirm the findings of the SENER 2015 study). As Table A.4.3 shows, lighting represents about 60 percent of Mexico City basic schools' electricity consumption. The replacement of current inefficient lighting with LEDs would represent an increased energy efficiency lighting of about 30%. In terms of the impact of such EE lighting intervention on primary schools' overall electricity consumption (as schools also consume electricity for other uses, see Figure A.4.2) it is estimated to be in the order of an 18 percent reduction. Furthermore, it is estimated that PV systems could be installed in about half of targeted schools (as they would have enough roof space) and could generate electricity to supply about 20 percent of their electricity consumption, and thus lower their electricity bills accordingly. Overall, savings of grid connected electricity per elementary school could reach 38 percent.

[82] There may be more than one school per building.

Figure A.4.2: Electricity consumption by technology in basic schools in Mexico



Source: SENER (2015)

13. In addition, the SEP authorities have expressed interest in also using the opportunity offered through the PRESEM to upgrade the EE in the schools to do a more "integrated" project. Under such approach, investments would generate EE improvements in the facilities, as well as contribute to increased safety and security, comfort and quality of learning environment (e.g., through increasing illumination levels-, installing light sensors, and upgrading/securing electrical installations). The AF will thus elaborate EE investment packages that offer such integrated approach within the space created by energy savings. Specifically, the project would consider increasing the schools' lighting service (as many schools, in particular primary and secondary schools, currently do not meet the relevant Mexican norms and standards for lighting),[83] which affects the comfort and the adequacy of the learning environment for children, as well as safety (through, for example, lighting in previously unlit hallways and lighting with sensors – which would contribute to both EE and safety). SEP is also interested in the opportunity to upgrade its (often deficient) electrical installations with measures such as electric protections and cabling, which bring safety and sustainability benefits but no inherent energy savings. According to the initial assessments carried out by FIDE, net energy savings (compared to current insufficient lighting situation) could still be achieved in many cases even after increasing the lighting service currently provided. Should expenditures associated with increased services outweigh the energy savings in some cases, SEP will need to authorize higher energy service payments in future years[84] associated with higher lighting levels for schools in this situation (which could be accommodated within the ESA framework).- On an aggregated basis, however, the bundling of EE investments in schools will be such that energy savings overall (for the entire bundle) would comply with the project's energy savings requirements of at least 20 percent – and SEP would still benefit from an overall reduction its electricity bill.

14. Moreover, for each education facility considered for an EE investment under the AF, a structural assessment would be performed (where it is not available). This would ensure that AF investments are undertaken in structurally

[83] Such as the "*NORMA Oficial Mexicana NOM-025-STPS-2008, Condiciones de iluminación en los centros de trabajo*" (lighting conditions in working environments).

[84] The team has discussed with SEP that lighting upgrades requested (e.g. where light and illumination levels are currently insufficient) may increase energy consumption in some schools compared to current levels (as current levels are not providing the necessary service) which may or may not be compensated by energy savings. Increasing the energy service would have implication for the definition of the baseline as both baseline and project energy consumptions should be based on the same level of energy service. This could be accommodated in the ESA, through an agreement with SEP on the adjusted baseline energy consumption. Practically, this may imply that SEP would see the consumption of energy for some schools increase compared to current consumption – but with energy efficient equipment installed through the project, the increase would be lower than otherwise would be the case. Essentially, the project would thus provide energy efficiency, as well as greater energy services to schools that need it.

sound facilities, thereby providing assurance of the sustainability of the investment. Table A.4.3 summarizes the EE interventions to be implemented in targeted basic education centers.

Table A.4.3: Electricity Consumption and EE measures in Basic Schools in Mexico City

Subproject type	Targeted Schools / Facilities (#)	Efficient lighting interventions impact (%)	PV systems interventions Impact (relative to purchased electricity) (%)	Other measures (relative to current electricity consumption)	Approximate average cost (USD$)	Average savings (%) (relative to purchased electricity
1. Primary and secondary schools	300	18	20	Electrical installations; Improved lighting (+25%)	16,000	38
2. Primary and secondary schools (with insufficient roof space for PVs)	300	18	None	Electrical installations; Improved lighting (+25%)	5,500	18

Source: Own elaboration based on FIDE assessments

15. Regarding technical high schools, FIDE's assessment suggests that energy savings could be achieved with energy efficient lighting and PV measures (Table A.4.4). In addition, it is estimated that energy savings associated with more energy efficient cooling, from the replacement of old and inefficient A/C equipment, would be feasible in some of the schools schools located in warm and humid climate regions. Such intervention would reduce a school's overall power consumption by 18 percent, as A/C uses typically represents roughly 50 percent of a technical schools' electricity bill and new EE equipment typically offers an improvement in efficiency of 35 percent. However, as lighting represents a smaller share of overall energy consumption – when A/C is present– LED replacements would contribute to reduction of overall electricity consumption by the school (with ACs) of about 9 percent. Additional comfort and safety improvement measures would be considered where needed to comply with lighting standards and to rehabilitate defective electrical installations. Structural assessments would be carried out (where none are available).[85]

Table A.4.4: Electricity Consumption and EE measures implemented in Technical High Schools in Mexico

Subproject type	Targeted Schools / Facilities (#)	Efficient lighting interventions Impact (on total electricity consumption) (%)	PV systems interventions Impact (relative to purchased electricity) (%)	Other measures (relative to current electricity consumption) (%)	Approximate Average cost (USD$)	Average savings (%) (relative to purchased electricity
1. Technical high schools in mild climate regions	100	18	20	Improved lighting (+25%)	78,000	38
2. Technical high schools in warm climate regions	100	9	20	A/C: 18% Improved lighting (+25%)	122,000	47

[85] Most public high schools are expected to have robust structures, as they also serve as public shelters during disasters.

16. In terms of technical colleges, current electricity consumption and potential EE improvement measures are presented in Table A.4.5. As in the case of technical high schools, measures that could be implemented in these facilities would include: LEDs, solar PV systems and installing energy efficient A/C equipment in some of these schools. The impact of such interventions would be similar to those for technical high schools (mentioned above). Similarly, comfort and safety improvement interventions could be implemented. A structural assessment would be performed for all targeted buildings (if not available).

Table A.4.5: Electricity Consumption and EE measures to be implemented in Technical Colleges in Mexico

Subproject type	Targeted Schools / Facilities (#)	Efficient lighting interventions Impact	PV systems interventions Impact (relative to purchased electricity) (%)	Other measures (relative to current electricity consumption) (%)	Approximate Average cost (USD$)	Average savings (%) (relative to purchased electricity)
1. Technical colleges in mild weather regions	50	18	20	Improved lighting (+25%)	215,000	38
2. Technical colleges in warm weather regions	50	9	20	A/C: 18Improved lighting (+25%)	474,000	47

C. The Health Sector

Context

17. The Mexican health sector is comprised of three major sub-systems: social security,[86] social protection[87] – both forming part of the public component of the sector – and the private system, and includes more than 26,000 health facilities. The Mexican health facilities, located throughout the country, are categorized in three general levels (Table A.4.3). The project proposes to focus on public Level 2 and Level 3 facilities given their greater energy consumption, higher energy bills and greater potential for energy efficiency. Individually, they also serve larger shares of the population.

Table A.4.3: Health Facilities per Type

Level: Basic ambulatory medical care. Mostly focusing on disease prevention, basic san rotection.	21,849 (83%)
nd Level: External consultations and/or hospitalization in four basic medical specialties: g ry, internal medicine, gynecology-obstetrics and pediatrics.	4,329 (16%)
level: Specialized medical units with specialized personnel and which carry out highly co cal procedures (in addition to investing in research and development activities and trai n resources.	156 (1%)
Total	**26,334**

[86] Social security schemes are compulsory for formal salaried workers, and different schemes cover different types of employment.
[87] *Seguro Popular* is the main pillar of the Social Protection System in Health (*Sistema de Protección Social en Salud*). It was designed to universalize health insurance by making coverage available to all citizens not already covered by a social security scheme. The Seguro Popular benefits an estimated 40-45% of the population.

18. While health outcomes in Mexico have improved significantly over the past several decades, they remain lower than those of comparable countries in Latin America and far below OECD averages. Health spending as a share of GDP and healthcare utilization rates have also grown rapidly in recent years (World Bank 2016). In general, studies indicate that the conditions of the health system and hospitals in Mexico are not optimal (SENER 2015). Among the challenges for Mexico's health sector is not only to provide health coverage to its citizens (through the *Seguro Popular),*[88] but also to provide the necessary infrastructure to be able to attend to the demand for health services. While public resources dedicated to satisfying the demand for health services in the country have increased (as a share of the country's GDP), they remain inadequate.[89] Moreover, as the population increases, it is expected that the demand for health services will continue to grow, putting further pressure on the sector.

19. The Ministry of Health (*Secretaría de Salud*, SSA) is the governing body at the public health policy level and oversees the country's public health system. The SSA is responsible for the social protection part of the country's health system and is also the operator, through the Coordinating Commission of National Institutes of Health (CCINS) of 28 mostly level 3 hospitals[90] (several highly specialized facilities, with training, research and medical care vocations) that are accessible to all Mexicans and are the only ones serving the population without social security. CCINS estimates that each SSA-managed hospital spends roughly MXN$1 million (about US$55,500) per month in electricity. Electricity payments are centralized for the six federal hospitals directly managed by SSA,[91] while the other facilities under SSA's authority manage their electricity bills individually. Given their service to Mexican society's poorest and most vulnerable, combined with their EE potential (which could create much needed budget space to satisfy other needs), and the existence of centralized payments for the electricity bills, SSA health facilities are proposed to be considered under the AF.

20. To complement the SSA-run public health facilities and to constitute a larger universe of potential cost-effective EE investment opportunities, the project proposes to also consider the Mexican Social Security Institute (*Instituto Mexicano del Seguro Social*, IMSS)-run facilities. IMSS, a federal entity affiliated to the Ministry of Health, is the oldest public health care provider in the country, attending to Mexicans in salaried private (formal) employment and their families (a total of about 63 million people, representing about 50% of the population). Its budget represents 45 to 47 percent (the largest portion) of Mexico's total federal annual allocation for healthcare expenditures. The IMSS-run hospitals are deemed well suited for the PRESEM operational and financing mechanism, given the large size of some of its about 300[92] level 2 and 3 hospital (some of which are among the largest in Latin America), its large electricity bill (about US$2.16 million per month), an attractive EE potential (potentially reaching 40 to 50 percent of hospitals' electricity consumption), no debt with CFE and the existence of a centralized electricity payment system (which is expected to reduce the burden and time needed for putting in place the institutional arrangements needed for the project's ESAs – see Annex 3 for further details).

[88] With the introduction of Seguro Popular in 2004, some 50 million Mexicans previously at risk of unaffordable health care bills have gained access to health insurance (OECD 2016).
[89] In its 2016 review of Mexico's system, the OECD's assessment is that the level and sustainability of health system funding remains far from optimal.
[90] The whole of these SSA-run hospitals represents a total of about 5,000 beds divided among 13 National Institutes of Health, 6 Federal Hospitals, 6 regional hospitals (Oaxaca, Ixtapaluca, Yucatán, Ciudad Victoria, Bajío, and Chiapas), 3 psychiatric hospitals, and several national centers (blood transfusion, etc.)
[91] Even though SSA's network includes the other hospitals previously mentioned, these are mostly autonomous in terms of day-to-day operations.
[92] The IMSS network also includes 1,506 Level 1 medical units.

21. EE potential in Mexican hospitals can also be found within their use of fossil fuels (mostly used for steam generation). For example, energy audits conducted in Mexico City hospitals have confirmed the economic EE potential that could be achieved through improved fuel used measures. Such audits showcase that measures such as fuel switching, boilers' replacement, installation of solar water heaters and other interventions could result in energy savings of roughly 40 percent and financial savings around 60 percent.[93] Tapping into such options would also be considered if they can be integrated within the PRESEM's ESA scheme.[94]

Hospitals' Characteristics and Current Situation

22. As mentioned before, SSA manages 28 large, level 3 hospitals in Mexico City while IMSS owns and operates 283 levels 2 and 3 facilities throughout the country. Roughly 57 percent are located in warm and humid climatic regions, which drive their higher energy consumption.

23. Similar to schools, Mexican public hospitals have electricity savings opportunities in lighting, PV systems and A/C equipment improvements, as shown in table A.4.4, with overall potential significantly affected by their climate zone. Potential savings in hospitals' overall electricity consumption associated with each EE intervention are estimated to be: 18 percent for lighting in mild weather areas (and 9 percent in warm regions), 20 percent for PV systems (in all areas), and 18 percent for A/C (only in warm regions). Unlike primary schools in Mexico City, no need for increases in the lighting or A/C service (compared to current levels) is foreseen. Like the case of schools, structural assessments of hospitals would be performed (where not available).

Table A.4.4: Electricity saving measures in Hospitals in Mexico

Subproject type	Targeted health Facilities (#)	Efficient lighting interventions Impact (on total electricity consumption. %)	PV systems interventions Impact (relative to purchased electricity)	Other measures (relative to current electricity cons. %)	Approximate average cost (USD$)	Average savings (%) (relative to purchased electricity
1. Hospitals in mild weather regions	11	12	10	7	1,000,000	29
2. Hospitals in warm weather regions	20	3%	10	A/C: 19	1,900,000	32

24. It is estimated that about two of the hospitals could initially be considered by the project would also include EE measures in their use of fossil fuels (which would also lead to greater GHG reductions compared to electricity savings, given their higher Global Warming Potential). Table A.4.5 summarizes the results from diverse energy use assessments carried-out in large hospitals and which have informed this project. Expected measures to be implemented would include: replacing fuels used (e.g., from diesel to natural gas if available), which could reduce fuel expenditures by 23 percent;[95] installing solar water heaters, which could achieve financial savings of 10 percent; and other measures

[93] Financial savings are larger than energy savings as some measures (such as fuel substitution) would not necessarily reduce energy consumption, but would reduce expenditures given the lower price of certain fuels (e.g. LP gas and natural gas are cheaper – per GJ – than diesel).
[94] Unlike electricity payments, there are no centralized systems for payments of hospitals' fossil fuel consumption.
[95] This figure does not take into account changes in the cost of fuel storage.

(such as repairs to tubes, reducing excess combustion, recuperating waste heat, and providing overall maintenance to existing systems) that could reduce expenditures by an additional 28 percent. Overall, all these measures, if can be included in the ESA framework, could reduce a typical hospital's fossil fuel bill by about 60 percent.

Table A.4.5: Fuel Consumption measures implemented in Hospitals in Mexico

Subproject type	Fuel switching interventions impact (%)	Solar water heaters interventions impact (%)	Other measures* (%)	Approximate average cost (USD$)	Average fuel savings (%)
1. Hospitals in mild weather regions (w/ thermal)	0 (energy) 23 (expenditures)	10	28	600,000	38 (energy) 61 (expenditures)
2. Hospitals in warm weather regions (w/ thermal)	0 (energy) 23 (expenditures)	10	28	240,000	38 (energy) 62 (expenditures)

Furthermore, the project may consider other technologies , such as co-generation in the case of significantly large hospitals (with an annual power consumption of over 7 GWh) and located in areas with a natural gas distribution network, and possibly heat pumps. It is estimated that co-generation may consider co-generation in 2 hospitals. Co-generation measures implemented in a hospital are estimated to cost in the order of US$575,000 and lead to a reduction of 50 percent of electricity bills and of about 26 percent of total energy cost.

XII. Annex 5: Economic and Financial Analyses

1. The new activities proposed will have a clear development impact and generate economic benefits from the beginning and will result in sizeable economic and financial benefits at both the local and national levels. These activities will help expand the scope of the operation to new sectors, scale-up the project by lowering the risks taken by FOTEASE and help establish a mechanism that can help build confidence on the implementation of municipal energy efficiency measures and ESAs. The GEF-supported facility would also have a spillover effect by ensuring a continuous flow of funds to establish the revolving fund for energy efficiency investments.

2. IBRD's support provides strong value added to Mexico's overall EE agenda, by mobilizing additional resources. These include the original US$100 IPF, the new AF loan, co-financing from AFD, the GEF grant and the counterpart funding in part unleashed due to the Bank's facilitation of innovative financing mechanisms for EE. In addition, the policy support provided under PRESEM's Component 1 (and new subcomponent 1.d) could also help mobilize private investors, which could in the future participate in the project by offering commercial financing for ESAs.

3. The project will continue supporting public entities through policy development and institutional strengthening, including municipalities, schools and hospitals (Component 1 and subcomponent 1(d)), municipal EE investments (Component 2), EE investments in schools and hospitals (Component 3), and a new contingency facility for municipalities and water utilities (Component 4). The economic and financial analyses only consider Components 2 and 3.[96] Together, the two components included account for 93 percent of IBRD financing.

4. Initial estimates indicate that public sector facilities have high EE potential due to outdated and high energy-consuming equipment. In the case of municipal and other public facilities, economic benefits comprise of saved energy, associated reductions in carbon emissions, and cost savings due to a reduction in expenditures on O&M (for SLs). Other economic benefits that are not monetized in this analysis include better capacity to design/implement EE programs or the collateral benefit of access to better quality public services. For example, the analysis does not consider improved safety that may accrue because of improved lighting (either in streets or schools), nor does it consider the demonstration effect EE measures may have in public buildings, whether town halls, hospitals or schools. In addition, as energy consumption is an important cost for government agencies – and competes for resources with other demands for public resources-, reducing energy expenditures will create fiscal space to allow municipalities, schools and hospitals (as well as relevant line ministries and agencies) to redirect saved resources towards other priorities.

5. The economic and financial analysis of EE sub-projects (cost-benefit analysis) was done for each subsector. In the case of the investments supported by the original project (public lighting, MB, and water/sanitation), the analyses are being updated to take into account the new eligibility and direct support criteria. In the case of schools and hospitals, new analyses were undertaken following the same logic of the parent project; i.e. drawing on the results of energy audits and/or similar projects implemented in Mexico and which could constitute a typical subproject under the AF. Expected direct emission reductions for each subproject type – over their respective lifetimes–[97] measured in tons of carbon dioxide equivalent (tCO_2e) are included in Table A.6.12 (based on GEF methodologies).

[96] It should be noted that the assessment of benefits associated with Components 2 and 3 are likely to be underestimated, given the analytical constraints associated with benefits that cannot be measured in monetary terms (e.g., improved comfort, learning environment and safety, to mention a few) and/or where information is not readily available.

[97] For this analysis, the economic life of each subproject type is as follows: 8 years for SLs, 10 years for OOs, and 20 years for MBs, schools and hospitals. Further details can be found in the GHG emission reductions assessment, which is part of the project files.

6. The economic analysis uses cost estimates for investment and operation and maintenance (O&M)[98] based on similar projects. Costs are adjusted to reflect economic values, excluding taxes and subsidies. Benefits are estimated based on savings to users. The main (quantified) economic benefits from EE investments is the economic value of the saved energy, the associated reductions in carbon emissions, as well as savings in O&M expenditures in the case of public lighting. The main economic costs are the capital investments. Based on the analysis performed, all subprojects are economically viable.

7. The main financial benefit of the EE investments, as assessed for the original PRESEM investments, is the reduction in the energy bills. The financial costs of EE investments are the capital investments. Direct financial support is provided to ensure that subprojects' payback periods are within one mayoral terms (for SLs, OOs and MBs) or within five years (for schools and hospitals). The analysis shows that all subprojects are viable according to this definition once the proposed direct support is considered.

A. Updated results for SLs, OOs and MBs

8. Overall the economic and financial analyses for these three municipal sectors remain valid, This paper only updated expected subprojects' results based on the new eligibility and direct support criteria, as well as lessons learnt through implementation (such as the smaller size of subprojects). In addition, expected results for these sectors now would consider indirect climate benefits linked to the parent Project that would be reported to GEF (this issue is discussed later in the Annex). Furthermore, emission reductions are now being estimated over a 20 years' lifetime for MBs, 10 years for OOs and still over an 8 years' lifetime for SLs.[99] Further details on updated expected results are presented in Table A.5.16. Further details by technology are presented below.

Public Street Lighting

9. The assumptions made for SL subprojects remain unchanged. A typical 20,000 light-points subproject was used for the original PAD analysis. Based on the lessons learnt from the first subprojects prepared, it is now expected the average size of subprojects would include roughly 10,000 light-points. The original analysis considered a direct support of 70 percent, which remains valid. As the only changes to these subprojects would be in the smaller size of the average sub-project, the replication effects (which are discussed below for the overall project) and expected results would now be reduced accordingly, as shown in Table A.5.1.

[98] O&M savings apply to the SL sector only, as savings in O&M are difficult to quantify for buildings (municipal, schools or hospitals) and water and wastewater sector.

[99] As pumps and air conditioning equipment have a lifetime of at least 10 years, PV systems' lifetime can reach 20 years and street lights have a lifetime of approximately 8 years.

Table A.5.1. Expected Results for Typical SL Subproject

		Street Lighting				
Key assumptions	**unit**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**
Current energy use	kWh / year	8,784,000	8,784,000	8,784,000	8,784,000	8,784,000
Price of electricity - (average price)	US$ / kWh	0.18	0.18	0.18	0.18	0.18
Social cost of carbon	US$ / tCO2e	30.0	30	30	30.0	30
Direct support	%	0%	70%	0%	50%	70%
Period of analysis	years	8	8	8	8	8
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%
Summary of results						
Total project investment	US$	5,049,300	5,049,300	4,352,845	5,049,300	6,059,160
Total project revenues (savings)	US$	6,435,846	6,435,846	6,037,747	6,435,846	5,148,677
Cost of support	US$	na	3,534,510	na	2,524,650	4,241,412
Energy savings	%	44%	44%	44%	44%	35%
Energy savings	kWh	30,842,389	30,842,389	30,842,389	30,842,389	24,673,911
Emission reductions	tCO2e	13,879	13,879	13,879	13,879	11,103
NPV	US$	-92,951	3,241,492	314,906	2,288,794	2,021,575
IRR	%	6%	48%	8%	26%	30%
Payback period	years	7.0	2.1	5.8	3.5	3.1

Water Utilities

10. As in the case of SL subprojects, the overall assumptions made for investments with OOs continue unaffected. The same types of subprojects are being considered, and the features originally considered for the analyses are still valid. The change to the direct financial support ceiling (i.e., up to 70 percent) would not have an impact on subprojects' results, but would improve financial conditions and thus make it more acceptable for OOs. Given the change in subprojects' lifetime, updated overall results are shown in Table A.5.2.

Table A.5.2. Expected Results for Typical OO Subproject

		Water Utilities				
Key assumptions	**unit**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**
Current energy use	kWh / year	30,750,000	30,750,000	30,750,000	30,750,000	30,750,000
Price of electricity - (average price)	US$ / kWh	0.11	0.11	0.11	0.11	0.11
Social cost of carbon	US$ / tCO2e	30.0	30	30	30.0	30
Direct support	%	0%	70%	0%	50%	70%
Period of analysis	years	10	10	10	10	10
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%
Summary of results						
Total project investment	US$	4,176,000	4,176,000	3,600,000	102,313	102,313
Total project revenues (savings)	US$	11,641,627	11,641,627	10,723,770	134,424	107,539
Cost of support	US$	na	2,923,200	na	51,157	71,619
Energy savings	%	21%	21%	21%	21%	17%
Energy savings	kWh	64,036,875	64,036,875	64,036,875	64,036,875	51,229,500
Emission reductions	tCO2e	28,817	28,817	28,817	28,817	23,053
NPV	US$	4,029,988	6,787,724	4,049,800	5,999,799	4,957,424
IRR	%	23%	84%	27%	51%	56%
Payback period	years	4.1	1.2	3.4	2.1	1.9

Municipal Buildings

11. Overall conclusions made for municipal buildings' investments also remain unchanged, but parameters have been updated based on lessons learnt during parent project implementation. Pilot projects have shown that power consumption in municipal buildings is considerably lower than that expected prior to implementation, the size of a

typical subproject (which would include a bundle of buildings) would be one third of what was originally planned. The pilots have also resulted in lower saving than expected, due to lower operations hours. Furthermore, changing the direct support to a limit of up to 70 percent would not have an impact on subprojects' results; but it would improve financial assessment for municipalities, and enable the integration of solar PVs in more projects, something both national and sub-national counterparts are very keen to include. Considering the changes to subprojects' lifetime and considering insights from implementation, updated overall results are shown in Table A.5.3.

Table A.5.3. Expected Results for Typical MBs Subproject

		Municipal Buildings				
Key assumptions	**unit**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**
Current energy use	kWh / year	859,005	859,005	859,005	859,005	859,005
Price of electricity - (average price)	US$ / kWh	0.10	0.10	0.10	0.10	0.10
Social cost of carbon	US$ / tCO2e	30.0	30	30	30.0	30
Direct support	%	0%	70%	0%	50%	70%
Period of analysis	years	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%
Summary of results						
Total project investment	US$	412,825	412,825	355,884	230,231	230,231
Total project revenues (savings)	US$	708,946	708,946	619,403	443,346	354,677
Cost of support	US$	na	288,978	na	115,115	161,161
Energy savings	%	38%	38%	38%	38%	30%
Energy savings	kWh	5,557,762	5,557,762	5,557,762	5,557,762	4,446,210
Emission reductions	tCO2e	2,501	2,501	2,501	2,501	2,001
NPV	US$	17,997	290,617	38,247	212,725	185,759
IRR	%	23%	34%	8%	19%	22%
Payback period	years	10.2	3.1	8.0	5.1	4.6

B. Economic and Financial Analysis for Schools and Hospitals

12. The economic and financial analyses for the new targeted sectors (schools and hospitals) are based on assumptions similar to those used under the parent project. The following assumptions apply to all subprojects under both sub-sectors.

- The foreign exchange rate is $18.28 MXN per U.S. dollar;
- All costs and revenues, as well as the discount rate, are net of inflation;
- The social cost of carbon is US$30 per tCO_2e reduced by the project.[100] The cost of carbon is included in the economic analysis but is not considered in the financial analysis, given that the monetization of emission reductions from this project is not currently envisioned;
- The financial analysis is inclusive of taxes and direct support; the economic analysis is exclusive of taxes or direct support;
- The price of electricity varies by subproject type (fluctuates between US$0.12-18 per kWh);[101]
- The discount rate is assumed to be 6 percent, which is used to represent the economic opportunity cost of capital in Mexico and is aligned to the original PRESEM values;[102]

[100] Based on 2014 World Bank guidance note:
http://globalpractices.worldbank.org/climate/_layouts/15/WopiFrame2.aspx?sourcedoc=/climate/Documents/carbon%20pricing%20guidance%20note%20-%207%2015%202015.docx&action=default.
[101] Based on the different tariffs applicable in Mexico.
[102] Based on the 10-year Mexican bond yield as of June 2015:

- Project incremental costs (these are the administrative costs charged by FIDE and CFE for their activities – see Table A.3.1 for further details) are not included as these are charged by FIDE and CFE to SENER;
- The assessment period is 20 years for all types of subprojects, except for those that would not include PV systems;
- VAT is 16% (only considered for the financial analysis);
- Annual inflation is estimated at 3% (based on past performance – INEGI – and forecasts – IMF); and
- The power grid emissions factor is 0.45 per kg/kWh (as published by SEMARNAT and consistent with was have been originally used in the PRESEM analysis);

13. Additional assumptions for certain sectors and interventions include:

- A/C equipment would only be replaced in warm weather regions;
- The lifetime by technology would be: 8 years for lighting; 10 years for A/C; and 20 years for PV;
- The default direct support level is set at the ceiling level, i.e., 70 percent (for the financial analyzes only);
- Energy efficiency investments applied to thermal energy use is only considered for some hospitals (not in schools).

14. The analyses conclude that all subprojects are economically viable. Regarding financial viability, the project seeks to ensure that the subprojects' payback periods are done within five years. This relatively short payback period is achieved through the application of direct financial support. The analysis shows that all subprojects are viable according to this definition once the proposed direct support is considered.

Schools

15. Six types of school where subprojects would be implemented were analyzed, these are: (i) elementary schools in mild weather regions; (ii) elementary schools in mild weather regions (no PV would be installed); (iii) high schools in mild weather regions; (iv) technical high schools in warm weather regions; (v) technical colleges in mild weather regions; and (vi) technical colleges in warm weather regions.

16. The assessments carried out for these facilities considered the following additional assumptions:

- All schools would benefit from improved lighting systems; lighting represents 60 percent of the bill in mild weather regions and 30 percent in warm areas; EE potential associated with lighting system is conservatively set at 30 percent;
- Most schools would also obtain PV systems capable of replacing 20 percent of total electricity consumption currently purchased from the utility; half the targeted basic schools in Mexico City would be excluded from this measure (given their insufficient surface);
- Subprojects in warm regions would include the modernization of A/C equipment;
- A/C accounts for 50 percent of the electricity bill in warm areas and these systems' efficiency could be improved by 35 percent;
- Current lighting levels would be improved to meet national standards. It is assumed that meeting such norms would increase electricity consumption from lighting by 25 percent. The economic analyses have been adjusted for this safety as well as comfort/education environment improvement;

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http://www.tradingeconomics.com/mexico/government-bond-yield.

- Electrical installations would be replaced in all schools; the cost of such intervention would be 50 percent of the cost of lighting investment costs. This will not bring energy savings per se, but will contribute to the sustainability of the investments and safety.

Main findings- base case

17. A summary of the aggregate financial and economic analysis for all schools can be found in table A.5.4. Table A.5.5 show the results for each subproject type.

Table A.5.4. Aggregate economic and financial analysis for schools

Subproject type	# of subprojects	No direct support		With direct support				Direct GHG ERs (tCO2e)	Indirect GHG ERs (tCO2e)
		EIRR (%)	Total cost (USD$ M)	Direct support (%)	Financial NPV (USD$ M)	FIRR (%)	Payback (yrs.)		
Schools	4 (900 fac.)	10%	51,975,200	70%	37,983,600	28%	3.71	240,900	722,600

Table A.5.5: Summary of analyzes results for schools

		Elementary school in mild weather region			Technical high school in mild weather region			Technical college in mild weather region		
Key assumptions	**unit**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**
Buildings' size	m2	700	700	700	4,000	4,000	4,000	10,000	10,000	10,000
Current energy use	kWh / year	61,388	61,388	70,597	181,091	181,091	208,255	407,500	407,500	468,625
Price of electricity - (average price)	US$ / kWh	0.18	0.18	0.18	0.12	0.12	0.12	0.18	0.18	0.18
Social cost of carbon	US$ / tCO2e	30.0	30	30	30.0	30	30	30.0	30	30
Direct support	%	0%	70%	0%	0%	70%	0%	0%	70%	0%
Period of analysis	years	20	20	20	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Summary of results										
Total project investment	US$	34,683	34,683	29,900	102,313	102,313	88,201	230,231	230,231	198,475
Total project revenues (savings)	US$	67,974	67,974	68,158	134,424	134,424	139,344	443,346	443,346	445,084
Cost of support	US$	na	24,278	na	na	71,619	na	na	161,161	na
Energy savings	%	23%	23%	28%	23%	23%	28%	33%	33%	35%
Energy savings	kWh	273,547	273,547	347,213	806,942	806,942	1,024,251	1,815,818	1,815,818	2,304,818
Emission reductions	tCO2e	123	123	156	363	363	461	817	817	1,037
NPV	US$	3,288	26,192	12,485	-25,314	42,251	-16	17,654	169,693	78,489
IRR	%	7%	30%	12%	3%	20%	6%	7%	30%	12%
Payback period	years	11.7	3.5	6.1	17.4	5.2	8.8	11.9	3.6	6.2

		Elementary school in mild weather region (no PV)			Technical high school in warm weather region			Technical college in warm weather region		
Key assumptions	**unit**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**
Buildings' size	m2	700	700	700	4,000	4,000	4,000	10,000	10,000	10,000
Current energy use	kWh / year	61,388	61,388	70,597	285,687	285,687	307,113	896,191	896,191	963,405
Price of electricity - (average price)	US$ / kWh	0.18	0.18	0.18	0.11	0.11	0.11	0.12	0.12	0.12
Social cost of carbon	US$ / tCO2e	30.0	30	30	30.0	30	30	30.0	30	30
Direct support	%	0%	70%	0%	0%	70%	0%	0%	70%	0%
Period of analysis	years	8	8	8	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Summary of results										
Total project investment	US$	12,096	12,096	10,427	148,480	148,480	128,000	465,778	465,778	401,533
Total project revenues (savings)	US$	5,859	5,859	19,956	247,459	247,459	232,116	843,413	843,413	784,291
Cost of support	US$	na	8,467	na	na	103,936	na	na	326,044	na
Energy savings	%	6%	6%	18%	33%	33%	35%	33%	33%	35%
Energy savings	kWh	27,993	27,993	101,659	1,692,407	1,692,407	1,863,819	5,309,035	5,309,035	5,846,750
Emission reductions	tCO2e	13	13	46	762	762	839	2,389	2,389	2,631
NPV	US$	-7,159	828	4,776	-846	97,206	19,640	35,120	342,709	95,574
IRR	%	-13%	12%	17%	6%	31%	8%	7%	33%	10%
Payback period	years	18.4	5.5	4.2	11.5	3.4	7.6	10.5	3.2	7.1

18. Total grid-supplied electricity savings from the subprojects vary between 6 percent for elementary schools (with no PV systems) to 35 percent at technical high schools and colleges in warm weather regions. This significant difference is explained by the fact that the latter start off with a larger energy consumption base and have a larger EE untapped potential. As the only intervention in some elementary schools (in Mexico City) would be lighting (and consumption may even increase due to the current insufficient lighting service provided) – and in some cases PV – the energy savings potential is limited. However, subprojects would still include these types of schools, given the value of the co-benefits provided by an improved lighting service. The schools would be bundled with other school types, and such subprojects would still be within the operation's parameters.

19. The economic analyses also show that subprojects' EIRR would fluctuate between 6 to 17 percent, with paybacks of 4.3 to 8.8 years. EIRRs for all subprojects types are above the project's criteria of 7 percent, reflecting again the significant untapped savings potential in the education sector. The EIRR also reflects the fact that the economic analyzes have been adjusted to consider safety and comfort improvement (and use as an adjusted consumption baseline).

20. The results of the financial analysis without any direct support show expected IRRs may even be negative or below 7 percent and intervention would result in considerable lower NPVs. These rather modest financial returns are a result of the increased lighting service levels – in addition to increased efficiency – (compared to the current situation) to be provided and the important cost of introducing PV systems in most facilities. Considering the low expected financial returns for the sub-projects, direct support is needed to incentivize schools and line agencies to act and achieve a payback period within five years. A direct support of up to 70 percent is proposed to achieve this goal by reducing the upfront capital expenditure costs associated with lighting, A/C and mostly PV technology. The cost of the direct support widely diverges from around $US6,000 (elementary schools) to over US$325,000 (technical colleges) per facility and is explained by the significantly larger size and energy consumption in such facilities. Considering the direct support, NPV would dramatically increase and IRR would be above the 7 percent requirement (and could even go up to 33 percent).

Sensitivity Analysis

21. Sensitivity analyses were also conducted to understand the impact of a worst-case scenario (20 percent higher investment costs and 20 percent lower energy savings) and a 50 percent direct support level. The findings are shown in tables A.5.6.

Table A.5.6. Summary of sensitivity analyzes for schools

		Elementary school in mild weather region		Technical high school in mild weather region		Technical college in mild weather region	
Key assumptions	**unit**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**
Buildings' size	m2	700	700	4,000	4,000	10,000	10,000
Current energy use	kWh / year	61,388	61,388	181,091	181,091	407,500	407,500
Price of electricity - (average price)	US$ / kWh	0.18	0.18	0.12	0.12	0.18	0.18
Social cost of carbon	US$ / tCO2e	30.0	30	30.0	30	30.0	30
Direct support	%	50%	70%	50%	70%	50%	70%
Period of analysis	years	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%
Summary of results							
Total project investment	US$	34,683	41,620	102,313	102,313	230,231	230,231
Total project revenues (savings)	US$	67,974	54,380	134,424	107,539	443,346	354,677
Cost of support	US$	17,342	29,134	51,157	71,619	115,115	161,161
Energy savings	%	23%	18%	23%	18%	33%	26%
Energy savings	kWh	273,547	218,838	806,942	645,553	1,815,818	1,452,655
Emission reductions	tCO2e	123	98	363	290	817	654
NPV	US$	19,648	17,027	22,947	22,219	126,253	109,690
IRR	%	18%	20%	11%	13%	18%	20%
Payback period	years	5.8	5.3	8.7	7.8	5.9	5.3

		Elementary school in mild weather region (no PV)		Technical high school in warm weather region		Technical college in warm weather region	
Key assumptions	**unit**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**	**Base case (w/ 50% subsidy)**	**Investment costs +20% and energy savings -20% (w/ support)**
Buildings' size	m2	700	700	4,000	4,000	10,000	10,000
Current energy use	kWh / year	61,388	61,388	285,687	285,687	896,191	896,191
Price of electricity - (average price)	US$ / kWh	0.18	0.18	0.11	0.11	0.12	0.12
Social cost of carbon	US$ / tCO2e	30.0	30	30.0	30	30.0	30
Direct support	%	50%	70%	50%	70%	50%	70%
Period of analysis	years	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%
Summary of results							
Total project investment	US$	12,096	12,096	148,480	148,480	465,778	465,778
Total project revenues (savings)	US$	5,859	4,687	247,459	197,967	843,413	674,730
Cost of support	US$	6,048	8,467	74,240	103,936	232,889	326,044
Energy savings	%	6%	5%	33%	26%	33%	26%
Energy savings	kWh	27,993	22,395	1,692,407	1,353,926	5,309,035	4,247,228
Emission reductions	tCO2e	13	10	762	609	2,389	1,911
NPV	US$	-1,454	-707	69,191	60,956	254,827	221,438
IRR	%	-1%	2%	17%	20%	19%	22%
Payback period	years	9.2	8.3	5.7	5.2	5.3	4.7

22. In the worst-case scenario, paybacks are between 4.7 to 8.3 years, and NPVs and IRRs also drop, though most subproject types would be within the operation's criteria. This calls for ensuring that the bundles of facilities incorporate different school types that combined can ensure meeting project requirements. Overall, results are still positive and demonstrate the subprojects' financial viability if an appropriate direct support level is set. The reduced direct support scenario shows that financial results would be worse (in terms of NPVs and IRRs), and that payback periods would go over or come close to the limits set by the project's criteria.

Hospitals

23. Six types of hospitals were assessed, these are: (i) hospitals in mild weather regions; (ii) hospitals in warm weather regions; (iii) hospitals in mild weather regions (w/ thermal); (iv) hospitals in warm weather regions (w/ thermal); (v) hospitals in mild weather regions (w/ cogeneration); and (vi) hospitals in warm weather regions (w/ cogeneration).

24. The analyzes for these facilities considered the following additional assumptions:

- All hospitals would benefit from improved lighting systems; lighting represents 60 percent of the bill in mild weather regions and 30 percent in warm areas; the EE potential associated with lighting system is conservatively set at 30 percent;
- Subprojects in warm regions would include the modernization of A/C equipment;
- A/C accounts for 50 percent of the electricity bill in warm areas and systems' efficiency could be improved by 35 percent;
- Thermal EE measures are only considered for hospitals with large diesel consumption;
- Cogeneration measures would only be implemented in hospitals with large electricity consumption, in regions where natural gas networks exist and could replace up to 40 percent of total consumption (larger cogeneration facilities would need to obtain a permit from the Energy Regulatory Commission, which could delay subprojects by several years);
- While PV measures would produce roughly 20 percent of total electricity consumption in schools it would be around 10 percent in hospitals (due to reduced space to install such systems);

Main findings- base case

25. A summary of the aggregate financial and economic analysis for hospitals can be found in table A.5.7. Table A.5.8 summarize results per subproject type

Table A.5.7. Aggregate economic and financial analysis for hospitals

Subproject type	# of subprojects	No direct support		With direct support				Direct GHG ERs (tCO2e)	Indirect GHG ERs (tCO2e)
		EIRR (%)	Total cost (USD$ M)	Direct support (%)	Financial NPV (USD$ M)	FIRR (%)	Payback (yrs.)		
Hospitals	6 (35 fac.)	10%	51,321,100	70%	49,682,800	39%	2.63	394,800	1,184,300

Table A.5.8: Summary of analyzes results for hospitals

		Hospital in mild weather region			Hospital in mild weather region (w/ thermal)			Hospital in mild weather region (w/ cogeneration)		
Key assumptions	**unit**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**
Buildings' size	m2	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Current energy use (power)	kWh / year	4,386,072	4,386,072	4,386,072	4,778,675	4,778,675	4,778,675	8,482,676	8,482,676	8,482,676
Current energy use (diesel)	l. / year	na	na	na	695,450	695,450	695,450	na	na	na
Price of electricity - (average price)	US$ / kWh	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08
Price of diesel - (average price)	US$ / l.	na	na	na	0.65	0.65	0.65	na	na	na
Social cost of carbon	US$ / tCO2e	30	30	30	30	30	30	30	30	30
Direct support	%	0%	70%	0%	0%	70%	0%	0%	70%	0%
Period of analysis	years	20	20	20	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Summary of results										
Total project investment	US$	1,238,333	1,238,333	1,067,529	2,042,690	2,042,690	1,760,940	2,934,113	2,934,113	2,529,408
Total project revenues (savings)	US$	1,914,734	1,914,734	1,709,897	7,830,869	7,830,869	6,559,572	7,866,632	7,866,632	6,296,190
Cogeneration savings	US$	na	na	na	na	na	na	3,254,652	3,254,652	3,254,652
Cost of support	US$	na	866,833	na	na	1,429,883	na	na	2,053,879	na
Energy savings	%	20%	20%	20%	29%	29%	29%	28%	28%	28%
Energy savings (electricity)	kWh	16,053,023	16,053,023	16,053,023	17,489,949	17,489,949	17,489,949	42,582,773	42,582,773	42,582,773
Energy savings (diesel)	l.	na	na	na	4,589,967	4,589,967	4,589,967	na	na	na
Emission reductions	tCO2e	7,224	7,224	7,224	24,097	24,097	24,097	19,162	19,162	19,162
NPV	US$	-34,728	783,039	53,924	2,326,294	3,871,518	2,105,412	1,525,275	3,615,493	1,261,982
IRR	%	6%	33%	7%	19%	94%	21%	12%	56%	13%
Payback period	years	10.2	3.0	7.9	3.7	1.1	2.9	6.3	1.9	5.1

		Hospital in warm weather region			Hospital in warm weather region (w/ thermal)			Hospital in warm weather region (w/ cogeneration)		
Key assumptions	**unit**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**	**Financial analysis (w/o support)**	**Financial analysis (w/ support)**	**Economic analysis (no taxes, no support)**
Buildings' size	m2	20,799	20,799	20,799	20,799	20,799	20,799	20,799	20,799	20,799
Current energy use (power)	kWh / year	8,664,115	8,664,115	8,664,115	6,057,864	6,057,864	6,057,864	8,360,153	8,360,153	8,360,153
Current energy use (diesel)	l. / year	na	na	na	281,650	281,650	281,650	na	na	na
Price of electricity - (average price)	US$ / kWh	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Price of diesel - (average price)	US$ / l.	na	na	na	0.63	0.63	0.63	na	na	na
Social cost of carbon	US$ / tCO2e	30	30	30	30	30	30	30	30	30
Direct support	%	0%	70%	0%	0%	70%	0%	0%	70%	0%
Period of analysis	years	20	20	20	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Summary of results										
Total project investment	US$	2,288,099	2,288,099	1,972,499	1,880,681	1,880,681	1,621,277	2,739,211	2,739,211	2,361,389
Total project revenues (savings)	US$	4,212,144	4,212,144	3,787,667	5,221,601	5,221,601	4,513,257	8,559,075	8,559,075	6,906,222
Cogeneration savings	US$	na	na	na	na	na	na	3,207,642	3,207,642	3,207,642
Cost of support	US$	na	1,601,669	na	na	1,316,477	na	na	1,917,448	na
Energy savings	%	24%	24%	24%	27%	27%	27%	31%	31%	31%
Energy savings (electricity)	kWh	36,086,037	36,086,037	36,086,037	25,231,001	25,231,001	25,231,001	46,189,586	46,189,586	46,189,586
Energy savings (diesel)	l.	na	na	na	1,858,890	1,858,890	1,858,890	na	na	na
Emission reductions	tCO2e	16,239	16,239	16,239	17,926	17,926	17,926	20,785	20,785	20,785
NPV	US$	353,758	1,864,766	498,542	1,177,914	2,499,364	1,156,468	2,142,690	4,101,995	1,811,615
IRR	%	8%	40%	10%	14%	60%	16%	15%	67%	17%
Payback period	years	8.7	2.6	6.7	5.8	1.7	4.5	5.2	1.6	4.3

26. Energy savings, including electricity and fuel savings (when applicable), from the hospitals subprojects would range from 20 to 31 percent. Financial savings would even be higher when considering measures such as fuel switching (which do not result in energy savings *per se*) – although these measures are only expected to be possible in few hospitals. These preliminary results show the significant untapped EE potential in the health sector. Energy savings opportunities could be higher than in schools due to the use of expensive and inefficient fuels (such as diesel). All subprojects would perform within the operation's investment criteria and show that in addition to electricity-related measures, fossil-fuel-related measures (e.g. for steam generation) and cogeneration (when natural gas distribution networks were available) would also be considered.

27. The economic analyses also show that subprojects' EIRR would fluctuate from 7 to 17 percent, with paybacks of 4.3 to 7.9 years, with the lower periods being for subprojects where thermal efficiency measures were included. EIRRs for all subprojects types are above the project's criteria of 7 percent, reflecting significant untapped savings potential in the sector. As in the case of schools, and given the large co-benefits to be derived from EE interventions, activities in hospitals that might individually become short of meeting project criteria could still be considered when they can be bundled with other interventions, so that, together can meet the operation's requirements. The EIRR also reflects the economic benefits associated to reducing CO2 emissions, which dramatically increase when reducing high-GHG emitting fossil fuels consumption.

28. The results of the financial analysis without any direct support show expected IRRs of 6 to 9 percent and considerable lower NPVs. The lower returns reflect the cost of introducing PV systems in all facilities. Subprojects that include both electricity and thermal measures or cogeneration measures present higher results, as such technologies would generate savings

29. The relatively low financial returns highlight the value of providing direct support to improve EE and achieve a payback period within the five year-period considered acceptable for such investments by health authorities, and in line with multi-annual planning processes. A direct support of up to 70 percent is proposed to achieve these goals by reducing the upfront capital expenditure costs associated with planned interventions. The cost of the direct support could go from around $US0.8 million to over US$2 million, with the range explained by the size and interventions in such facilities. Considering the direct support, NPV would dramatically increase and IRR would be above 30 percent in all cases.

Sensitivity Analysis

30. A sensitivity analysis for each subproject type was conducted to understand the impact of a worst-case scenario (20 percent higher investment costs and 20 percent lower savings) and a 50 percent direct support level. The findings are shown in table A.5.9.

Table A.5.9. Summary of sensitivity analyzes for hospitals

Key assumptions	unit	Hospital in mild weather region: Base case (w/ 50% subsidy)	Hospital in mild weather region: Investment costs +20% and energy savings -20% (w/ support)	Hospital in mild weather region (w/ thermal): Base case (w/ 50% subsidy)	Hospital in mild weather region (w/ thermal): Investment costs +20% and energy savings -20% (w/ support)	Hospital in mild weather region (w/ cogeneration): Base case (w/ 50% subsidy)	Hospital in mild weather region (w/ cogeneration): Investment costs +20% and energy savings -20% (w/ support)
Buildings' size	m2	10,000	10,000	10,000	10,000	10,000	10,000
Current energy use (power)	kWh / year	4,386,072	4,386,072	4,778,675	4,778,675	8,482,676	8,482,676
Current energy use (diesel)	l. / year	na	na	695,450	695,450	na	na
Price of electricity - (average price)	US$ / kWh	0.09	0.09	0.09	0.09	0.08	0.08
Price of diesel - (average price)	US$ / l.	na	na	0.65	0.65	na	na
Social cost of carbon	US$ / tCO2e	30	30	30	30	30	30
Direct support	%	50%	70%	50%	70%	50%	70%
Period of analysis	years	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%
Summary of results							
Total project investment	US$	1,238,333	1,238,333	2,042,690	2,042,690	2,934,113	2,934,113
Total project revenues (savings)	US$	1,914,734	1,531,787	7,830,869	6,264,695	7,866,632	6,293,305
Cogeneration savings	US$	na	na	na	na	na	na
Cost of support	US$	619,167	866,833	1,021,345	1,429,883	1,467,057	2,053,879
Energy savings	%	20%	16%	29%	24%	28%	22%
Energy savings (electricity)	kWh	16,053,023	12,842,418	17,489,949	13,991,959	42,582,773	34,066,218
Energy savings (diesel)	l.	na	na	4,589,967	3,671,974	na	na
Emission reductions	tCO2e	7,224	5,779	24,097	19,278	19,162	15,330
NPV	US$	549,391	486,242	2,326,294	3,616,956	3,163,618	2,621,269
IRR	%	18%	21%	19%	57%	34%	37%
Payback period	years	5.1	4.6	3.7	1.8	3.1	2.8

Key assumptions	unit	Hospital in warm weather region: Base case (w/ 50% subsidy)	Hospital in warm weather region: Investment costs +20% and energy savings -20% (w/ support)	Hospital in warm weather region (w/ thermal): Base case (w/ 50% subsidy)	Hospital in warm weather region (w/ thermal): Investment costs +20% and energy savings -20% (w/ support)	Hospital in warm weather region (w/ cogeneration): Base case (w/ 50% subsidy)	Hospital in warm weather region (w/ cogeneration): Investment costs +20% and energy savings -20% (w/ support)
Buildings' size	m2	20,799	20,799	20,799	20,799	20,799	20,799
Current energy use (power)	kWh / year	8,664,115	8,664,115	6,057,864	6,057,864	8,360,153	8,360,153
Current energy use (diesel)	l. / year	na	na	281,650	281,650	na	na
Price of electricity - (average price)	US$ / kWh	0.09	0.09	0.09	0.09	0.09	0.09
Price of diesel - (average price)	US$ / l.	na	na	0.63	0.63	na	na
Social cost of carbon	US$ / tCO2e	30.0	30	30	30	30	30
Direct support	%	50%	70%	50%	70%	50%	70%
Period of analysis	years	20	20	20	20	20	20
Discount rate (net of inflation)	%	6%	6%	6%	6%	6%	6%
Summary of results							
Total project investment	US$	2,288,099	2,288,099	1,880,681	1,880,681	2,739,211	2,739,211
Total project revenues (savings)	US$	4,212,144	3,369,715	5,221,601	5,350,747	8,559,075	6,847,260
Cogeneration savings	US$	na	na	na	na	na	na
Cost of support	US$	1,144,049	1,601,669	940,341	1,316,477	1,369,605	1,917,448
Energy savings	%	24%	19%	27%	22%	31%	25%
Energy savings (electricity)	kWh	36,086,037	28,868,830	25,231,001	20,184,801	46,189,586	36,951,668
Energy savings (diesel)	l.	na	na	1,858,890	1,487,112	na	na
Emission reductions	tCO2e	16,239	12,991	17,926	14,340	20,785	16,628
NPV	US$	1,433,050	1,232,783	1,177,914	2,197,512	3,685,424	3,031,653
IRR	%	23%	26%	14%	37%	40%	45%
Payback period	years	4.3	3.9	5.8	2.9	2.6	2.4

31. In the worst-case scenario paybacks fluctuate between 2.4 to 4.6 years, still within the operation's criteria for sub-project investments (and the bundled approach mentioned before would help bring any interventions within the requirements). Even if NPVs, IRRs and savings would drop by 20 percent, results are still positive and demonstrate the subprojects' financial viability (with an appropriate support level). The reduced direct support scenario shows that financial results would be worse (in terms of NPVs and IRRs) and that payback periods for subprojects in some cases would not be within the limits targeted by the project.

C. Direct and Indirect Emission Reductions Estimates

32. The operation would now report indirect emission reduction from the parent Project municipal sectors to GEF.[103] These indirect ERs would be estimated following a bottom-up approach, which involves multiplying direct emission reductions by a replication factor.[104] A replication factor of 3 has been assumed for an influence period of 10 years in line with GEF guidance. Although Component 3 activities (hospitals and schools) are not supported by GEF resources, a similar methodology was used to estimate ERs in these sectors (for reference only). Table A.5.10 shows expected direct and indirect emission reductions for the overall project (i.e. Component 2 and Component 3).

Table A.5.10. Projected Direct and Indirect Emission Reductions

Subproject type	# of subprojects	Total direct ERs (tCO2eq)	Total indirect ERs (tCO2eq)	Total ERs (tCO2eq)
Street lighting	**16**	**222,065**	**666,196**	**888,261**
Water pumping	**8**	**232,582**	**697,746**	**930,328**
Municipal buildings	**8**	**37,958**	**113,873**	**151,830**
Schools	**4 (900fc.)**	**240,876**	**722,629**	**963,506**
Elementary school in mild weather region	*350*	43,084	129,251	172,335
Elementary school in mild weather region (no PV)	*300*	3,779	11,337	15,116
Technical high school in mild weather region	*100*	36,312	108,937	145,250
Technical high school in warm weather region	*75*	57,119	171,356	228,475
Technical college in mild weather region	*50*	40,856	122,568	163,424
Technical college in warm weather region	*25*	59,727	179,180	238,907
Hospitals	**6 (35fc.)**	**394,766**	**1,184,297**	**1,579,062**
Hospital in mild weather region	*20*	144,477	433,432	577,909
Hospital in warm weather region	*11*	178,626	535,878	714,504
Hospital in mild weather region (w/ thermal)	*1*	24,097	72,291	96,388
Hospital in warm weather region (w/ thermal)	*1*	17,926	53,777	71,702
Hospital in mild weather region (w/ cogeneration)	*1*	13,971	41,913	55,884
Hospital in warm weather region (w/ cogeneration)	*1*	15,669	47,007	62,676
TOTAL	**42**	**1,128,247**	**3,384,741**	**4,512,987**

[103] For further details, please see: Calculating Greenhouse Gas Benefits of the Global Environment Facility Energy Efficiency Projects, Scientific and Technical Advisory Panel, GEF.
[104] The factor seeks to reflect how many times the investments might be repeated during a certain influence period.

XIII. Annex 6: Current Project Status

1. The operation was approved by the World Bank's Executive Board on March 8, 2016 and became effective on September 23, 2016. The project is being implemented by SENER over a five-year period. The operation's closing date is October 31, 2021. No closing date extension is necessary to accommodate the AF or the restructuring. Most project ratings are currently rated as "Satisfactory" (including "Progress towards achievement of PDO", "Overall Safeguards" and "Overall Risk"), while "Overall Implementation Progress" is rated as "Moderately Satisfactory". The Project is progressing well; although disbursements have been slower than originally planned, they will be accelerating, as a robust pipeline of subprojects has been developed and the lessons learned from first pilots have been integrated into the PRESEM procedures.

A. Project Description

2. The PRESEM's original PDO is to promote the efficient use of energy in the Borrower's municipalities by carrying out energy efficiency investments in selected municipal sectors and contribute to strengthening the enabling environment. The original Project included two components:

a. Component 1 – Policy development and institutional strengthening: Seeks to strengthen the enabling environment for energy efficiency at the municipal level, and contribute to the identification of potential subprojects that can feed into a pipeline beyond the project's life; and
b. Component 2 – Municipal energy efficiency investments: Supports cost-effective energy efficiency investments in municipal street lighting, water and wastewater, and municipal building sectors.

3. As will be the case with the AF, overall project coordination and implementation is the responsibility of SENER. The operation channels the loan and counterpart funds through the FOTEASE. SENER leads the implementation of activities under Component 1. The Electricity Savings Trust Fund (FIDE) executes – as 'Operator' – the activities considered under Component 2, for which it has signed an agreement with SENER. FIDE also has an agreement with the Federal Electricity Commission (CFE), through which the utility supports project execution by recognizing energy savings and recovering contributions from municipalities and water and wastewater utilities through electricity bills. Depending on the size and recovery period of each subproject, a "direct support" is provided, which means that no municipality or water utility will have to pay in full the costs of the subproject being implemented. These features are being replicated for the AF.

4. The Project relies in the use of Energy Service Agreements (ESAs), an innovative mechanism to finance energy efficiency projects in the public sector. Under the PRESEM, FIDE and SENER sign ESAs with municipal entities, which agree to continue paying their energy bills (a reduced amount due to the energy efficiency intervention), plus a payment of energy services (representing a portion of the investment costs). Both payments equal the old electricity bill the entity was paying. FIDE then prepares and bids out subprojects[105] on the municipal entities' behalf, CFE continues collecting the energy bill and transfers municipalities or water utilities payments of energy services to FIDE, who subsequently transfers the funds to the FOTEASE for reinvestment in energy efficiency issues (creating a revolving fund). Through this

[105] To be financeable, prepared subprojects need to demonstrate acceptable levels of economic efficiency and energy savings, including: (i) at least 20 percent energy savings; and (ii) economic internal rate of return (EIRR) of at least 7 percent (calculated excluding any direct support).

scheme, beneficiaries do not incur debt and implementation is outsourced to a competent entity (FIDE). The AF seeks to seize the opportunities created by this new mechanism.

B. Overall Progress

5. The Project is progressing, although disbursements have been slow in the first year, due to the inherent time and effort implications of putting in place a new and innovative mechanism involving multiple stakeholders. Significant efforts to date have been dedicated to working with the local governments (many of which have undergone municipal elections). This has contributed to delaying the process of rolling out the PRESEM in municipalities. The operation also faced initial delays related to the establishment of the Project Implementation Unit.

6. However, after having built the necessary foundation, SENER and FIDE have built a robust pipeline of subprojects with Bank support and achieved important milestones, including the launch of the first bidding. As for the setting up of the PIU, recruitments have taken place or are underway. The PIU's procurement, technical, legal, and financial management consultants have been hired as well as the PIU Coordinator. Thus, most project ratings are currently rated as "Satisfactory" (including "Progress towards achievement of PDO", "Overall Safeguards" and "Overall Risk"), while "Overall Implementation Progress" is rated as "Moderately Satisfactory".

7. In the case of Component 1, notable progress has been made in deepening the engagement with CONUEE and their support to implementation of key activities, such as the:

a. Implementation of the energy efficiency diagnostics;
b. Establishment of a "*diplomado*" (certification program) in municipal energy efficiency provided by a Mexican university;and
c. Preparation of ToRs on the development of a mechanism for the implementation of efficiency building codes to be piloted in two cities

8. In the case of Component 2, the Project is progressing, although disbursements have been slow in the first year as noted above. A robust pipeline of ten municipal EE subprojects are now under preparation (at different stages) under the PRESEM. The first bidding process (for street lighting in León) was launched in October 2017, , and another two are expected to be launched in December/January: water pumping with the water utility (Organismo Operador de Agua, OO) in Huamantla and SL in Miguel Hidalgo. The municipal buildings (MBs) sub project in Puebla[106] has suffered delays as a result of the earthquake in September and is now expected to be bid out later in February. The additional 6 subprojects under preparation include: Mérida (MBs), Huajuapan (SL), Cozumel (SL and MB), Pachuca (OO), along with Morelia (OO) and Reynosa (SL) [107]. In parallel, SENER and FIDE are planning the first call for proposals for new sub-projects in December. It is expected that the parent project will support over 20 subprojects with municipal entities until closing.

[106] SENER worked with the National Federalism and Municipal Development Institute (INAFED for its acronym in Spanish) to select 32 municipalities –one in each state of Mexico– where the project will operate.
[107] The sectoral scope of the municipal investments was decided based on the following criteria/considerations: (a) these areas were found to have significant untapped energy efficiency potential in areas that are under the direct control of municipalities or water utilities; (b) the energy savings came from electricity, provided by CFE, which is under SENER's sphere of influence; and (c) the possibility of using energy service agreements (ESAs) which allow municipalities to use electricity savings to partially repay, through the CFE electricity bill, energy efficiency investments (performed by the FIDE).

XIV. Annex 7: World Bank's Energy and Climate Change Engagement with Mexico

1. The World Bank and Mexico have had a long and solid engagement in the energy sector, which includes investment operations and advisory support for EE and other clean energy initiatives. The Low Carbon Development for Mexico (MEDEC) study (FY09) contributed to the launching of several EE operations, such as the Low Carbon Development Policy Loan (FY11) and the Efficient Lighting and Appliances Project (FY10). The latter also supported the preparation of two studies on EE opportunities in the education and health sectors,[108] and established a GEF-financed contingency facility for residential EE measures. Both the studies and the facility have been key in informing the preparation of this and the parallel GEF AF. The Bank also supported SENER in piloting city energy efficiency diagnostics (with ESMAP funding) in two municipalities (León and Puebla) using ESMAP's Tool for Rapid Assessment of City Energy (TRACE), and which the Government then expanded to 30 more Mexican municipalities[109]. This work laid the groundwork for the design of the PRESEM, whose implementation mechanisms are now being used for the additional sectors covered under this FA.

2. The Bank is currently supporting or preparing Mexico in the implementation of additional operations such as:

a. Mexico's participation in the Partnership for Market Readiness (PMR), through which Nationally Appropriate Mitigation Actions (NAMA) on integrated urban mobility systems, domestic appliances and urban services are being designed (FY17).
b. Sustainable Energy Technologies Development Project (FY15), which seeks to improve the institutional capacity of "Advanced Clean Energy" technology institutions and to foster the commercialization of ACE technologies by providing financial incentives (with GEF funding) to the private sector;
c. Energy for Sustainable Agriculture Development (FY18), which seeks to promote the adoption of renewable energy and energy efficiency technologies among agricultural producers.
d. Carbon Capture, Utilization and Storage Project (FY18), under which the Bank has deployed capacity building initiatives to strengthen Mexico's activities on the matter.

3. Table A.7.1 summarizes the Bank's operations with Mexico on energy and related issues, as well as other knowledge and convening services provided by the Bank.

[108] The energy efficiency studies in the health and education sector were prepared in 2015-2016 with support from the GEF financing to the Bank's Efficient Lighting and Appliances Project.
[109] With financing from the GEF funds to the above-mentioned project.

Table A.7.1. Overview of GEEDRs Energy and Climate Change Engagement in Mexico

Historic (up to 2005)	Early Support (2006–2010)	Strengthening (2011–2015)	New engagement (2016–onwards)
Financial Services			
• Solid Waste Management Pilot Project (P007628, FY86) • Urban Transport Project (P007615, FY87) • High Efficiency Lighting Pilot Project (P007492, FY94) • Renewable Energy for Agriculture Project (P060718, FY00) • Methane Gas Capture and Use at a Landfill - Demonstration Project (P063463, FY01) • Introduction of Climate-friendly Measures in Transport (P059161, FY03) • Mexico: Waste Management and Carbon Offset Project (P088546, FY05) •	• La Venta III – Large-Scale Renewable Energy Development Project (P077717, FY06) • Hybrid Solar Thermal Power Plant (P066426, FY07) • Mexico Wind Umbrella – La Venta II (P080104, FY07) • Mexico Integrated Energy Services (P088996, FY08) • Mexico Efficient Lighting and Appliances (P106424, FY10) • Urban Transport Transformation Program (P107159, FY10)	• MEDEC Low Carbon DPL (P121800, FY11) • Sustainable Energy Technology Development for Climate Change (P145618, FY15)	• **Municipal Energy Efficiency Project (P149872, FY16)** • **Additional Financing loan to the Municipal Energy Efficiency Project (P149872, FY18)** • **Additional Financing GEF grant to the Municipal Energy Efficiency Project (PXXXXXX, FY18)** • MX: PMR: Market Instruments for Climate Change Mitigation (P164508, FY18) • MX: Municipal Energy Efficiency Project (Additional Financing) (P149872, FY18) • MX: Energy for Sustainable Agriculture Development (P164055, FY18)
Historic (up to 2005)	**Early Support (2006–2010)**	**Strengthening (2011–2015)**	**New engagement (2016–onwards)**
Convening and Coordination Services			
• Consolidation & Strengthening of the Mexican Office for Greenhouse Gas Mitigation (P060412, FY99)	• Preparation of the Clean Technology Fund Investment Plan (FY09)	• Energy-efficiency and Access Forum (FY11) • International Renewable Energy Forum (FY14) • Energy Efficiency in Cities Conference (FY14) • International Energy Efficiency in Cities Conference (FY16)	• DEMEX, FY18

Historic (up to 2005)	Early Support (2006–2010)	Strengthening (2011–2015)	New engagement (2016–onwards)
Knowledge Services			
• Mexico Infrastructure Public Expenditure Review (P089103, 2005)	• Latin America and Caribbean Region Landfill Gas Initiative (P104757, FY06) • Evaluation of Energy Efficiency Initiatives (P099734, FY06) • Economic Assessment of Policy Interventions in the Water Sector (P096999, FY06) • Mexico Global Village Energy Partnership (P092051, FY07) • Mexico: Electricity Subsidy Study (P101346, FY08) • Carbon Finance Assistance Program for Mexico (P104731, FY09) • Mexico Low-carbon Development for Mexico (MEDEC) (P108304, FY09) • Massive Urban Transport-Federal Program (P110474, FY09) • Global Gas Flaring Reduction Partnership (P147906, FY10-on)	• Mexico Renewable Energy Assistance Program (P117870, FY11) • PMR – Market Instruments for Climate Change Mitigation in Mexico (P129553, FY13-on) • Carbon Capture, Utilization and Storage Development in Mexico (P131200, FY13) • Implementing TRACE Model in Pilot Cities in Latin America (P133060, FY14) • Greening Mexico's Electricity Generation by Internalizing Externalities • LCR Municipal Energy Efficiency Program (MEEP) (P148297, FY14) • MX Programmatic approach for the energy sector in Mexico: Supporting a low-carbon economy (P150562, FY15): A 3-year initiative FY16-18 (to be followed with a new PA from December 2018) • ESMAP TA for the energy sector in Mexico (P077717-TF018999)	• Energy Policy Notes • Programmatic Approach in Energy: Supporting a Low-Carbon Economy (P150562, FY15)