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PROJECT DOCUMENT
ON
A PROPOSED IBRD LOAN IN THE AMOUNT OF US\$250 MILLION
AND
A PROPOSED GLOBAL ENVIRONMENT FACILITY GRANT
IN THE AMOUNT OF US\$7.12 MILLION
TO THE UNITED MEXICAN STATES
AND
A PROPOSED CLEAN TECHNOLOGY FUND LOAN
IN THE AMOUNT OF US\$50 MILLION
TO NACIONAL FINANCIERA
WITH A GUARANTEE OF THE UNITED MEXICAN STATES
FOR AN
EFFICIENT LIGHTING AND APPLIANCES PROJECT

October 5, 2010

CURRENCY EQUIVALENTS

(Exchange Rate Effective May 3, 2010)

Currency Unit = Mexican Peso
12.2895 = US\$1

FISCAL YEAR

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ABBREVIATIONS AND ACRONYMS

AC	Air Conditioner
BANOBRAS	<i>Banco Nacional de Obras y Servicios Públicos</i> (National Public Works and Services Bank)
BP	Bank Policy
CAS	Country Assistance Strategy
CC	Climate Change
CDI	<i>Comisión Nacional para el Desarrollo de los Pueblos Indígenas</i> (National Commission for the Development of Indigenous Peoples)
CDM	Clean Development Mechanism
CF	Carbon Finance
CFE	<i>Comisión Federal de Electricidad</i> (Federal Electricity Commission)
CFE/FIDE Implementation Agreement	Agreement, dated February 20, 2009, as amended from time to time, between CFE and FIDE relating to the implementation of the appliance replacement program
CFL	Compact Fluorescent Lamp
CFL Implementation Agreement	Agreement to be entered into between SENER and FIDE for the implementation of the CFL replacement program under Component 1 of the Project
CIF	Climate Investment Fund
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
CONAE	<i>Comisión Nacional para el Ahorro de Energía</i> (National Commission for Energy Savings)
CONUEE	<i>Comisión Nacional para el Uso Eficiente de Energía</i> (National Commission for the Efficient Use of Energy)
CPS	Country Partnership Strategy
CRE	<i>Comisión Reguladora de Energía</i> (Energy Regulatory Commission)
CTF	Clean Technology Fund
DEC	Development Economics Group
DF	Distrito Federal (Federal District)
DGDSENR	Directorate General of Distribution and Supply of Electricity and Nuclear Energy
DGGCTE	Directorate General of Generation, Conduction and Transmission of Electricity
DGPI	Directorate General for Promotion and Investments

DICONSA	<i>Distribuidora Conasupo S.A. de C.V.</i>
DPL	Development Policy Loan
DSM	Demand-side Management
ECLAC	Economic Commission for Latin America and the Caribbean
EA	Environmental Assessment
EE	Energy Efficiency
EE Trust Fund	<i>Fideicomiso para la Transición Energética y el Aprovechamiento Sustentable de la Energía</i>
EEAU	Energy Efficiency Administrative Unit
EMP	Environmental Management Plan
ENACC	<i>Estrategia Nacional de Cambio Climático</i> (National Climate Change Strategy)
ENIGH	<i>Encuesta Nacional de Ingresos y Gastos de los Hogares</i>
EIRR	Economic Internal Rate of Return
ENE	<i>Estrategia Nacional de Energía</i> (National Energy Strategy)
ER	Emissions Reduction
ERPA	Emissions Reduction Purchase Agreement
ESMAP	Energy Sector Management Assistance Program
FDI	Foreign Direct Investment
FIDE	<i>Fideicomiso para el Ahorro de Energía Eléctrica</i>
FIPATERM	<i>Fideicomiso para el Programa para el Aislamiento Térmico</i>
FY	Fiscal Year
GDP	Gross Domestic Product
GEF	Global Environment Facility
GF	Guarantee Facility
GHG	Greenhouse Gases
GoM	Government of Mexico
GP	Government Procedures
GWh	Gigawatt hour
IB	Incandescent Bulb
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IDA	International Development Association
IDB	Inter-American Development Bank
IEA	International Energy Agency
IFC	International Finance Corporation
IFI	International Financial Institution
IMF	International Monetary Fund
IP	Investment Plan
IPs	Indigenous Peoples
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IPPF	Indigenous Peoples Planning Framework
IS	Institutional Strengthening
KfW	KfW Bankengruppe (German Development Bank)
kWh	Kilowatt hour
LCR	Latin America and the Caribbean

MEDEC	Mexico Low Carbon Study
MLA Agreements	IBRD Loan Agreement between IBRD and UMS, the CTF Loan Agreement between IBRD (as trustee for CTF) and NAFIN, and the GEF Grant between IBRD (as trustee for GEF) and UMS
MOU	Memorandum of Understanding
MtCO ₂ e	Megatons of Carbon Dioxide Equivalent
MW	Megawatt
M&E	Monitoring and Evaluation
NAFIN	<i>Nacional Financiera</i>
NAFIN/FIDE Implementation Agreement	Agreement dated [XX, 2009], as amended from time to time, between NAFIN and FIDE relating to the implementation of the appliance replacement program
NDP	National Development Plan
NGO	Nongovernmental Organization
ODS	Ozone Depleting Substances, such as CFCs, including CFC-12
OECD	Organization for Economic Cooperation and Development
OLADE	<i>Organización Latinoamericana de Energía</i> (Energy Organization for Latin America)
OP	Operations Policy
PECC	<i>Programa Especial de Cambio Climático</i> (Special Program for Climate Change)
PEMEX	<i>Petróleos Mexicanos</i> (Mexican Petroleum Company)
PERGE	Large-scale Renewable Energy Project
PoA	Program of Activities
PRONASE	<i>Programa Nacional para el Aprovechamiento Sustentable de la Energía</i>
PROSENER	<i>Programa Sectorial de Energía</i>
RAC	Refrigerators and Air Conditioners
RAC Implementation Agreements	(i) SENER/ CFE Implementation Agreement, (ii) SENER/FIDE Implementation Agreement, (iii) SENER/NAFIN Coordination Agreement, (iv) CFE/FIDE Implementation Agreement, and (v) NAFIN/FIDE Implementation Agreement relating to Component 2 of the Project
RE	Renewable Energy
SEDESOL	<i>Secretaría de Desarrollo Social</i> (Secretariat of Social Development)
SEMARNAT	<i>Secretaría de Medio Ambiente y Recursos Naturales</i> (Secretariat of Environment and Natural Resources)
SENER	<i>Secretaría de Energía</i> (Secretariat of Energy)
SENER/CFE Implementation Agreement	Agreement, dated February 13, 2009, as amended from time to time, between SENER and CFE relating to the implementation of the appliance replacement program
SENER/FIDE Implementation Agreement	Agreement, dated February 18, 2009, as amended from time to time, between SENER and FIDE relating to the implementation of the appliance replacement program
SENER/NAFIN Implementation Agreement	Agreement, dated February 12, 2009, as amended from time to time, between SENER and NAFIN relating to the implementation of the appliance replacement program and the establishment of the Guarantee Facility
SEPOMEX	<i>Servicio Postal Mexicano</i> (Mexican Postal Service)

SHCP	<i>Secretaría de Hacienda y Crédito Público</i> (Secretariat of Finance and Public Credit)
SIL	Specific Investment Loan
SO _x	Sulfur Oxides
SO ₂	Sulfur Dioxide
TA	Technical Assistance
UMS	United Mexican States
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

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MEXICO
Efficient Lighting and Appliances Project

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I. STRATEGIC CONTEXT AND RATIONALE

A. Country and Sector Issues

Country Overview

1. The Mexican economy is beginning to recover from a deep contraction of economic activity following the global economic and financial crisis. As a relatively open economy, Mexico was hit hard by the collapse of international trade during the last quarter of 2008 and the first quarter of 2009. As a result, annual economic growth in 2008 reached only 1.3 percent and gross domestic product (GDP) actually contracted by 6.5 percent in 2009. Prior to the onset of the economic crisis, the Mexican economy experienced a period of balanced and broad-based expansion of economic activity at an average GDP of 3.8 percent between 2004 and 2007. Vigorous global economic expansion contributed to the enhanced growth performance as exports increased at a double-digit annual average rate. Enhanced price stability contributed to a healthy increase of domestic demand as a result of an improved purchasing power of wages and salaries and an expansion of domestic credit and consumer lending.
2. The Government's development plan aims at enhancing structural economic growth and aspires to generate one million new jobs each year and reach an annual economic growth rate of 5 percent toward the end of the administration in 2012. To reach those levels of growth, Mexico will require improved competitiveness through the lowering of barriers to business investment, improved infrastructure, an expanded financial sector and a strengthened human capital base.
3. Mexico is both a large producer and exporter of energy, and also a major consumer of energy. For example, it is the world's sixth-largest oil producer and Latin America's largest energy consumer. As a result, the energy sector is of strategic importance to the economy and is a driver of economic growth, productivity and competitiveness. For years, the country has relied on a generous endowment of petroleum to meet domestic energy needs as well as to generate significant revenues through the international sale of crude oil; however, oil production has dropped from a high of approximately 3.4 million barrels per day in 2004 to approximately 2.6 million barrels per day in 2009. Fossil fuels (including imported gas) represent a large portion of the generation matrix (about 80 percent); as a consequence, enhancing energy efficiency and diversification through the expanded use of renewable energy sources are key elements to strengthening the long-term sustainability of the Mexican electricity matrix.
4. Addressing climate change has also become a major policy objective for the Government of Mexico. It is the second-largest emitter in Latin America and ranks twelfth in the world in terms of total GHG emissions. Energy related emissions contribute to over 60 percent of Mexico's total GHG emissions, with land use, industrial processes and wastes accounting for the majority of the remaining emissions. Due to the prominence of energy-related emissions, including those related to electricity generation, the Government has embarked on an aggressive program of energy efficiency that is integrally linked to its climate change agenda.

Mexico's Electricity Sector

5. There are several key institutions in Mexico's electricity sector, which is dominated by public sector entities. The *Secretaría de Energía (SENER, Secretariat of Energy)* is responsible for planning and formulating electricity and other energy policies. The *Comisión Reguladora de Energía (CRE, Energy Regulatory Commission)* is responsible for the regulation and oversight of the electricity subsector. The state-owned power company, *Comisión Federal de Electricidad (CFE, Federal Electricity Commission)*, is responsible for the generation, transmission and distribution of electricity and serves the entire population. Since the mid-1990s, private participation in the sector has increased dramatically in generation, with most new capacity being provided by independent power producers (IPPs) that produce power either for self-supply or to sell to CFE under long-term contracts.

6. Electricity coverage (access) in Mexico is currently 97 percent. In 2009, Mexico consumed 230 TWh of electricity, which represents a slight decrease from 2008 (231 TWh), mainly explained by the effects of the financial crisis on economic activity. In spite of this fact, the Government forecasts that electricity consumption in Mexico will increase by 3.3 percent annually through 2018 (down from the average 3.9 percent annual increase from 1997 to 2007).

7. Mexico's installed capacity reached 50.3 GW. CFE owns 177 generating plants with an effective generation capacity of 38.9 GW; the company generated about 154 TWh in 2009. IPPs represent around 23 percent of total installed capacity (11.4 GW) and generated 32 percent of total electricity (76 TWh) in 2009. Fossil fuel based generation represents the overwhelming majority of Mexico's electricity generation (about 80%), while the mix has been steadily shifting from oil products to natural gas.

8. The Government is actively promoting renewable energy, both to diversify its generation mix and to promote its climate change objectives. SENER is planning to increase Mexico's installed capacity of wind power from 208 MW to 4,000 MW by 2012. The majority of this new wind power capacity will be developed in areas identified with high potential, including Oaxaca, Baja California and Yucatán. Similarly, Mexico also plans to increase its installed hydropower capacity by 1,244 MW in the next 10 years (currently estimated at 11.4 GW), and to increase its geothermal capacity by 233 MW in the same time frame.

Electricity Use: The Residential Sector

9. In 2008, the residential sector accounted for 25.8 percent of total electricity use. In 2008, a typical household consumed the equivalent of about 8,735 kWh/year of energy (4,157 kWh/year of electricity and 4,578 kWh/year of gas). Most household energy consumption is attributable to the use of domestic equipment such as stoves, heaters, refrigerators and air conditioners; combined, these represent about 70 percent of household energy consumption and are expected to be the main growth areas of future residential electricity demand.

10. Energy consumption in the residential sector has been growing faster than GDP; according to the Government's analysis in its *Programa Nacional para el Aprovechamiento Sustentable de la Energía 2009–2012 (PRONASE)*, this is due to several factors including Mexico's overall population growth, an increased penetration rate of energy-consuming

technologies in households, and higher energy consumption levels of various technologies. Air conditioning, home appliances and electronics are expected to be the main growth areas of residential electricity demand in Mexico. Currently, these three energy end-uses along with lighting account for roughly equal shares of residential electricity consumption. Electricity consumption in the lighting sector as a whole grew on average by 3.9 percent per year between 1997 and 2007 and is projected to continue at 3.3 percent annually through 2030, with the residential sector portion projected to grow the most rapidly. In response to the important role of the residential sector in the consumption side of Mexico's electricity equation, the Government has initiated energy efficiency programs that target power consumption in the residential sector by increasing the efficiency of household lighting and appliances, as proposed under this Efficient Lighting and Appliances Project (the Project).

11. Despite the fact that Mexico provides significant electricity subsidies to consumers; - currently over two-thirds of these subsidies go to residential consumers - the average residential tariff in Mexico (US\$8 cents/kWh in low income groups) is about the same as that in the US, Chile and Colombia and is considered high enough to induce energy efficiency measures. While reducing residential electricity subsidies would provide greater incentives to promote energy efficiency, the experience with residential energy efficiency programs in Mexico shows that there are sufficient price incentives to make it attractive for households to replace inefficient lighting and appliances. For example, at current average residential tariffs, a compact fluorescent lamp (CFL) would pay for itself in less than a year and generate savings of over US\$20 over its lifetime.

12. However, aware that subsidies represent an important fiscal burden (estimated at US\$ 9 billion in 2006), the GoM is exploring options to address them in the near to medium-term. SENER has proposed in its February 2010 National Energy Strategy (ENE) a three-pronged plan of action to begin to address electricity tariffs and subsidies in the context of the Government's energy efficiency objectives. The first prong of actions is to gradually implement tariff schemes that reflect the opportunity costs of other energy sources, and incentivize energy efficiency while protecting low-income populations through targeted subsidy programs. Under the second prong, the Government will explore complementary mechanisms to promote energy efficiency. The third line of action is to provide more transparent information on the sub-components of energy prices, differentiating between the supplier's price, taxes and subsidies. It is worth mentioning that the Mexican Government's action of consolidating *Luz y Fuerza del Centro* (a former public utility that provided electricity services to the city of Mexico and its metropolitan area) with CFE was in part in an effort to reduce costs and thus bring electricity costs closer to the tariff rates.

Climate Change, the Energy Sector and Mexico's Response

13. The Government has made mitigation of climate change a priority. In May 2007, President Calderón announced the National Climate Change Strategy (*Estrategia Nacional de Cambio Climático*, ENACC), thereby placing climate change at the heart of the national development policy. ENACC sets the country's long-term climate change agenda, together with medium- to long-term goals for adaptation and mitigation. According to Mexico's Fourth National Communication to the UNFCCC, Mexico emitted 711 million tons of carbon dioxide equivalent (Mt CO₂e) in 2006, of which over 400 Mt CO₂e (60.4 percent) came from energy-

related emissions (including from energy-use in the transport sector). In August 2009, Mexico officially launched a Special Climate Change Program (*Programa Especial de Cambio Climático*, PECC), that operationalizes ENACC. The PECC identifies a range of climate change interventions at the sectoral and subsectoral levels and quantifies the potential impact and cost of each intervention in terms of policy, regulation and technology adoption. The program sets emission-reduction targets, including an electricity-related emissions reduction goal of 14 to 28 Mt CO₂ by 2012. Under a longer-term vision, PECC establishes the formal objective of reducing GHGs by 50 percent by 2050 against the baseline of 2000. Energy efficiency (EE) is a key pillar of the PECC program.

14. Although Mexico, as a non-Annex I country, is not mandated to limit or reduce its GHG emissions under the Kyoto Protocol, the country has firmly adopted the UNFCCC principle of “common but differentiated responsibilities” and has pledged to voluntarily reduce its GHG emissions. In December 2008, at the 14th Session of the Conference of the Parties to the UNFCCC in Poznan, Poland, Mexico announced that it would reduce its GHG emissions in 2050 by 50 percent below 2002 levels, and restated that commitment during the January 2009 meeting of the World Economic Forum in Davos. Furthermore, Mexico will host the 16th Conference of the Parties of the UNFCCC at the end of 2010, demonstrating its commitment to achieve an international climate change agreement. The relevance of climate change to the energy sector has been addressed in various and interrelated analytical and policy works, including the Government’s climate change strategy, PECC and the *Low-Carbon Development for Mexico* (MEDEC) study, as described below.

15. According to the recently published MEDEC: *Low-Carbon Development for Mexico* (World Bank 2010), managing the growth of electricity demand through energy efficiency measures in the end-use sectors should be a critical component of Mexico’s climate change mitigation strategy. As described in this report, currently the electric power sector accounts for around 21 percent of GHG emissions. Reducing electricity consumption and the related need for generation represents an important venue to reduce Mexico’s GHG emissions.

Mexico’s Energy Efficiency Strategy

16. To achieve its energy efficiency and climate change mitigation goals, the Government has developed a national strategy that lays the groundwork for the implementation of a comprehensive energy efficiency plan. The strategy includes regulatory changes accompanied by institutional strengthening of key government agencies, and the establishment of financial mechanisms to implement key programs and projects. Key measures are described below:

- a. On the regulatory side, the *Ley para el Aprovechamiento Sustentable de la Energía* (the Sustainable Use/Energy Efficiency Law) was signed into law in November 2008. This law establishes the enabling environment for promoting energy efficiency in the residential, commercial and industrial sectors by providing the legal framework for the development and implementation of strategies, policies and programs.
- b. In July 2009, SENER issued the *Estrategia Nacional para la Transición Energética y el Aprovechamiento Sustentable de la Energía* (National Strategy for the Energy Transition and Sustainable Use of Energy). The Strategy outlines the framework to promote

policies, programs, actions and projects to increase the use of renewable energy, and to promote energy efficiency and energy conservation in order to decrease the use of fossil fuels.

- c. The Government's Energy Sector Program 2007–2012 (PROSENER) provides a comprehensive policy framework that addresses energy security, technical efficiency, environmental sustainability and climate change. PROSENER identifies three goals in the energy sector: (i) to balance and diversify the primary sources of energy (e.g., reduce the share of fuel oil and coal-based generation from 38 to 30 percent by 2012 and increase the share of non-hydro renewable energy sources for power generation from 2 percent in 2006 to 6 percent by 2012); (ii) to promote the efficient production and use of energy in all sectors (e.g., increase energy savings from 21,686 GWh in 2006 to 43,416 by 2012); and (iii) to promote greater energy efficiency and conservation of electricity in the residential sector.
- d. On the financing side, the *Fideicomiso para la Transición Energética y el Uso Sustentable de la Energía* (the Trust Fund for the Energy Transition and the Sustainable Use of Energy, the “EE Trust Fund”) provided for in the Renewable Energy Law has been established with the purpose of increasing financing to advance the energy transition from hydrocarbons to renewable energy and energy efficiency. The Fund can provide loans, credits, guarantees or other financial support to projects that comply with the National Strategy for the Energy Transition and Sustainable Use of Energy. The Government made an initial contribution of US\$60 million to the Fund in 2009 to support a pilot appliance replacement program. In 2010, the Fund received an additional US\$125 million to be used for both energy efficiency and renewable energy projects.
- e. On the institutional front, the *Comisión Nacional para el Uso Eficiente de Energía* (CONUEE) has been established as provided in the Sustainable Use/Energy Efficiency Law, drawing on the staff and institutional capacity of the former *Comisión Nacional para el Ahorro de Energía* (CONAE). CONUEE's responsibilities include: (i) issuing recommendations to states, municipalities and individuals in relation to best practices for the sustainable use of energy; (ii) providing technical assistance on the sustainable use of energy to the agencies of the Federal Public Administration and to state governments and municipalities; and (iii) implementing the National Information Subsystem for the Sustainable Use of Energy. The creation of CONUEE provides a clearly differentiated distribution of responsibilities between SENER, which is in charge of sector planning, and CONUEE, which is in charge of the promotion of the sustainable use of energy in all sectors and levels of government and the implementation of the National Program for the Efficient Use of Energy (*Programa Nacional para el Aprovechamiento Sustentable de la Energía*, PRONASE).

17. The strategies and programs are supported at the operational level by two independent entities (legally established as trust funds): the private-sector *Fideicomiso para el Ahorro de Energía Eléctrica* (FIDE) and the public sector *Fideicomiso para el Programa de Aislamiento Térmico* (FIPATERM). Both FIDE and FIPATERM were established in 1990 at the initiative of CFE, and today serve as key vehicles for implementing energy efficiency programs. FIDE encourages electricity conservation in most electricity-consuming sectors. It is 20 percent

controlled by CFE; the other shareholders include public and private entities. While FIDE operates mainly in the central states of Mexico, FIPATERM serves a similar function to FIDE in several northern and southern states.

18. In application of the above mentioned laws, policies and strategies, the Government has begun to implement the following key energy efficiency programs: (i) the replacement of 47.2 million incandescent bulbs (IBs) with compact fluorescent lamps (CFLs) in the residential sector over a three-year period, including an initial phase targeting 2.2 million bulbs; (ii) the replacement of over two million appliances (refrigerators and ACs) over a four-year period; (iii) promoting more energy efficient public transport systems for local and long-distance travel; (iv) municipal-level replacement of existing streetlamps with more efficient public lighting; (v) greater efficiency in the industrial and commercial sub-sectors; (vi) supply-side energy efficiency activities by CFE; and (vii) an energy efficiency initiative within PEMEX. The Government is interested in mobilizing assistance from multilateral banks and other financial institutions, including the World Bank and the Clean Technology Fund (CTF),¹ to support the implementation of these programs.

B. Rationale for Bank Involvement

19. A Government priority is to return the country to a path of accelerated growth and to put a halt to growing poverty, while mainstreaming climate change considerations in its infrastructure programs; energy efficiency is one of the Government's vehicles to achieve this goal. The proposed Project will contribute to this effort by: (i) stimulating domestic demand for energy-efficient products; (ii) strengthening social inclusion through the free distribution of CFLs to low-income households and by improving the ability of low-income consumers to purchase more efficient appliances; and (iii) reducing GHG emissions resulting from the switch to more efficient lighting and appliances as prioritized under PECC.

20. The World Bank is well positioned to support these Government efforts due to its extensive experience in designing and implementing energy efficiency programs worldwide and in analyzing the effects of energy efficiency measures on climate change mitigation. The World Bank, through the use of IBRD, GEF and carbon finance, has been a strong partner of Mexico in its climate change mitigation and clean energy activities. The proposed Project is also aligned with: (i) the MEDEC study, which identifies a portfolio of projects, including energy efficiency, that can reduce the country's overall carbon emissions trajectory in the future, (ii) the Framework for Green Growth DPL, approved by the Bank in October 2009, that supports the Government's program to further develop the regulatory and monitoring framework for climate change mitigation in the energy and transport sectors, and (iii) the Urban Transport project, approved by the Bank in March 2010, that also includes CTF financing and contributes to a lower carbon growth path in the transport sector.

¹ The Clean Technology Fund (CTF) is one of the Climate Investment Funds (CIFs) created in 2008 to provide scaled-up resources to invest in projects and programs that contribute to the demonstration, deployment and transfer of low-carbon technologies with a significant potential for long-term greenhouse gas reductions.

C. Rationale for CTF Financing

21. The Project is part of Mexico's CTF Investment Plan and was endorsed by the CTF Trust Fund Committee in January 2009. The proposed Project, with its support for end use energy efficiency, is a key element of Mexico's strategy for climate change and will have significant sustainable development impacts.

22. The barriers to the adoption of energy efficiency technologies include: (a) the high initial investment cost of new and more efficient equipment; (b) the lack of incentives and knowledge of the benefits of a shift to more efficient equipment; (c) unfamiliar credit profiles of potential residential clients; (d) risk-averse lending practices by commercial banks and their apprehension about developing new or unproven business and product lines; and (e) the lack of relevant expertise and capacity of financial institutions to analyze and appropriately structure energy efficiency deals, typically resulting in high transaction costs and high interest rates that discourage potential borrowers. Concessional financing is key to overcoming these barriers.

23. This Project mobilizes this needed concessional financing from various available sources, including CTF, the World Bank and GEF, as well as carbon finance. The CTF financing component within this package provides incentives for scaling up a critical energy efficiency program for Mexico that would not otherwise be possible under a business-as-usual scenario.

D. Higher-level Objectives to which the Project Contributes

24. The proposed Project is fully consistent with the Mexico World Bank Group Country Partnership Strategy (CPS) for FY08–FY13 (Report No. 42846-MX) and the CPS Progress Report (Report No. 52776-MX, February 2010). The CPS focuses on the following strategic areas: accelerating growth, improving competitiveness, promoting social inclusion and reducing poverty, developing infrastructure and assuring energy security, strengthening institutions, and assuring environmental sustainability. The proposed Project will contribute to several interrelated CPS objectives as follows:

- (a) The Project aims to reduce electricity consumption by introducing more efficient technologies in the residential lighting sector throughout Mexico and by replacing old and inefficient appliances (refrigerators and air conditioners). The proposed EE measures provide direct benefits to end-users, such as households (lower electricity bills), as well as to the Government (avoided new generation capacity, lower fuel consumption, reduced electricity subsidies). These energy efficiency measures will contribute to Mexico's energy security and competitiveness.
- (b) Mexico has taken a major leap forward in integrating climate change considerations into its infrastructure and social programs under the *Programa Especial de Cambio Climático* (PECC). The Project will support these climate change mitigation efforts by introducing energy efficiency measures that will reduce GHG emissions.
- (c) By providing free CFLs to low to medium-income households under Component 1, and vouchers and credits at favorable interest rates for low-income consumers

under Component 2, the Project also supports the Government's social objectives of promoting social inclusion.

25. The proposed Project is consistent with GEF's Climate Change Focal Area, in particular GEF Operational Program 5: Energy Efficiency, and with its climate change strategic programs under GEF-4: SP1 "Promoting Energy Efficiency in Residential and Commercial Buildings." GEF incremental financing will help ensure that Project activities promote global environmental benefits. The activities that would be supported by the GEF include large-scale promotion of energy-efficient appliances and efficient lighting in households, both of which figure prominently in the Government's National Climate Change Strategy.

II. PROJECT DESCRIPTION

A. Lending Instrument

26. The lending instrument selected for IBRD financing for the UMS activities under Components 1 and 2a.i. of the Project is the Specific Investment Loan (SIL), which will be disbursed over a four-year period (2011–2014). The specific terms will be finalized during negotiations. A CTF Loan has been selected to provide financing to NAFIN under Component 2a.ii; the loan will be provided at an interest of 0.75 percent per annum and a 20-year maturity, including a 10-year grace period. Component 2a.ii. involves a Financial Intermediary Loan (FIL) through NAFIN to which O.P.8.30 is applicable (see Annex 17). GEF is providing a grant to UMS for Component 3 and for the Guarantee Facility under Component 2b.

B. Project Development Objectives and Key Indicators

27. The Project Development Objectives are to promote Mexico's efficient use of energy and to mitigate climate change by increasing the use of energy-efficient technologies at the residential level.

28. The Project's Global Environmental Objectives are to support efforts to mitigate climate change by expanding the use of energy-efficient equipment and services. The Project will promote the development of a sustainable market for energy efficiency equipment among the large and fast-growing energy end-use sectors for lighting, refrigeration and air conditioning.

29. The key indicators for measuring the achievement of the Project objectives are: (i) the number of IBs replaced by CFLs, (ii) the number of old and inefficient appliances replaced, (iii) GHG emissions reduced, and (iv) energy savings, namely avoided GWh of electricity production.

C. Project Components

30. The Project includes three components, as described below.

31. ***Component 1: Replacement of Incandescent Bulbs (IBs) with Compact Fluorescent Lamps (CFLs) in the Low to Medium-Income Residential Sector (Estimated total cost: US\$70***

million, of which IBRD US\$55 million and GoM US\$15 million). This component finances the replacement of 45 million IBs with CFLs in 11.25 million² low to medium-income households over a two-year period, as part of the Government's national energy efficiency program. The replacement program involves the purchase and distribution of new CFLs and the collection and proper disposal of the replaced IBs.

32. **Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners (ACs) in the Residential Sector** (Estimated total cost: US\$603 million, composed of (i) IBRD US\$195 million, (ii) CTF US\$50 million, (iii) NAFIN US\$127 million, (iv) GoM US\$55 million and (v) Consumers US\$176 million, complemented by a US\$35 million Guarantee Facility, of which US\$30 million is funded by GoM and US\$5 million by GEF). This component supports two types of incentives—vouchers and credits for consumers—for the replacement (including collection and scrapping) of approximately 1.7 million old and inefficient refrigerators and ACs over a four-year period as part of the Government's national energy efficiency program. Resources from the IBRD Loan to the Government will finance the vouchers and resources from the CTF Loan to NAFIN will support the credits as follows:

- **Component 2a.i. Financing of vouchers for low-income consumers** (including IBRD US\$195 million and GoM US\$55 million). Provision of vouchers as instant discounts to low-income consumers to improve their ability to pay for the replacement of inefficient appliances with more energy-efficient appliances.
- **Component 2a.ii. Financing of NAFIN's credit line** (including CTF US\$50 million). Provision by NAFIN of credits at favorable interest rates to low-income and other qualifying consumers to pay for the replacement of inefficient appliances with more energy-efficient appliances. A related Guarantee Facility protects NAFIN from credit defaults by consumers (component 2b).
- **Component 2b. Capitalization of the Guarantee Facility** (including GEF US\$5 million). Provision by SENER of funds to capitalize the existing Guarantee Facility that protects NAFIN from credit defaults by consumers.

33. **Component 3: Technical Assistance and Institutional Strengthening** (Estimated total cost: US\$6.32 million, of which GoM US\$4.20 million and GEF US\$2.12 million). This component will enhance SENER's capacity to promote energy efficiency activities consistent with its new responsibilities under the Energy Efficiency Law, and will strengthen the ability of the implementing agencies to carry out the Project. Activities under this component include: (a) studies to expand the CFL replacement program; (b) development of Energy Efficiency Standards and Programs; (c) assessment of potential complementary demand-side management (DSM) activities; (d) information and awareness campaigns related to the CFL and appliances programs; (e) monitoring and evaluation activities for the Project components; (f) training and capacity building for the implementing agencies; and (g) support to the EE Administrative Unit.

² The 11.25 million households represent over 95% of rural and urban households located in the lowest 4 deciles of electricity consumption, according to CFE's database (see Annex 4).

34. **Summary of Financing Plan.** A summary of the Project costs by component and source of financing is presented in Table 1. The cost and source of funds for the Guarantee Facility under Component 2b are provided in Table 2.

Table 1: Project costs by component and sources of financing (US\$ million)

Component	Government*	NAFIN**	IBRD	CTF	GEF***	Cons.	Total
1.Replacement of IBs by CFLs	15.00	0.00	55.00	0.00	0.00	0.00	70.00
2. Appliance Replacement							
Component 2a.i.	55.00	0.00	195.00	0.00	0.00	0.00	250.00
Component 2a.ii.	0.00	127.00	0.00	50.00	0.00	176.00	353.00
3.Technical Assistance & Inst. Strengthening	4.20	0.00	0.00	0.00	2.12	0.00	6.32
Total Project Costs	74.20	127.00	250.00	50.00	2.12	176.00	679.32

*In addition, Government will also contribute to US\$30 million to capitalize the Guarantee Facility for Component 2b (see table below).

**Includes €25 million (US\$32.5 million assuming 1.30US\$/€) financing from KfW to NAFIN for the line of credit. This figure does not include the US\$50 million provided by the CTF for the line of credit.

***GEF will also provide an additional US\$5 million to the Government to capitalize the Guarantee Facility.

Table 2: Guarantee Facility under Component 2b (US\$ million)

Component	Government	GEF	Total
Guarantee Facility	30.00	5.00	35.00
Total	30.00	5.00	35.00

35. Carbon finance is also being developed in connection with the Project activities; associated Clean Development Mechanism (CDM) Programs of Activities (PoA) are being considered for the bulb replacement activities under Component 1 and the appliance replacement program under Component 2 (described further in Annex 4). In addition, in connection with the refrigerator and air conditioner disposal activities under Component 2, Montreal Protocol Multilateral Fund resources are supporting an assessment of opportunities for financing ODS³ destruction through the voluntary and potentially the compliance GHG markets (see Annex 4).

D. Lessons Learned and Reflected in the Project Design

36. The design of the proposed Project builds on the lessons learned from the World Bank's longstanding engagement in Mexico's energy sector (both investments and technical assistance), its experience in Mexico and elsewhere with energy efficiency operations and in addressing environmental and climate change issues, and the Mexican Government's own experience with the CFLs and pilot appliance replacement programs. Lessons reflected in the Project design include:

- (a) *Addressing Consumer Affordability Barriers.* One of the key barriers to adopting energy-efficient technologies is the high initial investment cost of the new equipment.

³ ODS stands for Ozone Depleting Substances, such as CFCs. Refrigerators and air conditioners older than 10 years in Mexico commonly contain CFC-12 as a refrigerant in the compressor and coils.

This is particularly relevant for low-income consumers. The Project addresses this barrier by providing the CFLs for free to low to medium-income households and by providing instant discount vouchers to low-income consumers to help finance a portion of the upfront cost of acquiring new efficient appliances to replace old and inefficient ones.

(b) *Importance of Dissemination of Information to Support Market Mechanisms.* Market mechanisms that promote EE products are more effective and sustainable when they rely on market actors to make decisions based on the commercial merits of products. One of the key requirements to support the decision-making process of consumers is to provide sufficient and accurate information about the energy consumption and related financial information of the products; in this way, consumers can be aware of the savings and make their own judgments about reasonable financial paybacks. The Project's Technical Assistance Component will finance an information and awareness campaign directed at consumers on these aspects.

(c) *Improved Consumer Use of Products.* The benefits of more energy-efficient products (e.g. lower electricity bills) can be offset if the new and more efficient products are not used appropriately (for example by keeping the lights turned on longer hours than before or running the ACs for longer periods of time). Accordingly, the potential benefits of EE programs can be protected by informing consumers regarding the corresponding behavioral aspects. The information and communications campaign implemented under the Technical Assistance component is being designed to also address this aspect.

(d) *Benefits of Relying on Existing Systems for Cost Recovery.* Experience has demonstrated that cost recovery of credits targeted to lower-income households has a higher rate of success when repayments are effected through electricity or water utility bills. Preliminary results from the Appliances Pilot Program indicate that tying repayment to CFE's electricity bills have indeed yielded very low levels of default. Accordingly, Component 2b of the Project has been structured to provide for repayments of the credits offered by NAFIN directly through the usual CFE electricity bill issued to consumers.

(e) *Incorporating Proper Disposal of Inefficient Products.* Experience in other EE programs has demonstrated that if the disposal of the old, inefficient products being replaced are not included under the replacement programs, there is a high risk that those inefficient products will continue to be used (either by the same consumers or sold in the informal market) thereby offsetting the benefits of the EE program. The Project addresses this issue by requiring the consumers to surrender their old products (IBs, refrigerators and ACs) in order to receive the new products and by requiring within the Project design an adequate disposal mechanism.

(f) *Importance of Ensuring Synergies with Government Policies.* In practice, the implementation of energy efficiency operations has faced a variety of hurdles. Experience has demonstrated that a key element to overcome these hurdles is a strong Government commitment to the effort, experimentation, and supportive policies and institutions. The Project builds off the Government's prioritization of energy efficiency and related climate change objectives (e.g. as reflected in the National Climate Change

Strategy and the related PECC). It also builds off of previous diagnostic work, experience with pilot programs, and institutions such as FIDE with an established record of delivery. These elements have informed the Project's design (including the choice of institutions and their roles) and provide a strong foundation for the large-scale replacement activities proposed under the Project.

E. Alternatives Considered and Reasons for Rejection

37. A number of alternative project designs were considered, including with respect to the scope of the Project, its scale, the borrowing agencies, and the implementation arrangements:

(a) *Scope of Project Activities.* The initial project scope included a municipal street lighting component. However, during project preparation, it was decided to separate this activity from the current Project as it presented additional complexities on top of an already complex project (including the need for an additional borrower to channel funding to the municipalities and an additional distinct set of implementation arrangements for street lighting). A separate Pilot Municipal Street Lighting program will be implemented by BANOBRAS with its own resources and could provide the basis for a follow-on larger scale activity supported with multilateral financing.

(b) *Scale of the Project Activities.* A larger-scale CFL program involving the replacement of 70 million IBs was initially considered. This component was narrowed in scope to the current 45 million to meet the goals established by PECC, namely the replacement of 47.2 million IBs with CFLs (1.4 million replacements have already been implemented).⁴ The change in scale is explained by the targeting mechanism used by the Government to select eligible low-income households connected to the grid (the 45 million replacements cover all consumers within the four to five lowest deciles of electricity consumption based on CFE statistics).

(c) *Choice of Borrowing Agencies.* Various different configurations of borrowers were considered for the IBRD loan. Consideration was given to NAFIN as the borrower of the IBRD resources to finance a small scale CFL component, with NAFIN looking to recover the cost of the free CFLs through carbon finance revenues. This option was rejected due to the small scale proposed by NAFIN compared to the Government's target (PECC).

(d) *Allocation of CTF Resources.* Consideration was given to allocating a portion of the CTF resources to fund the Guarantee Facility under Component 2b which protects NAFIN against consumer defaults on the credit. This option was rejected because placing CTF resources in a guarantee facility for nonperforming consumer loans would not generate a high enough return to enable NAFIN to repay the principal and interest on the CTF loan.

⁴ 400,000 IBs have been exchanged for CFLs through SENER's Pilot Program implemented by FIDE and distributed by SEPOMEX various states; and 1 million CFLs have been exchanged by SEMARNAT's partnership with a private sector provider through private sector retailers in the city of Puebla.

(e) *Alternatives to Retail Stores in Implementation of CFL Replacement Program.* Consideration was given to distributing the CFLs through the *Servicio Postal Mexicano* (SEPOMEX) given its contact with households. Reliance on existing retail stores was preferred as the involvement of retail stores was determined to support better the long-term sustainability of the program since these stores play and will continue to play a natural role in the provision of bulbs and other household items to consumers.

III. IMPLEMENTATION

A. Partnership Arrangements

38. The Project will be financed by a combination of resources provided by various partners in addition to IBRD: (i) a US\$50 million CTF Loan to fund the credit line under Component 2a.ii. of the Project that is designed to support the rapid deployment of efficient appliances on a large scale; (ii) a €25 million loan from KfW to NAFIN for the credit line established under Component 2a.ii of the Project; (iii) a US\$7.12 million Grant from GEF to the UMS to contribute to the establishment of NAFIN's Guarantee Facility under Component 2b and to support Component 3; and (iv) a US\$0.05 Montreal Protocol Multilateral Fund Grant through which the Bank is currently supporting SENER and SEMARNAT to assess opportunities for financing the destruction of ODS collected under the Government's refrigerator replacement program through the voluntary GHG market. In addition, two carbon finance programs will be developed as a result of the emissions reductions generated under Components 1 and 2 of the Project.

B. Institutional and Implementation Arrangements

39. **Overall Organization.** The *Secretaría de Energía* (SENER) is responsible for overall oversight, and is the World Bank's main counterpart for the Project. SENER is composed of several directorates, including: (i) the Directorate General for Promotion and Investments (DGPI), which has principal responsibility for Component 1, and (ii) the Directorate General for Distribution and Supply of Electricity and Nuclear Energy (DG DSENR) and the Directorate General for Generation, Conduction and Transmission of Electricity (DGGCTE) which have principal responsibility for Component 2. Each Directorate is also involved in the studies and other capacity building activities to be carried out under Component 3.

40. To support these directorates and to strengthen SENER's ability to provide monitoring, financial management, reporting and other oversight functions, the Project will use the SENER's Rural Electrification Unit that was established under the Bank-financed Integrated Energy Services Project to provide administrative support. This EEAU, which is already operational, includes among others, a financial management and a procurement specialist. This unit will report to the three SENER Directorates involved in Project implementation. The responsibilities of the EEAU will include providing financial management services for the overall Project and procurement services for the activities to be undertaken by SENER under Component 3.

41. As head of the energy sector, SENER is largely a regulatory and policy development agency with limited capabilities to implement projects. SENER faces both operational and budgetary constraints, requiring that other entities participate in Project implementation. In this

context, the proposed implementation arrangements rely on several entities: FIDE, FIPATERM, CFE, CONUEE and NAFIN. The implementation arrangements for each component are briefly described below. Detailed implementation arrangements are described in Annex 6.

42. **Component 1: CFL Program.** DGPI is the Directorate within SENER responsible for the design and overall oversight of the component. In this regard, the DGPI provides guidance on strategic issues such as procurement, definition of the role of suppliers, the eligibility criteria for households, and the targeting of the program to low to medium-income households. Given SENER's execution limitations, SENER appointed FIDE as the "CFL Executing Agency" responsible for operational aspects related to implementation of Component 1 of the Project. FIDE will be responsible for the bulk procurement of the CFLs and associated services; it will sign contracts with the suppliers of CFLs and with the firms selected for the collection and disposal of the IBs. Households will exchange IBs for CFLs at approved retail stores, which stores will then deliver the IBs for proper disposal. FIDE will supervise and monitor activities under the Component and will ensure that the Operational Manual is appropriately followed by all parties.

43. SENER and the CFL Executing Agency will enter into an implementation agreement (the CFL Implementation Agreement) that sets out the respective responsibilities of each party. The Implementation Agreement will incorporate the Operational Manual. The signing of this agreement is a condition of effectiveness for the MLA Financing Agreements. Funds for the implementation of this Component will be withdrawn from the EE Trust Fund by the CFL Executing Agency to issue payments to suppliers and service providers, including to suppliers under the bulk procurement of CFLs and to providers of IB disposal services.

44. **Component 2: Appliances Program.** DGDSENR and DGGCTE are responsible for the design and overall oversight of Component 2. In this regard, DGDSENR and DGGCTE provide guidance on strategic issues such as the structuring of the voucher program and of the credit line, and the eligibility criteria for households.

45. The implementation arrangements for Component 2 build on the existing appliance replacement pilot program.

- The replacement of refrigerators and ACs takes place via eligible retail stores (see Annex 6) in Mexico. Participating retail stores sell qualifying energy-efficient refrigerators and ACs to consumers and also deliver the consumer's old and inefficient appliance to the scrapping centers.
- FIDE will be primarily responsible for the various operational aspects of the appliance replacement program, including reviewing consumer eligibility, managing payments to the retail stores under both the vouchers and the credit lines, verifying compliance of sales with the program's requirements, and supervision of the Component, including compliance with the Operational Manual.
- CFE is responsible for managing the flow of funds under Component 2ai. from SENER to FIDE to effect the payments to the retail stores under the vouchers, and for

administering the repayments under subcomponent 2a.ii which are effected through its electricity billing system.

- NAFIN is the provider of the credit lines under Component 2a.ii. and will appoint FIDE to administer the credit line, including verification of credit documentation and effecting payments to retailers.
- The Guarantee Facility will be funded by SENER and will be administered by NAFIN.

46. These current arrangements for the existing pilot program are set out in several implementation agreements (the RAC Implementation Agreements). New implementation agreements will be prepared a condition of Effectiveness to incorporate the Operational Manual, to reflect the expanded and modified aspect of Component 2 as compared to the pilot program, and to include additional prescriptions mandated by the presence of Bank financing.

47. The flow of funds under this Component will be structured as follows:

- The voucher program will be funded under the following procedures. In accordance with the budget approved each year by Mexico's Congress, the Government will transfer resources to the EE Trust Fund, which is managed by SENER. Upon approval of the Appliance replacement program by the EE Trust Fund's Committee, authorized funds are transferred on an annual basis from the fund to CFE as trustee for the fund; the funds are held by CFE in a traditional commercial bank account and are transferred periodically to FIDE. FIDE requests the necessary funds from CFE and then pays the retailers based on its review of the documentation of sale received from the retailer.
- For the credit sub-component, NAFIN provides the resources for credit, which it transfers to FIDE based on FIDE's request depending on the level of approved credits. FIDE in turn pays the retail stores the principal amount of the credit for the verified transactions.
- Consumers pay the balance (if any) remaining for the new appliance after application of the voucher and credit, and surrenders to the retail store the old appliances to be replaced (typically at the time of delivery of the new appliance). Credit repayments by consumers are made through the electricity bill to CFE, which transfers the repayments to FIDE, which in turn transfers them to NAFIN.

48. **Component 3: Technical Assistance and Institutional Strengthening.** DGPI within SENER is responsible for managing implementation of this component, with the support of the EEAU, and will coordinate with the other directorates within SENER (including the DGDSENR and DGGCTE), as well as FIDE and the other entities involved in Project implementation to be supported under this Component. CONUEE will support DGPI, and SENER generally, in implementing this Component. Procurement will be undertaken by the EEAU.

C. Monitoring and Evaluation of Outcomes/Results

49. Monitoring and evaluation (M&E) is a key part of the program. M&E systems will be developed under the Project for all components in order to monitor Project indicators. M&E is

an integral part of each component and, as appropriate, will allow for the modification of the implementation arrangements for each component in order to improve the effectiveness of Project implementation. A specific budget to undertake this function has been established under Component 3. In addition, in the event of eventual carbon financing, Components 1 and 2 will need to comply with the strict baseline determination and verification procedures to monitor the energy savings under the approved CDM methodologies in order to generate the Certified Emission Reductions.

D. Sustainability and Replicability

50. *Sustainability.* The sustainability of the Project is supported by several factors. These include a strong Government commitment, the anticipated positive demonstration effects of efficient household-level electric goods, and various complementary actions beyond the Project's scope.

51. Government Commitment: The Government is strongly committed to EE, as reflected in the approval of the Energy Efficiency Law, the development of the associated regulatory framework and the launching of the pilot CFL and appliance programs as key priorities supported by the Government. In addition, the Government is strongly committed to providing financing for EE activities including through the EE Trust Fund and indirectly through NAFIN. EE is also an integral part of the Government's climate change mitigation strategy, as presented in the PECC. This context evidences the broad and deep-rooted commitment to energy efficiency and related areas of climate change and enhanced energy security which provides a strong supportive context to promote the sustainability of the activities and benefits to be derived from the Project.

52. Demonstration, Market Penetration and Related Effects: Under Component 1, the Government will distribute 45 million CFLs free of charge to low to medium-income households, complemented by an aggressive communication campaign that will include information on the energy savings of CFLs. Electricity and other services are typically not included as part of rental fees in Mexico, so the consumers themselves (especially low-income groups) will benefit from the energy savings by paying lower electricity bills, generating the necessary buy-in and avoiding the principal-agent effect. As a result of Project implementation and based on the results of programs in other countries, the population is expected to increase its awareness of the energy savings benefits and familiarity with CFLs and in the process facilitate a permanent change in its consumption behaviors. The market penetration of efficient residential lighting will be supported by private sector projects targeted at medium and higher income-level consumers. In parallel, the Government is preparing regulations to phase-out the use of incandescent bulbs in the short- to medium-term. Under Component 2, by encouraging the replacement of appliances through incentives (vouchers and/or credits) to a large number of consumers, the program will allow these consumers to experience the benefits of these energy-efficient appliances and to demonstrate these benefits to other households. It will also increase the market for these appliances, which should help to drive their price down, thereby increasing affordability for additional exchanges.

53. Complementary Technical Assistance: Various of the technical assistance activities under Component 3, such as the standards and labeling programs, will also support the sustainability of

the replacement activities provided for under Components 1 and 2. In addition, the information and awareness campaigns under Component 3 will touch a broader population beyond the households directly benefiting under the Project, thereby helping to create a broader context of support for the use of energy-efficient electrical goods at the residential level. In addition, increased awareness by consumers will likely affect behaviors in other segments, such as the business and governmental sectors.

54. Complementary EE actions: The sustainability of this effort will be supported by similar EE activities in other segments of the economy. For example, the Government is developing energy efficiency programs for the industrial, commercial and public lighting sectors. Once the cost savings and EE benefits of programs in these sectors are realized, together with the market development of residential lighting and appliance programs through this Project, a ripple effect is expected across a broad-based market in Mexico for the targeted technologies and sectors.

55. *Replicability:* The replication potential of this operation is significant and is closely linked to the sustainability elements described above. The Project is likely to demonstrate energy savings that result in more efficient residential products. As a greater number of consumers become aware of the cost savings that can be realized through the investment, a push for more efficient product choices from retailers will continue to drive the market transformation. The transformational path of this intervention can be summarized as follows: (a) the “demonstration effect” from increased scale will create a higher level of awareness among consumers and financiers; (b) the growth trajectory of the efficient appliance market in Mexico will be supported through increased private sector participation; and (c) the benefits of efficient appliances, such as increased affordability, which extend beyond climate change to core development benefits (improved standard of living), will help support replicability.

E. Critical Risks and Possible Controversial Aspects

56. The main risk factors and the proposed mitigation measures are outlined the table below.

Critical Risks Matrix

Risk	Risk mitigation measure	Risk rating with mitigation
Technology/reliability risks regarding EE equipment	Only well-proven technology and equipment will be used for Components 1 and 2.	Low
Market uptake does not occur at the rate expected for the residential lighting and appliance components	The CFLs will be distributed for free through a variety of distribution channels to reach the target population in an effective and timely manner. For Component 2, an attractive package of vouchers and credits will be put in place for low-income end-users accompanied by an aggressive awareness and education campaign. In addition, the CFL and appliances components build from successful ongoing pilot programs, reducing the risk of low market uptake.	Moderate
Sustainability of the use of CFLs once the free CFLs are no longer working	The continued use of CFLs once the CFLs distributed for free are no longer working will be ensured by a strong communications and information campaign, by the realization of the savings for the households in terms of electricity consumption;and the legislation that will be developed by the country for phasing-out the use of IBs.	Moderate

Risk	Risk mitigation measure	Risk rating with mitigation
Program leakage of subsidized CFLs that might be redeployed to non-target sectors or beyond Project areas	The Government plans to replace a large portion of IB with CFLs in all residential sectors, aiming at market transformation. These investments will be supported by policy measures. Therefore, given the comprehensiveness of the Government's overall approach, only small leakages of subsidized CFLs to non-targeted sectors is anticipated. In addition, most of the Project benefits are independent of targeting to specific consumer groups. Although appliances present less leakage risks compared to CFLs as they are less transportable, a strong oversight will be in place to ensure no mismanagement of the voucher program.	Low
Potential reduction of energy savings due to rebound effect ⁵	With respect to refrigerators and ACs, a "rebound effect" could occur due to: (1) the new refrigerator or AC being larger in size, potentially offsetting part of the estimated energy efficiency gains; (2) the old refrigerator or AC could be retained as a secondary refrigerator or AC. The program design, which includes size limitations and the mandatory exchange and scrapping of old refrigerators and ACs mitigates this risk. With respect to CFLs, the potential rebound effect could exist but is also being mitigated by the required exchange of IBs for the CFLs under the program.	Low
Insufficient experience of the CFL Executing Agency in World Bank Procurement	ICB would apply to the acquisition of CFLs. As FIDE has previous experience in ICB but not under World Bank Procurement Guidelines, a procurement training program has been included under Component 3. Project implementation will include close Bank supervision of procurement activities.	Substantial
Slow disbursement rate	The Project design incorporates the experience gained through existing pilot programs and is reflected in the implementation arrangements for each component to facilitate a more rapid disbursement rate. The Project also provides for retroactive financing for Component 2a.i. to allow for the smooth transition between the pilot programs and the initial start-up of the activities under the Project. Activities to mitigate market uptake risks described above will also help to mitigate this slow disbursement risk.	Moderate
Complex financial management arrangements	Mexico has strong country public financial management (FM) arrangements. Regarding the proposed Project, the FM Assessment found that there are strong financial controls in place. Specific TORs will be required for the external audit of this Project, requesting the auditor's opinion on the adequate application of the key operational and financial controls of the program. In addition, the administrative unit (EEAU) set up in SENER will be responsible for overall Project coordination of FM activities.	Moderate
Environmental management for old appliances and IBs	Disposal of IBs and old equipment will follow SEMARNAT's (Secretariat of Environment) approved procedures; annual performance audits will also be carried out. An Environmental Management Plan has been prepared and its implementation will be one of the Project covenants.	Low
Disposal of CFLs	CFLs contain mercury. The TA component will support the development of a CFL recycling market.	Moderate

⁵ Direct, indirect and macroeconomic effects that can increase energy use following the installation of energy-efficient products which create a discrepancy between projected and actual energy savings.

Risk	Risk mitigation measure	Risk rating with mitigation
Complex implementation arrangements with multiple actors could delay implementation	The Project builds on existing pilot programs with the same entities, who each have clearly defined roles reflected in their respective implementation agreements and have been successfully playing their roles under the ongoing pilot program. Institutions also have the capacity for the scale-up envisaged under the Project	Moderate
Foreign Exchange Risk of CTF Funds	NAFIN will directly hedge the risks in the international market. Current rates indicate that the direct hedging of this risk by NAFIN will not have a significant impact on the on-lending interest rate to consumers.	Low
Overall risk rating		Moderate

F. Loan/Grant Conditions and Covenants

57. The Project involves one IBRD Loan, one CTF Loan and one GEF Grant, as follows: (i) IBRD Loan to the UMS, (ii) CTF Loan to NAFIN, and (iii) GEF Grant to the UMS (called the MLA Financing Agreements).

58. The conditions and covenants for the IBRD Loan to UMS and the CTF Loan to NAFIN are as follows:

(a) Conditions for close of negotiations:

- Receipt of the draft Operational Manual (including Financial Management arrangements).
- Receipt of the draft CFL Implementation Agreement.
- Receipt of draft amendments to the following agreements: (i) the SENER/CFE Implementation Agreement, (ii) the SENER/NAFIN Implementation Agreement, (iii) the CFE/FIDE Implementation Agreement, and (iv) the NAFIN/FIDE Implementation Agreement, each relating to implementation of Component 2 of the Project.
- Adoption by SENER of a standard form supplement to the FIDE-Participating Retailers Agreements regarding the arrangements for the execution of Component 2 of the Project.

(b) For Effectiveness, the main conditions for each of the financing agreements are as follows:

For the IBRD Loan to UMS:

- the *Contrato de Mandato* has been duly executed by the parties thereto;
- the CFL Implementation Agreement, the SENER-CFE Implementation Agreement, the CFE-FIDE Implementation

Agreement, and the SENER-NAFIN Coordination Agreement have all been executed by the parties thereto;

- the borrower and NAFIN have adopted the Operational Manual in form and substance satisfactory to the Bank; and
- receipt of legal opinions from counsels satisfactory to the Bank that the *Contrato de Mandato* is binding on the parties thereto.

For CTF Loan to NAFIN:

- that the IBRD Loan Agreement has been executed and delivered and all conditions precedent to its effectiveness have been fulfilled; and
- that the NAFIN-FIDE Implementation Agreement has been executed on behalf of the parties thereto.

For the GEF Grant Agreement

- This Agreement shall not become effective until evidence satisfactory to the World Bank has been furnished that the conditions specified below, have been satisfied:
 - Receipt by the Bank of evidence regarding the binding execution of the GEF Grant Agreement;
 - the IBRD Loan Agreement has been executed and delivered and all conditions precedent to its effectiveness (other than the effectiveness of this Agreement) have been fulfilled; and
 - the *Convenio de Colaboración* has been duly executed by the parties thereto.

The main Loan Covenants are:

In the case of UMS as Borrower under the IBRD Loan Agreement:

- The Borrower shall maintain, until completion of the Project, the unit within SENER (the EEAU), with staff (including a procurement specialist and a financial management specialist), structure and functions satisfactory to the Bank;
- For the purposes of implementing Component 1 of the Project, the Borrower, through SENER, shall transfer a portion of the proceeds of the Loan to FIDE under the CFL Implementation Agreement;

- For the purposes of implementing Part 2(a)(i) of the Project, the Borrower, through SENER (through *Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía*) shall:
 - transfer a portion of the proceeds of the Loan to CFE through the SENER-CFE Implementation Agreement;
 - cause CFE to make available to FIDE, through an the CFE-FIDE Implementation Agreement, the required amounts from the Loan to allow FIDE to reimburse Eligible Retailers with the amounts equivalent to the Vouchers redeemed by Eligible Beneficiaries under the Appliances Replacement Program;
 - cause FIDE, under the terms of the CFE-FIDE Implementation Agreement, to make available to each Eligible Retailer, through the FIDE-Eligible Retailers Agreement, the required amounts from the Loan to cover payments due to each of the Eligible Retailers; and
 - exercise its rights and carry out its obligations under the SENER-CFE Implementation Agreement, and cause CFE and FIDE to carry out their obligations under the CFE-FIDE Implementation Agreement, in such manner as to protect the interests of the Borrower and the Bank, and to accomplish the purposes of the Loan.
- For the purposes of implementing Part 2(a)(ii) of the Project, the Borrower shall:
 - enter into an agreement with NAFIN (the SENER-NAFIN Coordination Agreement) for the purposes of coordinating their respective roles and responsibilities regarding the implementation of Part 2(a)(ii) of the Project, in accordance with the provisions of the CTF Loan Agreement; and
 - exercise its rights and carry out its obligations under the SENER-NAFIN Coordination Agreement in such manner as to protect the interests of the Borrower and the Bank, and to accomplish the purposes of the Loan.
- The Borrower, through SHCP, shall enter into a *Contrato de Mandato*, satisfactory to the Bank, among NAFIN and SENER;
- The Borrower shall, carry out and/or cause to be carried out the Project in accordance with the Operational Manual, the IPPF, and the Environmental Management Plan.

- The Borrower shall ensure that the Project is carried out in accordance with the provisions of the Anti-Corruption Guidelines.

In the case of NAFIN as Borrower under the CTF Loan Agreement:

- The Borrower shall carry out the Project in accordance with the Operational Manual.
- The Borrower shall:
 - make available to FIDE, through the NAFIN-FIDE Implementation Agreement, the required amounts from the Loan to allow FIDE to carry out Part 2(a)(ii) of the Project; and
 - exercise its rights and carry out its obligations under the NAFIN-FIDE Implementation Agreement in such manner as to protect the interests of the Borrower and the World Bank, and to accomplish the purposes of the Loan.
- The Borrower shall, and shall cause FIDE to, ensure that Part 2 (a) (ii) of the Project is carried out in accordance with the provisions of the Anti-Corruption Guidelines.
- The Borrower shall carry out Part 2 (a) (ii) of the Project in accordance with the IPPF, the Environmental Management Plan, and the Operational Manual.

In the case of NAFIN as the trustee of the GEF Grant:

- The Recipient shall ensure that the Parts 2 (b) and 3(a)(i) and (ii), 3(b)(ii) and (iii), 3(c)(ii), 3(d), 3(e) and 3(f) of the Project are carried out in accordance with the provisions of the Anti-Corruption Guidelines. In this regard, the Recipient shall ensure that all subsidiary agreements derived from this Agreement, include the obligation to comply with the Anti-Corruption Guidelines;
- Make available a portion of the proceeds of the Grant to NAFIN, acting as a trustee of the Guarantee Facility, under the Financing Agreement, to be entered between the Recipient, through SENER, and NAFIN, acting as trustee of the Guarantee Facility, under terms and conditions acceptable to the World Bank for the purposes of partially funding the Guarantee Facility.
- Cause NAFIN, acting as trustee of the Guarantee Facility, to:

- establish and maintain a separated Guarantee Account for the Guarantee Facility in a commercial bank acceptable to the World Bank.
- To provide to the Recipient and the World Bank, periodic written reports on the defaults and recovery plan in accordance with the Operational Manual.
- To abide by the Anti-Corruption Guidelines, and to manage and use the proceeds of the Guarantee Account in a manner consistent with the purposes and objectives of the Project and in accordance with the provisions of the Guarantee Facility Operational Manual;
- Ensure that Part 2(b) of the Project is carried out in accordance with the provisions of an operational Manual acceptable to the Bank.
- Not amend, waive or fail to enforce any provision of the Operational Manual without the World Bank's prior written approval.
- The Recipient shall organize and maintain during Project implementation a Guarantee Facility Committee.
- The Recipient shall make available during the implementation of Part 2 (b) of the Project, an amount equivalent to \$5,000,000 as counterpart funds for the Guarantee Facility.
- The Recipient shall review with the World Bank, no later than [eighteen] months after the Effective Date, the operation of the Guarantee Facility for the purposes of assessing the operation of said Guarantee Facility and determine a framework for the future operation and/or winding down of the Guarantee Facility.
- The Recipient shall carry and/or cause to be carried the Parts of the Project referred to in Section 2.01 of this Agreement in accordance with the IPPF; and the Environmental Management Plan.
- The Recipient shall enter into a contract (*Convenio de Colaboración*) with NAFIN.

IV. APPRAISAL SUMMARY

A. Economic and Financial Analyses

59. Economic and financial analyses were undertaken for the Project, representing, respectively, the returns to the country as a whole, and to individual actors (NAFIN and households).

- *Economic Analysis.* The Project generates a robust economic rate of return. The overall economic internal rate of return (EIRR) for the Project was found to be 40 percent: more than 100 percent for the residential lighting component and 21 percent for the efficient appliances component,⁶ while the NPV was US\$860 million. The economic benefits include the energy savings from energy efficiency investments and the associated CO₂ reductions. The economic return would be even higher if other benefits associated with energy efficiency were quantified. These include the avoided capital costs for new power generating capacity, macroeconomic effects from avoided natural gas imports, energy security benefits by reducing overall electricity consumption, and local health benefits of reduced air pollution.
- *Financial Analysis.* The financial internal rate of return for Component 2b for NAFIN is 7.4 percent and the NPV discounted at its weighted average cost of capital of 5.4 percent is US\$15 million. Although Project financials appear moderate, a US\$25 million Guarantee Facility protects NAFIN as the financial intermediary for up to 9 percent of consumer defaults. In addition, households benefit financially under the CFL and appliance replacement programs from the energy savings.

B. Technical

60. Proven commercial technologies will be used for the CFL and appliance components, with established efficiency benefits.

- *Component 1.* CFLs are a proven energy-efficient technology; that consume less electricity than incandescent bulbs for the same lighting services. Mexico has experience in the area of CFL replacement; it was one of the first countries to introduce CFLs through its Mexico High Efficiency Lighting (GEF-ILUMEX) Project beginning in 1995, and the market penetration of CFLs has been increasing gradually since that time. The CFLs procured under Component 1 will be of high quality and will follow international standards (such as ELI, the U.K. Energy Saving Trust, E.U. CFL Quality Charter, U.S. Energy Star standard, and the Asia CFL Quality Charter) regarding the CFLs' life span, voltage fluctuation, power factor, harmonic distortion and mercury content.
- *Component 2.* The new refrigerators to be exchanged under this Component must be at least 5 percent more efficient than the prevailing Mexican energy efficiency norm (NOM-015-ENER-2002) for refrigerators. The qualifying air conditioners must be no more than one additional ton of refrigeration larger than the replaced air conditioner (1- to 1.5-ton capacity or mini-split ACs 0.75 to 1 ton) and must comply with the Mexican air conditioner energy efficiency norm NOM-021-ENER/SCFI/ECOL-2008. To ensure that the ACs comply with the norm, their efficiency must be certified by an accredited national institute under the *Entidad Mexicana de Acreditación* (EMA) or a similar international entity. The ACs will have a logo that states its efficiency. The appliances qualifying under this Component can be imported or manufactured in Mexico and must have a logo that states their efficiency or possess the "FIDE" logo, which also states the

⁶ Other recent studies have found EIRRs of 45 percent for residential refrigeration and 17 percent for residential air conditioning (Johnson and others 2010).

efficiency of the appliancesqualifying appliances are widely manufactured and are generally available at retail stores in Mexico.

61. Mexican energy efficiency standards are already high compared to other developing countries. These have been strengthened over time through a process of periodic updates (standards for refrigerators were updated in 2003 while for air conditioners in 2001). This update process has brought Mexican energy efficiency standards in line with some of the world's most stringent standards. Therefore, even though a 5% target over the current standards seems marginal, it represents efficiency gains in the range of 30-65% relative to the old equipment being replaced. A target above this 5% level would likely reduce the number and affordability of eligible efficient models.

C. Fiduciary

Financial Management

62. The World Bank conducted an assessment of the proposed Project arrangements (see Annex 7). The Project involves a high level of complexity including several implementing entities, and the flow of funds is also quite complex, especially for Component 2. These factors, together with the size of the proposed operation, make the inherent FM risk Substantial. The mitigating control factors, described in the FM Annex, include: (i) strong country public FM arrangements; (ii) a strong financial control environment in place, including suitable information technology systems used for overall accounting and processing, and an Operational Manual that contains detailed documentation of the policies and procedures applicable to the program; and (iii) specific TORs required for the external audit of the Project to ensure compliance with the Project's key operational and financial controls. As a result, the residual FM risk, i.e., the inherent risk as mitigated by existing controls, is determined to be *Moderate*.

63. The Operations Manual will include the Project FM Manual and is to be completed as a condition of closing negotiations. The inclusion of an FM specialist within the EEAU, under terms of reference and with qualifications satisfactory to the Bank, will be included as a condition of effectiveness and a covenant in the loan agreement. NAFIN is the trustee of the trust fund Fideicomiso 8013-9 "Guarantee Facility TF" created for the repayment of defaulted lines of credit to eligible beneficiaries under the existing appliances replacement program, which will be also used to manage the resources of the GEF Guarantee Facility under component 2b of the project. In this regard, NAFIN will need to fulfill in a manner satisfactory to the Bank the requirements established in paragraph 8 of OP 10.20 - Global Environment Facility Operations, which will be included as a covenant in the GEF legal agreement.

Procurement

64. The Bank carried out an assessment of the capacity of SENER and FIDE to handle procurement for Components 1 and 3. FIDE does not have previous experience in implementing World Bank-financed projects; however, it has previous experience in using International Competitive Bidding (ICB) for procuring CFLs, following its own procurement rules. The assessment also reviewed FIDE's organizational structure and found it satisfactory for

implementing Bank procurement guidelines and procedures. FIDE should coordinate the procurement of CFLs with CFE to adequately handle technical aspects of the Project; this aspect will be confirmed during appraisal and negotiations and is to be reflected in the implementation agreement between SENER and FIDE (i.e., the CFL Implementation Agreement). SENER will be responsible for procuring the studies to be financed under Component 3. Procurement will be conducted by the EEAU, as described above. Capacity building for this unit will also be provided under Component 3. At this stage the procurement risk is considered *Substantial*. Further details are included in Annex 8.

D. Social

65. SENER has undertaken a Social Assessment in the targeted areas selected for the Project, specifically for the CFL program in Component 1, which will be implemented nationwide in low to medium income households. Beneficiaries of this component will include different low-income social groups, including indigenous peoples (IPs). The Social Assessment focused on an analysis of: (i) the social context of the Project; (ii) aspects of diversity and gender; (iii) a participation framework for formal as well as informal institutions in the Project areas; (iv) preparation of a culturally adequate communications strategy; (v) a detailed stakeholder analysis; and (vi) a comprehensive analysis of social risk, including potential risks emanating from the Project and risks to the Project from the social context. A structured consultation was carried out on March 13, 2010, with the national indigenous people's leadership in the *Comisión Nacional para el Desarrollo de los Pueblos Indígenas* (CDI).

66. The Project is expected to benefit a large proportion of Mexico's indigenous peoples. To ensure adequate social inclusion, SENER has prepared an Indigenous Peoples Planning Framework (IPPF) and a Social Assessment as required by OP/BP 4.10; a framework is appropriate for situations where the specific beneficiaries are not known at appraisal, as is the case in this Project. As part of this IPPF, a statistical social assessment has been developed to support a strategy that focuses on reaching locations with significant numbers of indigenous peoples. If the strategy is successfully implemented, and recognizing that there are several challenges, the Project could reach over two-thirds of Mexico's indigenous peoples for Components 1 and 2 (a detailed description of the IPPF and the results of the consultation with the indigenous leaders can be found in Annex 10).

67. SENER will also prepare a culturally adequate communication strategy to reach indigenous peoples at the beginning of Project implementation, as recommended in the IPPF. This strategy will be financed under Component 3. Following the consultation, the national indigenous peoples leadership (through the CDI) endorsed the Project and made recommendations to ensure the inclusion of indigenous families as Project beneficiaries (a detailed account of these outcomes can be found in Annex 10). These recommendations have been included in the outreach strategy, as described in the IPPF.

68. The IPPF that was prepared will guide actions by the Government, NAFIN and implementing agencies to ensure compliance with the relevant Mexican legislation and with the Bank's Operational Policy (OP/BP 4.10) for Indigenous Peoples.

E. Environment

69. The bidding documents for Component 1 will stipulate that the awarded consortium will be responsible for the distribution of CFLs and the collection of used incandescent bulbs. FIDE will be responsible for ensuring proper disposal of the used bulbs in compliance with Mexican environmental law, policies and procedures, and with the World Bank Safeguards policy (OP/BP/GP 4.01). In addition, the analytical aspects for the development of CFL recycling centers through private sector participation will be supported under Component 3.

70. Component 2 involves environmental risks associated with the disposal of old refrigerators and air conditioners, including the dismantling of units, the recycling of metals, and the safe handling, recycling and disposal of refrigerant gases. An adequate recycling and disposal program will minimize potential impacts, especially those related to refrigerant gases; similar programs adopted internationally have had success through the use of well-prepared operational manuals and guidelines. An operational manual is currently in use in the appliance replacement pilot program for refrigerant gas recovery as well as for waste management in the scrapping centers; it will be incorporated into the Project Operational Manual. Component 2 will also support the development of a certification program for dismantling appliances, for recycling centers, and for supporting annual audits of these facilities.

71. An Environmental Management Plan (EMP) was prepared to guide the actions of the Government, NAFIN and implementing agencies to ensure compliance with the relevant Mexican environmental legislation and with the Bank's Environmental Safeguards (OP/BP 4.01).

Safeguard Policies

72. This is a Category B Project with no major negative social or environmental impacts. The safeguard policies that this Project triggers are the Environmental Assessment (OP/BP/GP 4.01) and the Indigenous Peoples policy (OP/BP 4.10). The Project will have minor adverse environmental impacts and no adverse social impacts. Among the environmental benefits associated with reducing energy consumption through energy efficiency measures are: the reduction in local air pollutants (fine particulates, SO_x, NO_x), and the reduction of greenhouse gas emissions, specifically CO₂. In addition, demand-side EE investments in the residential sector may bring significant social benefits such as reducing consumer electricity bills, thus improving affordability.

73. As noted above, SENER has prepared an Environmental Assessment (EA) for the Project and a resulting EMP. SENER through FIDE will ensure that service providers comply with the requirements of the EMP; FIDE has the operational capacity to supervise the performance of the delivery agencies (demonstrated in part through their expertise in the pilot programs). Public consultations with stakeholders were held for the EA and the EMP in accordance with OP/BP 4.01, and their relevant suggestions were included in the final EA and EMP reports. In addition, as also noted above an IPPF was prepared and structured consultations have been carried-out.

74. The EMP and the IPPF were released in-country (including through SENER's website), and were filed in the Infoshop end of June 2010.

75. Specific environmental and social issues for each component are listed below.

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP 4.01)	[X]	[]
Natural Habitats (OP/BP 4.04)	[]	[X]
Pest Management (OP 4.09)	[]	[X]
Physical Cultural Resources (OP/BP 4.11)	[]	[X]
Involuntary Resettlement (OP/BP 4.12)	[]	[X]
Indigenous Peoples (OP/BP 4.10)	[X]	[]
Forests (OP/BP 4.36)	[]	[X]
Safety of Dams (OP/BP 4.37)	[]	[X]
Projects in Disputed Areas (OP/BP 7.60)*	[]	[X]
Projects on International Waterways (OP/BP 7.50)	[]	[X]

F. Policy Exceptions and Readiness

76. The Project complies with all applicable Bank policies and requires no policy exception.

77. The following table provides an overview of the Project's readiness for Board consideration.

Readiness Criteria	Status
Financial Management Assessment	Assessment complete. Risk is Moderate
Procurement Capacity Assessment	Assessment complete. Risk is Substantial
Social and Environment Assessment	Assessment complete. Documents released in-country and filed in the Infoshop
Project Implementation Teams Established	Technical teams in SENER and NAFIN have been established. EE Administrative Unit at SENER in place..
Project Implementation Manuals Prepared	Under preparation. To be completed by close of negotiations.
Bidding Documents Prepared for Year 1 Activities	Preparation of bidding documents for Component 1 will start in August 2010.

* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas.

Annex 1: Country and Sector Background
MEXICO: Efficient Lighting and Appliances Project

A. Country Context

1. The Mexican economy is beginning to recover from a deep contraction of economic activity following the global economic and financial crisis. As a relatively open economy, Mexico was hard hit by the collapse of international trade during the last quarter of 2008 and the first quarter of 2009. As a result, annual economic growth in 2008 reached only 1.3 percent and gross domestic product (GDP) actually contracted by 6.5 percent in 2009. Prior to the onset of the economic crisis, the Mexican economy experienced a period of balanced and broad-based expansion of economic activity at an average annual GDP rate of 3.8 percent between 2004 and 2007. A vigorous global economic expansion contributed to the enhanced growth performance as exports increased at a double-digit annual average rate. Enhanced price stability contributed to a healthy growth of domestic demand as a result of an improved purchasing power of wages and salaries and an expansion of domestic credit and consumer lending.

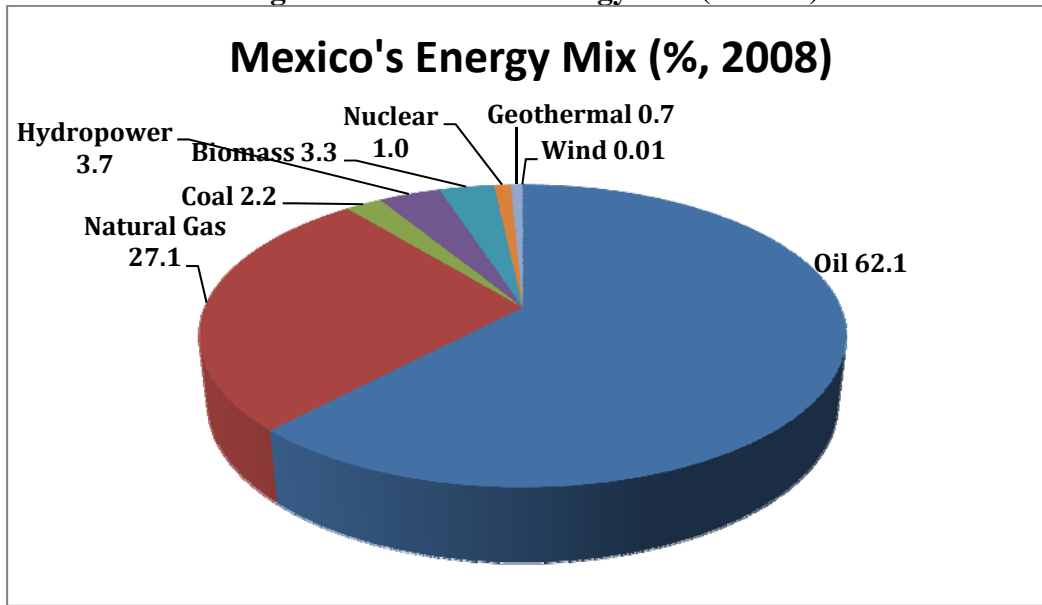
2. The Government's development plan aims at enhancing structural economic growth and aspires to generate one million new jobs each year and reach an annual economic growth rate of 5 percent by the end of the current administration in 2012. To reach these levels of growth, Mexico will require improved competitiveness through the lowering of barriers to business investment, improved infrastructure, an expanded financial sector and a strengthened human capital base.

B. Energy in Mexico

3. Mexico is both a large producer and exporter of energy, and also a major consumer of energy. For example, it is the world's sixth-largest oil producer and Latin America's largest energy consumer. As a result, the energy sector is of strategic importance to the economy and is a driver of economic growth, productivity and competitiveness. For years, the country has relied on a generous endowment of petroleum to meet domestic energy needs as well as to generate significant revenues through the international sale of crude oil; however, oil production has dropped from a high of approximately 3.4 million barrels per day in 2004 to approximately 2.6 million barrels per day in 2009. Although PEMEX's relative contribution to the economy has declined in the past two decades as oil reserves have fallen by 27 percent in the last five years, oil revenues still provide at least one-third of the federal budget.

4. Hydrocarbons represent 89 percent (of which 62 percent is oil and 27 percent is natural gas) of the primary energy production in the country, while electricity production (hydropower, nuclear and geothermal) represents about 5 percent, biomass 3 percent and coal 2 percent. Details on Mexico's energy matrix are provided in Figure 1.1 below.

Figure 1.1: Mexico's Energy Mix (in 2008)



Source: SENER, Balance Nacional de Energía, p. 21.

5. Mexico's 2007–2012 energy policies are based on its National Development Plan, which establishes Federal Government commitments, strategies and lines of action in all areas including the energy field. Energy security and diversification are a paramount component of the national agenda, as observed in the Mexican Energy Reform (Hydrocarbons Law), the *Ley para el Aprovechamiento de las Energías Renovables y el Financiamiento de la Transición Energética* (Renewables Law) and the *Ley para el Aprovechamiento Sustentable de la Energía* (the Sustainable Use/Energy Efficiency Law) approved by Congress in November 2008. These new laws seek to reform the energy sector in Mexico with a special emphasis on hydrocarbons, but also with a focus on energy efficiency and renewable energy. The policies embedded in these laws seek to ensure the energy supply needed for the country's development at competitive prices, to operate at international standards, mitigate environmental impacts and promote the rational use of energy while diversifying primary energy supplies.

C. The Electricity Sector

Institutional Context

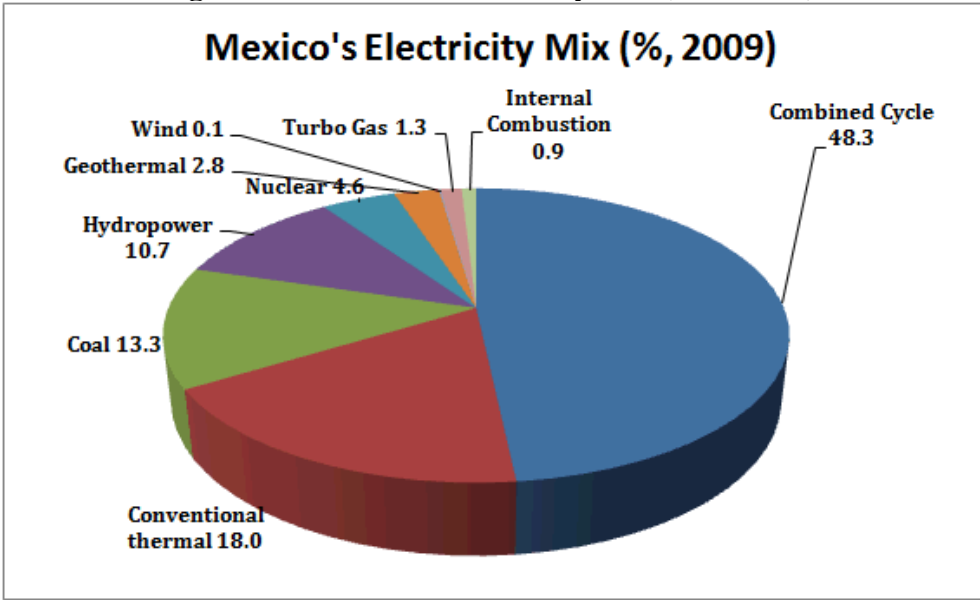
6. There are several key institutions in Mexico's electricity sector, which is dominated by public sector entities. The *Secretaría de Energía* (SENER, Secretariat of Energy) is responsible for planning and formulating electricity and other energy policies. The *Comisión Reguladora de Energía* (CRE, Energy Regulatory Commission) is responsible for the regulation and oversight of the electricity subsector. The state-owned power company, *Comisión Federal de Electricidad* (CFE, Federal Electricity Commission), is responsible for the generation, transmission and distribution of electricity and serves the entire population. Since the mid-1990s, private participation in the sector has increased dramatically in generation, with most new capacity being

provided by independent power producers (IPPs) that produce power either for self-supply or to sell to CFE under long-term contracts.

Generation Mix

7. In 2009, Mexico’s installed capacity reached 50.3 GW. CFE owns 177 generating plants with an effective generation capacity of 38.9 GW; the company generated about 154 TWh in 2009. IPPs represent around 23 percent of total installed capacity (11.4 GW) and generated 32 percent of total electricity (76 TWh) in 2009. Fossil fuel based generation represents the overwhelming majority of Mexico’s electricity generation (about 80%), while the mix has been steadily shifting from oil products to natural gas. Figure 1.2 below illustrates Mexico’s electricity generation matrix in further detail.

Figure 1.2: Mexico’s Electricity Mix (as of 2009)



Source: SENER, *Prospectiva del Sector Eléctrico*, p.145.

8. The Government of Mexico (GoM) is actively promoting renewable energy development through policies, programs and projects. The Renewable Energy Law and the associated policy and institutional framework being developed are intended to have a transformational effect on Mexico’s energy sector and contribute in a substantial way to the country’s ambitious agenda to address climate change. In July 2009, SENER released its *Estrategia Nacional Para la Transición Energética y el Aprovechamiento Sustentable de la Energía* that assesses Mexico’s renewable energy situation in an international context and describes objectives and planning instruments for renewable energy development as well as the relationship to ongoing energy sector reforms. In that context, SENER is planning to increase its installed capacity of wind power from 208 MW to 4,000 MW by 2012. The majority of this new wind power capacity will be developed in areas identified with high potential, including Oaxaca, Baja California and Yucatán. Similarly, Mexico also plans to increase its installed hydropower capacity (currently estimated at 11.4 GW) by 1,244 MW in the next 10 years and to increase its geothermal capacity by 233 MW in the same time frame.

Consumption levels

9. Electricity coverage (access) in Mexico is currently 97 percent. In 2009, Mexico consumed 230 TWh of electricity,⁷ which represents a slight decrease from 2008 (231 TWh), mainly explained by the effects of the financial crisis on economic activity. In spite of this fact, the Government forecasts that electricity consumption in Mexico will still increase by 3.3 percent annually through 2018 (down from the average 3.9 percent annual increase from 1997 to 2007).

Electricity Use: The Residential Sector

10. In 2008, the residential sector constituted 16 percent of total end-use energy consumption and 25.8 percent of total electricity use.⁸ According to the *Programa Nacional para el Aprovechamiento Sustentable de la Energía 2009–2012* (PRONASE), energy consumption in the residential sector has been growing faster than GDP growth due to Mexico's overall population growth, an increased penetration rate of energy-consuming technologies in households, and higher energy consumption levels of various technologies.

11. In 2008, a typical household consumed an equivalent of approximately 8,735 kWh/year of energy (4,157 kWh/year of electricity and 4,578 kWh/year of gas). Most household energy consumption is attributable to the use of domestic equipment such as stoves, heaters, refrigerators and air conditioners; combined, these represent about 70 percent of household energy consumption (the remainder is transport) and are expected to be the main growth areas of future residential electricity demand. Electricity consumption in the lighting sector as a whole grew at 3.9 percent annually between 1997 and 2007 and is projected to continue at 3.3 percent annually through 2030,⁹ with the residential sector is projected to grow the most rapidly.

Residential Electricity Subsidies

12. Electricity subsidies in Mexico are among the largest in the world (US\$9 billion in 2006) and have absorbed a significant proportion of public resources. Subsidies in 2006 were equivalent to about 1 percent of gross domestic product and were more than one-third of total electricity sector revenues. Over two-thirds of total electricity subsidies in Mexico go to residential consumers, and the volume of subsidies to residential consumers increased by 46 percent between 2002 and 2006 in real terms (Komives and others, 2009). Mexico has an extremely complex tariff system with over 112 different billing possibilities for residential consumers. These subsidies have largely been financed by a bookkeeping transfer: the Federal Government essentially reimburses CFE for providing subsidies to its consumers by discounting the taxes and dividends ("*aprovechamiento*") that CFE would otherwise have to pay the Government. Tariff subsidies of such a large magnitude impact heavily on the performance of the electricity sector and on Mexican society more generally in several ways. First, the fiscal transfers used to pay for the electricity subsidies divert resources from priority social and

⁷ CFE. <http://www.cfe.gob.mx/lang/en/Pages/thecompany.aspx>

⁸ The industrial sector accounted for 58.5 percent of electricity use, commercial sector 7.4 percent, services sector 3.8 percent and agricultural sector (mainly water pumping) 4.4 percent.

⁹ The lighting sector as a whole currently represents approximately 18 percent of Mexico's total electricity consumption.

economic programs. Second, subsidies distort price signals, elevating demand above what it would be if electricity were priced at marginal or average cost. Finally, subsidies also engender environmental externalities by supporting overconsumption; elevated demand in turn leads to incremental emissions from power plants, including local pollutants responsible for poor air quality and the resulting health impacts. Finally, the bulk of subsidies go to the non-poor. Numerous reports have illustrated this point, and Mexican authorities, cognizant of this problem, have expressed a strong interest in evaluating the impact of a shift from quantity-based targeting to means testing, building upon the poverty profiling and verification systems established under the *Oportunidades* social program.

13. Despite the fact that Mexico provides significant electricity subsidies to consumers; - currently over two-thirds of these subsidies go to residential consumers - the average residential tariff in Mexico (US\$8 cents/kWh in low income groups) is about the same as that in the US, Chile and Colombia and is considered high enough to induce energy efficiency measures. While reducing residential electricity subsidies would provide greater incentives to promote energy efficiency, the experience with residential energy efficiency programs in Mexico shows that there are sufficient price incentives to make it attractive for households to replace inefficient lighting and appliances. For example, at current average residential tariffs, a compact fluorescent lamp (CFL) would pay for itself in less than a year and generate savings of over US\$20 over its lifetime.

14. Within this context, SENER has proposed in its February 2010 National Energy Strategy (ENE) a three-pronged plan of action to begin to address electricity tariffs and subsidies in the context of the Government's energy efficiency objectives. The first prong of actions is to gradually implement tariff schemes that reflect the opportunity costs of other energy sources, and incentivize energy efficiency while protecting low-income populations through targeted subsidy programs. Under the second prong, the Government will explore complementary mechanisms to promote energy efficiency. The third line of action is to provide more transparent information on the sub-components of energy prices, differentiating between the supplier's price, taxes and subsidies. It is worth mentioning that the Mexican Government's action of consolidating *Luz y Fuerza del Centro* (a former public utility that provided electricity services in Mexico city and its metropolitan area) with CFE was in part in an effort to reduce costs and thus bring electricity costs closer to the tariff rates.

D. Climate Change, the Energy Sector and Mexico's Response

15. Dealing with climate change has become a major policy objective of the Government of Mexico. In May 2007, President Calderón announced the National Climate Change Strategy (*Estrategia Nacional de Cambio Climático*, ENACC), thereby placing climate change at the heart of the national development policy. The country is the second-largest emitter of greenhouse gases (GHG) in Latin America¹⁰ and ranks twelfth in the world in terms of total GHG emissions. Mexico's climate change strategy aims at reducing emissions of GHGs per unit of GDP and reducing the impacts of climate change by implementing a timely adaptive response.

¹⁰ Using the most recent data to date (2006). Includes human-produced, direct emissions of carbon dioxide only. Excludes other greenhouse gases; land use, land-use change and forestry (LULUCF); and natural background flows of CO₂. Source: United Nations Statistics Division, Millennium Development Goals indicators.

Due to the prominence of energy-related emissions, the Government has embarked on an aggressive energy efficiency program that is integrally linked to its climate change mitigation strategy.

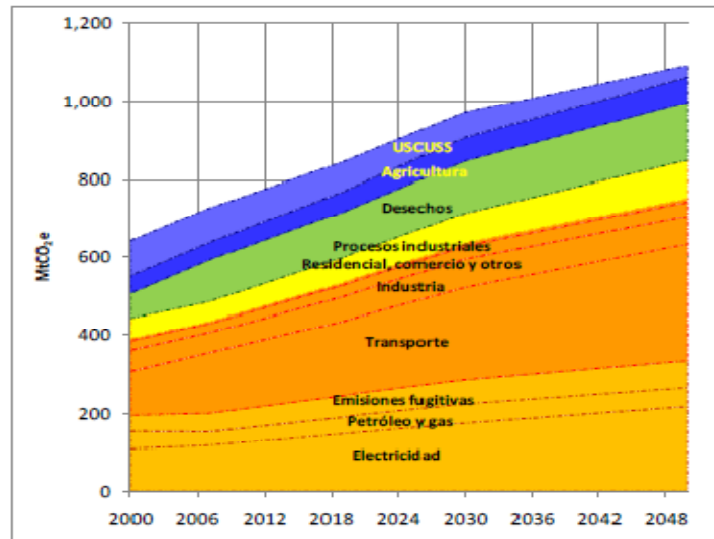
16. According to Mexico's Fourth National Communication to the UNFCCC, Mexico emitted 711 million tons of carbon dioxide equivalent (Mt CO₂e) in 2006, of which over 400 Mt CO₂e came from energy-related emissions (including from energy-use in the transport sector). These emissions account for about two-thirds of total emissions in terms of CO₂e.¹¹ The relevance of climate change to the energy sector has been covered in various and interrelated analytical and policy works, including the Government's National Climate Change Strategy, PECC and the MEDEC low carbon study, as described below.

17. ENACC sets the country's long-term climate change agenda, together with medium- to long-term goals for adaptation and mitigation. In August 2009, Mexico officially launched a Special Climate Change Program (*Programa Especial de Cambio Climático*, PECC), which defines how to operationalize ENACC. PECC identifies a range of climate change interventions at the sectoral and subsectoral levels, and quantifies the potential impact and cost of each intervention in terms of policy, regulation and technology adoption. The program sets emission-reduction targets, including an annual electricity-related emissions reduction goal of between 14 and 28 Mt CO₂ by 2012. PECC sets out a four-pillar program that includes: (i) a long-term vision for government action; (ii) sectoral plans for GHG mitigation; (iii) plans for adaptation; and (iv) cross-cutting policy initiatives. Under a longer-term vision, PECC establishes the formal objective of reducing GHG by 50 percent by 2050 against the baseline of 2000. Energy efficiency (EE) is an important aspect of the PECC program.

18. In order to prioritize the proposed interventions for mitigation, PECC quantifies sectoral GHG emissions in Mexico and projects their future growth under different scenarios. Figure 1.3 below illustrates the sectoral breakdown—highlighting the central and growing role of electricity—in Mexico's current and future emissions profile under a "baseline" scenario.

¹¹ The contribution by category in terms of CO₂e is as follows: energy uses: 60.4 percent; waste: 14.4 percent; land use, land-use change and forestry: 9.9 percent; industrial processes: 8.9 percent; and agriculture: 6.4 percent. The energy uses category is further subdivided into energy industry: 35 percent; transportation: 34 percent; manufacturing and construction industry: 13 percent; fugitive emissions: 11 percent; and other sectors (residential, commercial, and agricultural): 7 percent. Mexico's total GHG emissions are equivalent to about 4.31 tons of CO₂e per capita if only CO₂ emissions from fossil fuel combustion are included.

Figure 1.3. Base Case Growth in Emissions in Mexico, by Sector (2000–2050)



Source: PECC Consultative Draft, March 2009.

19. In establishing a plan to stabilize and reduce GHG emissions, PECC identifies the interventions necessary at the sectoral and subsectoral levels, quantifying the potential impact of each change in policy, regulation, and technology adoption. The Plan identifies four groups of policy interventions according to the emissions reduction impact and cost of implementation, as illustrated in the diagram below. Those policies and programs falling into Groups 1 and 2 will produce reductions in CO₂e emissions that also provide economic and social co-benefits—such as those from improved health benefits, lower energy prices, or greater urban mobility—which are greater than the outlays in public transfers. Groups 3 and 4 will require longer-term commitment of resources, although the Government recognizes the benefits, particularly of Group 3, to be crucial to the climate change strategy. The primary infrastructure area in Group 3 is renewable energy, a recognition that the pricing of contracts for renewable generation—particularly in the periods prior to the implementation of a cap and trade regime—will have to value the external benefits of emission reductions in order to attract sufficient private sector interest. The targeted interventions under the proposed Project fall under Group 1, representing interventions that pay for themselves through significant co-benefits.

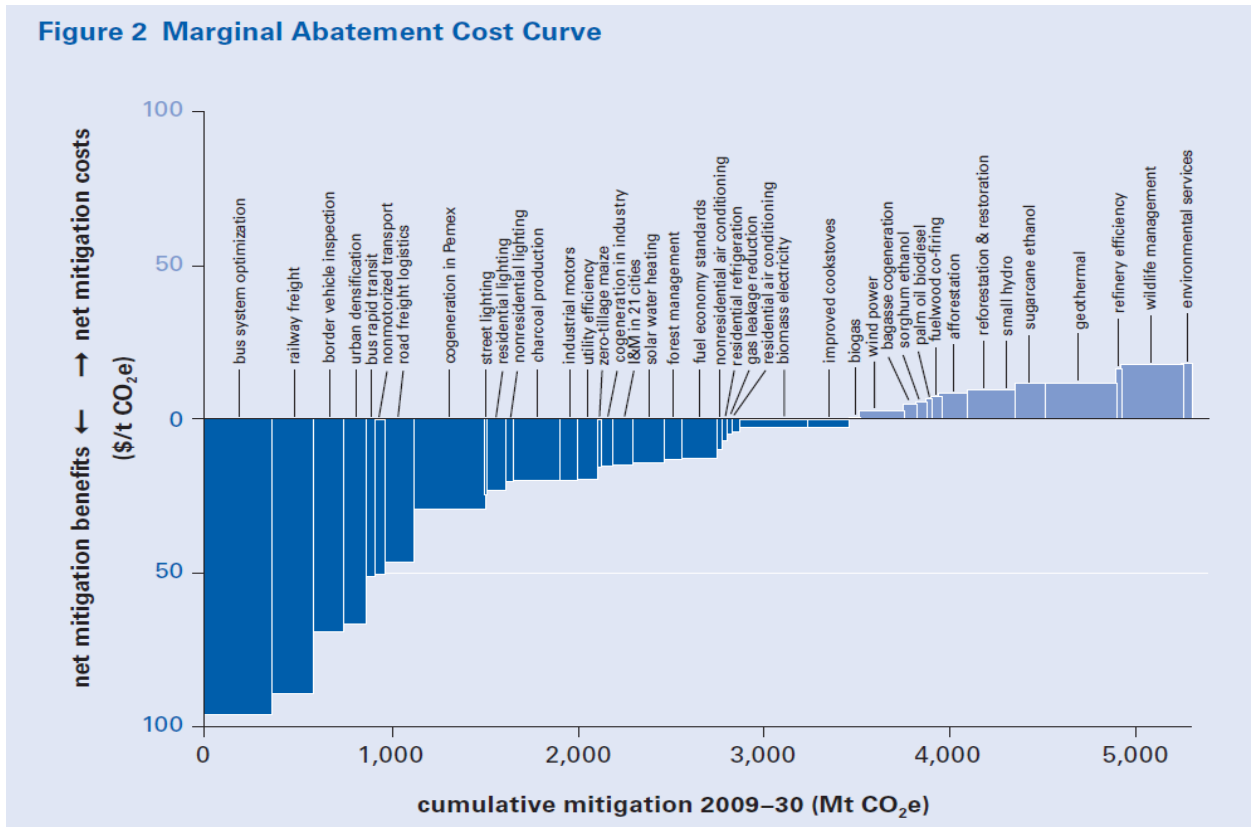
**PECC Division of Interventions According to Size of Impact
and Cost of Intervention**

	<i>Lower-Hanging Fruit: Interventions that Pay for Themselves through Significant Co-benefits</i>	<i>Higher-Hanging Fruit: Interventions that May Contain Costs beyond their Co-benefits</i>
High Impact: > 3 million metric tons per year of CO ₂ e reduction	<p>Group 1</p> <p><i>Between US\$5 and US\$33 net benefit per tCO₂e</i></p> <p>Infrastructure 1. Mass Transit and Public Transport 2. Residential & Commercial Energy Efficiency</p> <p>Industrial 3. Co-generation in Industry, Petroleum, Gas</p>	<p>Group 3</p> <p><i>Between US\$32 net cost and US\$12 net benefit per tCO₂e</i></p> <p>Infrastructure • Renewable Energy Generation</p> <p>Agriculture/Forestry • Reduced Deforestation</p>
Low Impact: < 3 million metric tons per year of CO ₂ e reduction	<p>Group 2</p> <p><i>Between US\$24 and US\$65 net benefits per tCO₂e</i></p> <p>Infrastructure • Municipal Services and Industrial Energy Efficiency • Electricity Transmission & Distribution</p> <p>Industrial and Commercial • Light-duty Vehicle Efficiency</p>	<p>Group 4</p> <p><i>Between US\$7 and US\$17 net cost per tCO₂e</i></p> <p>Industrial and Infrastructure • CO₂ Capture and Storage</p> <p>Agriculture/Forestry • Reforestation</p>

Source: PECC Consultative Draft (March 2009); Bank illustration.

20. According to the recently published *MEDEC: Low-Carbon Development for Mexico* (World Bank 2010), managing the growth of electricity demand through energy efficiency measures in the end-use sectors will be a critical component of Mexico’s climate change mitigation strategy. As described in this report, currently the electric power sector accounts for around 21 percent of GHG emissions. The demand for electricity in Mexico has been growing faster than GDP over the past several decades and this trend is likely to continue for the foreseeable future as electricity use continues to grow in all sectors. Air conditioning, home appliances and electronics are expected to be the main growth areas of residential electricity demand in Mexico. Currently, these three energy end-uses along with lighting account for roughly equal shares of residential electricity consumption. The MEDEC marginal abatement cost curve shows that the investment required in all electricity efficiency interventions is significantly less than the investment in power plants that would otherwise be needed (Figure 1.4). In other words, “negawatts” from energy efficiency are almost always cheaper than megawatts.

Figure 1.4. Focus Areas of Energy Efficiency Opportunity



Source: Low-Carbon Development for Mexico, World Bank (2010)

21. The Government is moving to incorporate its climate change agenda into its individual sector programs. The Government’s Energy Sector Program 2007–2012 (*PROSENER*) provides a comprehensive policy framework focused on energy security, technical efficiency, environmental sustainability and climate change. Its policy objectives and specific targets provide the enabling policy framework to advance the country’s climate change agenda. In the electricity sector, *PROSENER* has adopted three goals: (i) to balance and diversify the primary sources of energy (e.g., reduce the share of fuel oil and coal-based generation from 38 to 30 percent by 2012 and increase the share of renewable energy sources for power generation from 2 percent in 2006 to 6 percent in 2012); (ii) to promote the efficient use and production of energy in all sectors (e.g., increase energy savings from 21,686 GWh in 2006 to 43,416 GWh by 2012); and (iii) to promote greater energy efficiency and conservation of electricity in the residential sector. The table below summarizes the specific targets that have been enumerated by different sources.

Energy Efficiency Targets Summarized by Source

<i>Estrategia Nacional de Cambio Climático (ENACC)</i>	
CONUEE program's mitigation potential	Gradually reach 24 MtCO ₂ e/year (within a scope of 20 to 28 MtCO ₂ e/year) in 2014 (baseline 2005)
FIDE's and new programs' mitigation potential	Reach an additional CO ₂ e of around 8 percent (5 to 10 percent), that is, to incrementally reduce and reach 3.9 MtCO ₂ e/year (within a scope of 3.8 to 4 MtCO ₂ e/year) in 2014 (baseline 2005)
<i>Programa Especial de Cambio Climático (PECC)</i>	
Enhance energy efficiency in homes and offices through FIDE's energy efficiency programs (Goal #36)	Emissions reduction of 0.35 MtCO ₂ e by 2012 (baseline 2008)
GHG emission reduction through electricity savings within the Federal Public Administration (APF) as a result of energy efficiency (Goal #44)	Emissions reduction of 0.25MtCO ₂ e by 2012 (baseline 2009)
Electricity savings of 7,871 GWh between 2009 and 2012 as a result of the replacement of 1,928,916 refrigerators and air conditioners and 47.2 million CFLs for IBs (Goal #37)	Emissions reduction of 4.73 MtCO ₂ e by 2012 (baseline 2008)
<i>Programa Sectorial de Energía 2007–2012 (PROSENER)</i>	
Overall GHG emission reduction (CO ₂ e) from savings in electricity generation	Emission reduction of 28 MtCO ₂ e by 2012 (baseline: 14 MtCO ₂ e in 2006)

22. At the international level, although Mexico as a non-Annex I country is not mandated to limit or reduce its GHG emissions under the Kyoto Protocol, the Government has firmly adopted the UNFCCC principle of “common but differentiated responsibilities” and has pledged to voluntarily reduce its GHG emissions. In December 2008, at the 14th Session of the Conference of the Parties to the UNFCCC in Poznan, Poland, Mexico announced that it would reduce its GHG emissions in 2050 by 50 percent below 2002 levels, and restated that commitment during the January 2009 meeting of the World Economic Forum in Davos. Furthermore, Mexico will host the 16th Conference of the Parties of the UNFCCC at the end of 2010, demonstrating its commitment to achieving an international climate change agreement.

E. Mexico's Energy Efficiency Strategy

Regulatory, Institutional and Programmatic Context

23. To achieve its energy efficiency and climate change mitigation goals, the Government has designed a comprehensive national strategy that lays the groundwork for the implementation of a comprehensive energy efficiency plan. The strategy includes regulatory changes accompanied by the strengthening of key government agencies, and the establishment of financial mechanisms to implement key programs and projects. Key measures are described below.

24. On the regulatory side, the *Ley para el Aprovechamiento Sustentable de la Energía* (the Sustainable Use/Energy Efficiency Law) was signed into law in November 2008. This law establishes the enabling environment for promoting energy efficiency by providing the legal framework for the development and implementation of strategies, policies and programs. The objective is to promote the sustainable use of energy in all of the processes and activities related to the production, transformation, distribution and consumption of energy, including those in the residential, commercial and industrial sectors.

25. In addition to establishing the legal basis for formulating strategies, policies and programs for the sustainable use of energy, the Energy Efficiency Law requires strong secondary regulations to create the specific mechanisms for implementing the announced energy efficiency objectives and strategies. In July 2009, SENER complied with this commitment by making publicly available the *Estrategia Nacional para la Transición Energética y el Aprovechamiento Sustentable de la Energía* (National Strategy for the Energy Transition and Sustainable Use of Energy). The Strategy outlines the framework to promote policies, programs, actions and projects to increase the use of renewable energy, and to promote energy efficiency and energy conservation to decrease the use of fossil fuels.

26. In February 2010, SENER published Mexico's 2010–2024 National Energy Strategy (ENE). The Strategy is based on three pillars: (i) energy security, (ii) economic and productive efficiency, and (iii) environmental sustainability. Based on these three pillars, the Strategy outlines nine objectives to be implemented by 2024, as well as the elements that will facilitate their implementation. Among these nine objectives, two directly target energy efficiency: (i) to increase the efficiency levels of energy consumption, and (ii) to operate the energy infrastructure in a more efficient, reliable and secure manner.

27. At the programmatic level, PROSENER (described above) and the *Programa Nacional para el Aprovechamiento Sustentable de la Energía 2009–2012* (PRONASE) identify opportunities to achieve an optimal use of energy and to generate substantial energy savings for the country in the medium and long terms. Several high-potential areas for emission reductions have been identified, including lighting (19.2 TWh 2010–2012), household equipment (6.6 TWh 2010–2012) and transport (9.0 TWh 2010–2012).

28. On the financing side, the *Fideicomiso para la Transición Energética y el Uso Sustentable de la Energía* (the Trust Fund for the Energy Transition and the Sustainable Use of Energy, or the EE Trust Fund) provided for in the Renewable Energy Law was established with the purpose of increasing financing to advance the energy transition from hydrocarbons to renewable energy and energy efficiency. The EE Trust Fund is an important vehicle to foster the implementation of renewable energy and energy efficiency projects in Mexico, since the limited availability of financing has been identified as one of the most important barriers to the adoption of sustainable energy practices. The Fund can provide loans, credit guarantees and other financial support to projects that comply with the National Strategy for the Energy Transition and Sustainable Use of Energy. The Fund is expected to be fully capitalized by 2011. The Government made an initial contribution of US\$60 million to the Fund in 2009 to support a pilot appliance replacement program. In 2010, the Fund received US\$125 million to finance both energy efficiency and renewable energy projects.

29. On the institutional front, the *Comisión Nacional para el Uso Eficiente de Energía* (CONUEE) has been established, drawing on the staff and institutional capacity from the former *Comisión Nacional para el Ahorro de Energía* (CONAE). CONUEE has been granted the authority: (i) to issue recommendations to states, municipalities and individuals in relation to best practices for the sustainable use of energy; (ii) to facilitate the optimal use of energy from exploration to consumption; and to develop and issue methodologies for the quantification of GHG emissions associated with exploration, production, processing, distribution and consumption of energy, as well as the emissions avoided as a result of the more sustainable use of energy; (iii) to provide technical assistance on sustainable use of energy to the agencies of the Federal Public Administration and to state governments and municipalities; and (iv) to implement the National Information Subsystem for the Sustainable Use of Energy. These tasks represent an important expansion over the mandate of CONAE, notably with respect to its expanded responsibility in the areas of monitoring and oversight of program implementation. The creation of CONUEE also provides a clearly differentiated distribution of responsibilities between SENER, which is in charge of sector planning, and CONUEE, which is in charge of the promotion of the sustainable use of energy in all sectors and levels of government and the implementation of the National Program for the Efficient Use of Energy (PRONASE).

29. The programs described above are supported at the operational level by two independent entities (legally established as trust funds), the private sector *Fideicomiso para el Ahorro de Energía Eléctrica* (FIDE) and the public sector *Fideicomiso para el Programa de Aislamiento Térmico* (FIPATERM). Both FIDE and FIPATERM were established in 1990 at the initiative of CFE, and today serve as key vehicles for implementing energy efficiency programs. The goal of FIDE is to encourage electricity conservation in most electricity-consuming sectors. FIDE is 20 percent controlled by CFE; the other shareholders include public and private sector entities. While FIDE operates mainly in the central states of Mexico, FIPATERM serves a similar function to FIDE in several northern and southern states (Campeche, Chiapas, Chihuahua, Coahuila, Durango, Oaxaca, Nuevo León, Sinaloa, Sonora, Tabasco, Tamaulipas, Quintana Roo and Yucatán).

Energy Efficiency Opportunities within the Residential Sector

30. As noted above, energy consumption in the residential sector has been growing faster than GDP growth as a result of Mexico's overall population growth, an increased penetration rate of energy-consuming technologies within households, and higher energy consumption levels of various technologies and this growth has been projected to continue at 3.3 percent annually through 2030. Most household energy consumption is derived from domestic equipment such as stoves, heaters, refrigerators and air conditioners; combined, these represent about 70 percent of household energy consumption and are expected to be the main growth areas of future residential electricity demand. This information provides the basis for cost-effective household energy efficiency programs based on increasing the energy efficiency of residential appliances and lighting.

31. *Refrigerators.* Data from the 2007 census indicated that 98.99 percent of the households with electricity in Mexico had a refrigerator and that 58 percent (13.09 million) of these refrigerators were less than 10 years old, 29 percent (6.43 million) were between 11 and 20 years old, and 13 percent (3.44 million) were more than 20 years old. The main international

manufacturers of household refrigerators have refrigerator and compressor manufacturing facilities in Mexico. The share of locally manufactured refrigerators in total sales decreased from 75.8 percent in 2001 to 67.3 percent in 2007. In 2007, 1.6 million new household refrigerators were sold in Mexico, representing a 4 percent increase from the previous year.

32. *Air conditioners.* The household market penetration of room and mini-split air conditioners in Mexico is estimated to be less than 25 percent, or approximately 6 million households. It is estimated that 25 percent or less of these household air conditioners were installed before 2000 (i.e., are more than 10 years old), with the vast majority (over 4.5 million) installed during or after 2000.¹² In terms of the growth in air conditioner sales over time, sales in Mexico were about 160,000 in 1994 but grew rapidly during the first ten years of the standards program, reaching 568,000 in 2004. The average annual growth rate during the full 10-year period was about 15 percent, but it exceeded 30 percent in the last three years of the analysis period.

33. *Residential lighting.* Despite recent efforts to promote compact fluorescent lamps (CFLs), incandescent lamps still account for about 80 percent of the in-use residential light bulbs in Mexico, indicating a large potential for scaling up CFLs. A majority of the incandescent bulb market in Mexico consists of domestically produced IBs, supplied by three large producers: General Electric, Philips and OSRAM. The approximate local retail price for an incandescent bulb is US\$0.30.¹³ With respect to CFLs, there is currently no local production in Mexico (instead there is a competitive imports market). The retail price of a CFL has been declining. For example, in 1993 the price was around US\$18.00, but has significantly declined over time. Current local retail prices of CFLs are approximately US\$1.92 for low quality, US\$2.5 for medium quality and US\$3.25 for high quality.¹⁴

34. Mexico's energy efficiency programs are a cornerstone of the country's energy strategy. Although these programs build on a variety of efforts initiated nearly two decades ago, there remains a huge potential for expanding EE activities in the residential sector in Mexico. Between 2009 and 2012, the Government has begun to implement several energy efficiency programs: (i) the replacement of 47.2 million incandescent bulbs (IBs) with compact fluorescent lamps (CFLs) in the residential sector over a two-year period, including an initial phase targeting 2.2 million bulbs; (ii) the replacement of over two million appliances (refrigerators and ACs) over a four-year period; (iii) promoting more energy efficient public transport systems for local and long-distance travel; (iv) municipal-level replacement of existing streetlamps with more efficient public lighting; (v) greater efficiency in the industrial and commercial sub-sectors; (vi) supply-side energy efficiency activities by CFE; and (vii) an energy efficiency initiative within PEMEX. The Government is interested in mobilizing assistance from multilateral banks and other financial institutions, including the World Bank and the CTF to support the implementation of these programs. The Government's commitment to carry out these programs has been demonstrated by the launch of three key pilot programs: the Appliance replacement program, the CFL Program and the Municipal Street Lighting Program, as described in the section below.

¹² Source: "Future Air Conditioning Energy Consumption in Developing Countries and what can be done about it: The Potential of Efficiency in the Residential Sector", McNeil, Michael A., Letschert, Virginie E.

¹³ Source: OSRAM.

¹⁴ Source: OSRAM.

Mexico's Energy Efficiency Pilot Programs

35. *Appliance Replacement Pilot Program.* The Government launched an Appliance Replacement Pilot in March 2009 to test the implementation arrangements and evaluate the effectiveness of the tiered scheme of vouchers and credits for different eligible consumers. As of December 31, 2009, the program has successfully financed the exchange of 210,494 appliances in states throughout the country. About 93 percent of the appliance replacements have been refrigerators, and 7 percent have been air conditioners. The early results of the pilot program have been used by SENER to modify certain aspects of its proposed large-scale appliance replacement effort (to be supported under the Project) to improve its efficiency and effectiveness. The implementation of the full program will be financed by the proposed IBRD and CTF credits to the Government and NAFIN.

36. *CFL Replacement Pilot Programs.* A pilot program for the replacement of incandescent bulbs (IBs) with CFLs began in October 2009 and was completed in February 2010. The pilot program aimed to replace 500,000 IBs with CFLs within the low-income urban and semi-urban areas of four states of Mexico: Veracruz, Jalisco, Michoacán, and Chiapas. As of February 6, 2010, 406,071 CFLs had been distributed to 135,357 families (3 bulbs/family), which represents an 81.57 percent completion of the pilot program's goal. The pilot program collected and destroyed 391,057 incandescent bulbs, which implies 96.3 percent compliance. All (100 percent) of the IBs collected were functioning.

37. FIDE served as the implementing agency under the overall guidance and supervision of SENER. To distribute the CFLs, FIDE signed a contract with the Mexican Postal Service (SEPOMEX), which was in charge of distributing the CFLs and collecting and disposing of the functioning IBs. The *Oportunidades* roster was used to identify eligible households and notify users about the program through the regular *Oportunidades* information channels. Households had a limited time-window to bring their vouchers and functioning incandescent bulbs to a nearby SEPOMEX office location to exchange their IBs.

38. SENER purchased the CFLs to be replaced from FIDE at US\$1.5 each. The total cost of one CFL replacement, including distribution, has been estimated at MX\$26.95, not including VAT, and MX\$31.00 VAT included (US\$2.6). The total cost of the program was US\$1,068,062. During this pilot program, SEPOMEX also conducted approximately 1,300 surveys among users; SENER will use the results to analyze and modify the implementation design for the scaled-up program under Component 1. In addition, SEMARNAT financed the replacement of approximately one million IBs with CFLs through two large retail stores (Comex and Coppel), with the overall coordination handled by a private sector CDM developer.

39. *Municipal Public Street Lighting Pilot Program.* In the public lighting sector, BANOBRAS is operating a pilot program in which it lends funds to individual energy efficiency projects in municipalities for the replacement of inefficient street lighting systems. The program's main objective is to assist municipalities in replacing inefficient technologies with more energy-efficient ones. A secondary benefit of the program is that the resulting decreased GHG emissions will help the municipality and the Federal Government reach their announced climate change objectives. Finally, more efficient lighting sources may help prevent crime in public areas. The program represents a tool for generating greater social benefits at the lowest

possible cost, with a neutral or positive effect on public finances. BANOBRAS and The Government are interested in expanding this program.

Annex 2: Major Related Projects Financed by the Bank and/or other Agencies

MEXICO: Efficient Lighting and Appliances Project

MAJOR RELATED BANK-FINANCED PROJECTS

Project ID	Project Name	Summary	IEG rating (if applicable)	DO / IP rating (if applicable)
P115608	<i>Framework for Green Growth Development Policy Loan</i>	This Development Policy Loan supports the Government of Mexico's program to further develop the regulatory, monitoring and financial framework for low-emissions evolution in the transport and energy sectors.	N/A	N/A
P114892	<i>Energy Sector Memorandum of Understanding with SENER</i>	Assists SENER and the Government of Mexico in further strengthening the country's capacity to promote the use of RE sources in power generation.	N/A	N/A
P080104	<i>Wind Umbrella, or La Venta II</i>	A carbon finance operation that aims to reduce GHG emissions from power generation by 4 million tons of CO ₂ e over a 20-year operation period through wind energy, and contribute to further development of the international carbon market in Mexico.	N/A	(Carbon Finance)
P108304	<i>Low-Carbon Development for Mexico Study (MEDEC)</i>	The study highlights Mexico's potential for reducing carbon emissions from power generation, providing estimates of the respective net costs, emissions reductions and upfront investment that would be required.	N/A	N/A
P077717	<i>Large-Scale Renewable Energy Development GEF Project (La Venta III)</i>	The project aims to assist Mexico in developing initial experience in commercially based grid-connected renewable energy applications by supporting construction of an approximately 101 MW IPP wind farm while building institutional capacity to value, acquire and manage these resources on a replicable basis.	N/A	MS / MS
P095038	<i>Integrated Energy Services Project</i>	This project supports the use of renewable energy in rural areas for the provision of electricity.	N/A	MU / MS
P066426	<i>Hybrid Solar Thermal GEF Project (Agua Prieta)</i>	This project demonstrates and encourages replication of the Integrated Solar Combined Cycle Systems (ISCCS) power generation technology in Mexico and elsewhere, thereby contributing to the reduction of global GHG emissions.	N/A	MS / MU

DO/IP Ratings: HS (Highly Satisfactory), S (Satisfactory), MS (Moderately Satisfactory), U (Unsatisfactory), MU (Moderately Unsatisfactory), HU (Highly Unsatisfactory).

MAJOR RELATED ENERGY EFFICIENCY PROJECTS

Program Name	Program Description
<i>Program for Financing of Electric Energy Saving (PFAEE) (1st phase completed)</i>	This program, started by CFE and FIDE, finances the replacement of old, inefficient refrigerators and air conditioners with modern, more efficient equipment. It also provides financial support for thermal insulation of homes. The cost of more efficient lighting is also financed through a credit paid on electricity bills, which is largely recovered due to reduced electricity costs.
<i>Refrigerator Replacement—First Phase Project (2000–2006)</i>	With regard to refrigerators, initial research and implementation of a first phase (2002–2006) of replacing old, inefficient technologies identified the initial cost as the most important barrier to promoting efficient technologies. With limited available financial resources, CFE has only been able to finance around US\$4.9 million and achieve savings of 2,131 GWh over a period of 16 years. It is evident that the scaling-up of such a program would not be successful without additional funds for incentives or subsidies to make the efficient technologies more affordable to the consumer. It has also been demonstrated that the use of refrigerators beyond their operational lifetime is the prevailing practice in Mexico and will continue to be so without any major policy intervention from the Government. The same applies to air conditioners, or even worse to the imports of second-hand, inefficient equipment from the United States.
<i>ILUMEX GEF project (1994–1998, completed)</i>	This project involved the promotional sale of high-efficiency CFLs, 2.6 million of which were sold by the end of the project. However, the project was never replicated at a large scale, nor did it trigger a market transformation because even though the CFLs were sold at a promotional price, the costs were still high for lower-income groups and incentives were not aligned properly to make a transformation on the demand side. Experience has demonstrated that even when talking about less-poor groups, advertising does not produce the required behavioral changes; thus the packaging of advertising with financial incentives would prove more effective. On public lighting, including street lighting, the penetration of more efficient lamps and devices is still rather low due to the high upfront investments needed for a full transformation of the sector.
<i>Chillers Concessional Lending Pilot Project (completed)</i>	The pilot project aimed to replace 20 energy inefficient chillers with energy-efficient units in Mexico in two phases, with 10 chillers replaced in each phase. This subproject was carried out by the Trust Fund for Electrical Energy Savings (<i>Fideicomiso para el Ahorro de Energía Eléctrica, FIDE</i>). ¹⁵ Available funds were used to create a revolving fund from which chiller owners could borrow money to replace their old equipment. Energy efficiency gains from the new equipment allowed chiller owners to repay the loan in less than two years using only the savings from electricity consumption. The innovative chiller replacement project established a robust methodology for chiller replacement projects that can be applied easily worldwide. Chillers were replaced, baseline equipment was destroyed and 100 percent of the loans was recovered.

¹⁵ At the initiative of CFE, the Private Trust Fund for Electricity Savings (*Fideicomiso para el Ahorro de Energía Eléctrica, FIDE*) was created as a nonprofit institution (1990) with the purpose of encouraging electricity conservation in almost all consuming sectors. *FIDE*'s main objectives include: (i) changing people's consumption patterns toward a more rational use of electricity; (ii) raising awareness and promoting electricity conservation; (iii) demonstrating that electricity conservation is feasible and economically and socially beneficial; (iv) expanding *FIDE*'s presence internationally; (v) incorporating electricity saving concepts into the sector's planning; (vi) capacity building in the area of energy efficiency; (vii) providing technical support for the development of regulatory reforms to support energy efficiency and conservation; and (viii) developing monitoring indicators for measuring results. *FIDE* is 20 percent controlled by CFE; the other shareholders include public, private and social sectors (*SENER, CONUEE, CFE, and SUTERM*). As of September 2007, *FIDE* had completed 25,917 energy diagnoses and concluded 3,899 electric energy saving projects, which have generated direct savings of 13,191 GWh in electricity consumption and 1,566 MW in power (most notably, due to light consumption patterns, by reducing the demand for peak load). These direct savings are equivalent to the domestic consumption of five states: Nuevo León, Jalisco, Tamaulipas, México and Aguascalientes, equivalent to the reduction of approximately 8,000,000 tCO₂.

Annex 3: Results Framework and Monitoring
MEXICO: Efficient Lighting and Appliances Project
Results Framework

PDO	Project Outcome Indicators	Use of Project Outcome Information
<p>The Project's Development Objectives are to promote Mexico's efficient use of energy and to mitigate climate change by increasing the use of energy-efficient technologies at the residential level.</p> <p>The Project's Global Environmental Objectives are to support efforts to mitigate climate change by expanding the use of energy-efficient equipment and services.</p>	<p>Amount of GWh saved.</p> <p>GHG emission reductions in tons of CO₂ equivalent.</p>	<p>Lower-than-expected energy savings and emission reductions may signal deficiencies in insufficient incentives for residential consumers and deficiencies in the implementation of the dissemination and capacity strengthening program, which would require adjustments in Project design - in particular at the time of Project mid-term review.</p>
Intermediate Outcomes	Intermediate Outcome Indicators	Use of Intermediate Outcome Monitoring
<p><u>Component 1:</u> Increased market penetration of CFLs in low-medium income population nationwide.</p>	<p>45 million CFLs distributed to low-medium income population and in use; lower electricity consumption.</p>	<p>Lower-than-expected CFLs in use would require changes to the implementation scheme for this component and better information and dissemination campaigns.</p>
<p><u>Component 2:</u> Increased market penetration of efficient appliances in the low-medium-income segment of the population.</p>	<p>1.7 million inefficient refrigerators and ACs exchanged for more efficient ones; lower electricity consumption.</p>	<p>Lower-than-expected number of participants in the appliances replacement program will require changes in the component's design and more intense promotion of the program.</p>
<p><u>Component 3:</u> Studies to facilitate development of recycling centers and disposal schemes, studies to phase out IBs.</p>	<p>CFL recycling centers and disposal schemes operational; regulations, norms and standards for phase-out of IBs are in place.</p>	<p>Non development of private sector recycling centers will require a review of incentives for private sector participation and greater Government involvement; non issuance of regulations, norms and standards will require the strengthening of political commitment to the Project.</p>

<p>Studies to (i) guide EE standardization with neighboring countries, (ii) guide the preparation of laws and regulations to ban imports of inefficient appliances, and (iii) guide the certification processes in industries, are completed.</p>	<p>EE standards with CA, USA and Canada are harmonized; laws and regulations to ban imports of inefficient appliances are in place; certification processes in industries are in place.</p>	<p>Delays in the development of standards with neighboring countries will require stronger political commitment by the Government; delays in banning imports of inefficient appliances may require stronger political commitment and/or increased capacity for border authorities; delays in certification processes for industries may require stronger commitment by CONUEE and increased capacity to put the certification program in place.</p>
<p>EE monitoring and evaluation programs are designed</p>	<p>M&E programs for Project components are in place and provide input and feedback on the performance of Project components.</p>	<p>Low implementation of M&E programs will require stronger commitment by SENER and CONUEE to the Project.</p>
<p>Awareness raising for more efficient equipment.</p>	<p>Communication campaign implemented.</p>	<p>Low rates of awareness will require stronger commitment by SENER in encouraging consumers to change their behavior.</p>

Arrangements for Results Monitoring

1. An impact evaluation will estimate the program's total impact on outcomes of interest and guide program implementation by scientifically testing alternative incentive and communication strategies against the adoption of energy-efficient practices and technologies so that the program can scale up the operational alternatives that are found to be most cost-effective. The impact evaluation is designed prospectively, i.e., before the intervention takes place, and the effects are measured after the intervention takes place at different exposure horizons. The average treatment effects will be measured as ex post mean differences in outcomes between a "treatment" group (targeted by the intervention) and a "control group" (a similar, randomly selected comparison group).

Component 1:

2. The impact evaluation will measure and determine:

- (i) The rate of adoption and change in energy consumption among eligible populations that received CFLs in exchange for incandescent light bulbs (relative to similar residential households that did not receive the intervention);
- (ii) The rate of adoption of CFLs among medium- and high-income populations that were targeted by the house-to-house communication strategy and the change in their energy consumption (relative to similar residential households that did not receive the intervention);
- (iii) The most effective communication strategy in securing high CFL adoption among medium- and high-income populations that are targeted by alternative communication strategies.

3. *Design.* Issue (i) data from CFE on household energy consumption will be used to evaluate the impact of the intervention as the mean difference in energy consumption between treatment and control groups. The difference between laboratory-calculated energy use and actual energy use will estimate the amount of behavioral change induced by energy savings.

5. Issues (ii) and (iii) will be addressed by randomly assigning households to different treatments (letters) or to no treatment. The study will use the Public Survey on Households Income and Expenditures, *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH), to establish a sample framework for the pilot intervention and stratify households along household characteristics that are thought to matter for household response to the intervention, such as income and education. Data from CFE on energy consumption will be used to estimate potential savings for households in each stratum. A letter will be distributed along with the electric bill and will vary along several dimensions (household savings versus environmental concern, psychological factors, price and look, with and without discount, offered deadline).

6. The impact of the intervention will be measured as the ex post intervention mean take-up and energy consumption in treated households relative to untreated households using sale data and energy consumption data from CFE.

7. This will provide information on the best strategies to maximize take-up and minimize ex post mean energy consumption in various household types. The best treatment in each stratum will be scaled up to the rest of the households in the country.

Component 2:

8. The impact evaluation will measure:
 - (i) The rate of replacement of refrigerators and ACs and the change in energy consumption among targeted households relative to similar residential households that did not receive the intervention.
 - (ii) The most effective communication strategy in securing high replacement rates.
9. *Design.* Issues (i) and (ii) will be addressed by randomly assigning households to different treatments (letters) or to no treatment. The study will use the ENIGH to establish a sample framework for the pilot intervention and stratify households along household characteristics that are thought to matter for household response to the intervention, such as income and education. In each stratum households will be randomly assigned to control or one of various treatments. Data from CFE on energy consumption will be used to estimate potential savings for households in each stratum. Treatment consists of a letter that will be distributed along with the electric bill and that will vary along several dimensions.
11. The impact of the intervention will be measured as the ex post mean replacement rate and energy consumption in treated households relative to untreated households using sale data and energy consumption data from CFE. These will provide a precise estimate of energy savings by type of household and equipment capacity against a valid counterfactual.
12. The best treatment in each stratum will be selected as the treatment with the highest ex post mean replacement rate and lowest ex post mean energy consumption. The best treatment in each stratum will be scaled up to the rest of the households in the country.
13. The *monitoring and evaluation* will also include a sampling of households to determine whether the Project lowered their electricity consumption (to be confirmed by negotiations).

Arrangements for Results Monitoring

Project Outcome Indicators	Baseline	Target Values					Data Collection and Reporting		
		YR1	YR2	YR3	YR4	YR5	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Accumulated amount of GWh saved	0	200	1,200	3,800	7,800	10,000	Annual	Annual and quarterly progress reports, CF verification reports	SENER, FIDE, FIPATERM and CFE
Accumulated associated CO ₂ emission reductions (thousand tons of CO ₂)	0	103	617	1,950	4,009	5,140	Annual		
Intermediate Outcome Indicators									
<u>Component 1:</u>									
Number of IBs replaced by CFLs	0		15 m	30m			Quarterly	Annual and quarterly progress Reports, CF verification reports	SENER, FIDE, FIPATERM
GWh saved*	0		400	1,700	2,800	1,500	Annual		
CO ₂ emission reductions* (thousand tons of CO ₂)	0		205	874	1,439	771	Annual		
<u>Component 2:</u>									
Number of appliances replaced	0	450,000	450,000	400,000	400,000		Quarterly	NAFIN and FIDE	
GWh saved	0	200	600	900	1,200	700	Annual		
CO ₂ emission reductions (thousand tons of CO ₂)	0	103	308	463	617	360	Annual		
<u>Component 3:</u>									
Studies completed (#)	None	1	3	4		8 studies completed	Annual	Annual reports, supervision missions	SENER and CONUEE
Information and dissemination (I&D) activities conducted	None	I&D, activities initiated	I&D ongoing	I&D ongoing	I&D ongoing	Completed			
Monitoring and evaluation (M&E) systems in place	None	M&E initiated	M&E ongoing	M&E ongoing	M&E ongoing	Completed			
Number of staff trained	None	20	-	-	-	20			

*Procurement of the first CFLs is expected to take at least 6-8 months and distribution 3-4 months therefore it is assumed that no GWh are saved nor CO₂ emissions are reduced during year 1.

Annex 4: Detailed Project Description
MEXICO: Efficient Lighting and Appliances Project

1. The Project includes three components, described in detail below.
2. ***Component 1: Replacement of Incandescent Bulbs (IBs) with Compact Fluorescent Lamps (CFLs) in the Low to Medium-Income Residential Sector (Estimated total cost: US\$70 million, of which IBRD US\$ 55 million and GoM US\$15 million)***
3. This component finances the replacement of 45 million IBs with CFLs in 11.25 million low-medium income households over a projected two-year period, as part of the Government’s national energy efficiency program. The replacement program involves the purchase and distribution of new CFLs and the collection and proper disposal of the replaced IBs. Households will be eligible to exchange four working incandescent bulbs for CFLs. The replacement of 45 million CFLs will support Mexico’s efforts to achieve the target outlined under PECC to replace 47.2 million incandescent bulbs (IBs) with compact fluorescent lamps (CFLs) in the residential sector. Two complementary pilot programs have already successfully distributed nearly 1.4 million CFLs in the past year (as described in Annex 1).
4. *Identification of Beneficiary Households.* The eligibility of households under Component 1 will be determined based on their electricity consumption as set out in CFE’s database. Households that fall within the lowest four deciles of electricity consumption (see Table 4.1) will be eligible for the free CFL exchange program¹⁶. Under this component, SENER is targeting participation by about 11.25 million households (which represents over 95% of the households in these four lowest deciles). The two pilot programs (SENER’s and SEMARNAT’s as described in Annex 1) already distributed CFLs to approximately 1.4 million low-to medium income households (under the 1-4 consumption deciles). It is also assumed that a small percentage of the qualifying consumers will not participate in the program. Details regarding the physical exchange of the IBs for CFLs and the implementation arrangements areas are set out in Annex 6.

Table 4.1: Eligible Households (Lowest 4 Deciles of Electricity Consumption)

Consumption Decile	Monthly Electricity Consumption (MX\$)	# of Consumers
1	146.39	2,949,385
2	188.72	2,949,385
3	212.81	2,949,385
4	248.27	2,949,385

5. *Technical Specifications.* The CFLs procured under Component 1 will be of high quality and will comply with specified minimum international standards (such as ELI, the U.K. Energy Saving Trust, E.U. CFL Quality Charter, U.S. Energy Star standard, and the Asia CFL Quality Charter) regarding the CFLs’ life span, voltage fluctuation, power

¹⁶ The number of eligible households per consumption decile has been proxied using the monthly electricity consumption data from the Encuesta Nacional de Ingresos y gastos de los Hogares (ENIGH) where each decile represents 10% of the total national number of households (29’493,850).

factor, harmonic distortion and mercury content. The standards to be used will be agreed during appraisal. During the implementation of SENER's CFL pilot program, a survey of more than 1,000 households was conducted and the results will guide the procurement of CFLs in order to incorporate the consumer preferences (color, model, etc).

6. *Costs and affordability:* Due to the high prevailing costs of CFLs in the Mexican market (approximately US\$3–4 dollars) and limited ability of low to medium-income consumers to pay, SENER has determined that the CFLs should be provided at no cost. This approach is needed to help ensure high participation rates and a quick rate of implementation (which is key to the economic benefits detailed in Annex 9). It is anticipated that the bulk procurement of CFLs will enable these bulbs to be purchased at a lower price, in the range of US\$0.85/CFL. With distribution, the collection/disposal of replaced IBs, and the management/marketing of the program, the overall cost per bulb is expected to be about US\$1.5/CFL in urban areas and about US\$2/CFL in rural areas (these figures do not include the future recycling costs at the end of the CFLs' life span). Accordingly, the estimated total cost of this Component for the replacement of 45 million CFLs is about US\$70 million.

7. *Information and Awareness Campaign.* The CFL replacement program will be supported by a variety of technical assistance activities under Component 3 of this Project. To support the high replacement goals of the program, SENER will undertake an information and awareness campaign that promotes the replacement of IBs with CFLs. Other activities include a study to encourage the development of CFL recycling centers and disposal schemes by the private sector.

8. *Carbon Finance.* An associated Clean Development Mechanism (CDM) Program of Activities (PoA) is being considered for this component (see Part A of Attachment 1 to this Annex).

9. ***Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners (ACs) in the Residential Sector*** (Estimated total cost: US\$603 million, composed of (i) IBRD US\$195 million, (ii) CTF US\$50 million, (iii) NAFIN US\$127 million, (iv) GoM US\$55 million and (v) Consumers US\$176 million, complemented by a US\$35 million Guarantee Facility, of which US\$30 million is funded by GoM and US\$5 million by GEF). .

10. This component supports two types of incentives for the replacement (including collection and scrapping) of approximately 1.7 million old and inefficient refrigerators and ACs over a four-year period as part of the Government's national energy efficiency program. These incentives include vouchers and credits for consumers. Both incentives are needed to promote the replacement program. The voucher improves consumer affordability for the lowest income segments (levels 1 and 2) by ensuring that the return on the investment in an efficient appliance (i.e. energy savings) is sufficient to cover costs (i.e. debt service) of accessing the credit line over time. The credit line provides a vehicle to finance the new appliance net of vouchers and represents a strong incentive to replace inefficient appliances for higher income consumers (levels 3 and 4). Resources from the IBRD Loan to the UMS will finance the voucher subcomponent and resources from the CTF Loan to NAFIN will support the credit subcomponent as follows:

- a. **Component 2a.i. Financing of vouchers for qualifying low-income consumers** (including IBRD US\$195 million and GoM US\$55 million). Provision of vouchers as instant discounts to low-income consumers to improve their ability to pay for the replacement of inefficient appliances with more energy-efficient appliances.
- b. **Component 2a.ii. Financing of a credit line for NAFIN** (including CTF US\$50 million). Provision of credits, at favorable interest rates,²⁶ to low-income and other qualifying consumers to pay for the replacement of inefficient appliances with more energy-efficient appliances. A related Guarantee Facility protects NAFIN from credit defaults by consumers (component 2b).
- c. **Component 2b. Capitalization of the Guarantee Facility** (including GEF US\$5 million). Provision by SENER of funds to capitalize the existing Guarantee Facility that protects NAFIN from credit defaults by consumers.

11. *Household Eligibility criteria.* The target populations for this program are low- and medium-income electricity consumers who currently have a refrigerator or an air conditioning unit that is at least 10 years old.¹⁷ As with the CFL program, the appliance replacement program under Component 2 uses as a proxy for determining whether a consumer qualifies as a low-to-medium-income household its electricity consumption, but given the different nature of appliances from light bulbs, a different categorization is used that is better adapted to and distinguishes between refrigerators and air conditioners. Four different levels of consumption are specified as set out in table 4.2, with different norms applying to refrigerators and air conditioners.

Table 4.2: Eligibility Criteria for Refrigerator and AC Replacement

Level of Consumption	Refrigerators	Air Conditioners
	Average Non-Summer Monthly Consumption (kWh)	Average Summer Monthly Consumption (KWh)
Level 1	76–175	251–500
Level 2	176–200	501–750
Level 3	201–250	751–1,000
Level 4	Over 250	Over 1,000

12. Different levels of benefits are provided to different levels of consumers, with lower-level consumers receiving larger discount vouchers (see Table 4.3). Households in levels 1 and 2 are eligible for the discount vouchers that cover a portion of the cost of acquiring the refrigerator and disposing of the old refrigerator. Households in Level 3 receive a discount voucher that covers only the cost of disposal of the old appliance. Households in Level 4 do not qualify for the discount vouchers (only for credits as

²⁶ Because this component involves the financing of a credit, at preferential terms, to eligible households for the acquisition of energy-efficient appliances, a Financial Intermediary Lending Assessment is provided. See Annex 17.

¹⁷ Currently, in order to be eligible for the program, a consumer must (i) own a refrigerator or air conditioner at least 10 years old and in working condition that must be given in exchange for the new appliance, (ii) demonstrate proof of residence in the same domicile shown on the consumer's electricity bill and provide the name, address and telephone number (when available) of a person who can corroborate that the beneficiary lives in the domicile as declared, and (iii) not have an unfavorable credit rating in the *Círculo de Crédito S.A. de C.V.*

described further below). The voucher amount combined with the maximum allocated line of credit amount is equal amongst the first three levels. However, for level 4, the program is targeting a higher income consumer group that is likely to purchase more expensive, larger appliances. Thus, the increased line of credit allocation under level 4 seeks to capture this market segment.

Table 4.3: Amount of Vouchers

Level of Consumption	Amount of Voucher re acquisition of appliance (MX\$)	Delivery of New Appliance + Removal of Old Appliance(MX\$)	Total Voucher (MX\$)
Level 1	1,800	400	2,200
Level 2	1,000	400	1,400
Level 3	0	400	400
Level 4	0	0	0

13. The eligibility level for households set out in table 4.2 above is also used for determining access to the credit line. The maximum credit line available to consumer by level is set out in Table 4.4 below. The line of credit is provided at an interest rate of 12 percent per annum, and is repayable over a four-year period. The effectiveness of the rate and repayment term in promoting the replacement program will be evaluated during Project implementation, and may be adjusted accordingly. Households in Levels 1 through 3 are eligible to be benefit from both the voucher and credit line, or can access each separately; households in Level 4 are only eligible for the credit line.

Table 4.4: Amount of Credits

Level of Consumption	Max. Amount of Credit (MX\$)
Level 1	\$3,400
Level 2	\$4,200
Level 3	\$5,200
Level 4	\$8,700

14. *Retail Store Eligibility Criteria.* Any retail store in Mexico that meets the eligibility criteria will be accepted to join the program at any time. To be eligible, the retail store must: (i) provide official identification of the person or legal representative (eligible identification documents include passport, military service card, *Instituto Federal Electoral* credential, or personal certificate); (ii) be established for at least two years; (iii) sign a “contract of participation” with FIDE; (iv) carry at least one refrigerator or air conditioner model that meets energy efficiency requirements; and (v) submit a complete list of prices for each eligible model, which will be recorded in the software database (*Sistema Integral de Atención*) and subject to FIDE verification.

15. *Qualifying Efficient Appliances by Consumer Levels.* Refrigerators and air conditioners must meet specific energy efficiency requirements in order to qualify as an

eligible appliance under the program. In addition to energy efficiency requirements, appliances must also meet certain size requirements, which varies by consumption Level, reflecting limitations on size for consumers that benefit from the larger subsidies provided by the vouchers as compared to the credits.

- For all refrigerators, the selected model must be at least five percent more energy-efficient than the maximum limit set by the current Mexican energy efficiency refrigerator norm (*Norma Oficial Mexicana*, NOM-015-ENER-2002). The ACs will clearly state in a logo the efficiency of the product.
- For all air conditioners, the selected model must meet or exceed the *Norma Oficial Mexicana* (NOM-021-ENER/SCFI/ECOL-2008).
- Consumers within Levels 1 through 3 can use the vouchers and credits to purchase qualifying refrigerators that range from 9 to 13 cubic feet, but the new efficient refrigerators cannot be more than 2 cubic feet larger than their current refrigerators.
- Consumers within Levels 1 through 3 can use the vouchers and credits to acquire window ACs from 1 to 1.5 tons or mini-split ACs from 0.75 to 1 ton, but the new AC cannot contain more than one additional ton of refrigeration as compared to the current AC.
- Consumers at Level 4 (which only have access to the credits): (i) can purchase qualifying refrigerators that are 9 cubic feet and larger, but the new appliance cannot be more than two cubic feet larger than the replaced refrigerator; and (ii) can purchase qualifying ACs up to five tons, but the new appliance cannot contain more than one additional ton of refrigeration as compared to the AC being exchanged.

16. *Information and Awareness Campaign.* As with Component 1 above, Component 2 will be supported by a variety of related technical assistance activities under Component 3 of this Project. In particular, to encourage the replacement of inefficient appliances, SENER will undertake an information and awareness campaign that promotes the benefits of the program. Other activities include a study to evaluate raising EE standards for appliances.

17. *Guarantee Facility and other Support Arrangements.* NAFIN will be protected against repayment default risk by consumers through a debt service repayment arrangement in which repayments are integrated into the usual CFE electricity bill (see Annex 6), and by a Guarantee Facility. The Facility is designed to provide financial comfort to NAFIN in providing credit lines to these consumers by protecting it against default risks (further implementation modalities are set out in Annex 6). The Facility is based on the guarantee established for the Pilot Program on Appliance Replacement which is set at approximately 15 percent of the potential maximum outstanding credits; for purposes of the Guarantee Facility under Component 2b, this figure will be adjusted downwards to 12.5 percent and this structure will be revisited periodically based on the performance of the entire loan portfolio.

18. The Guarantee Facility has a two-tier approach – a Junior Facility and a Senior Facility. The Junior Facility will have about two thirds of the Government financing and the remaining one third will be kept in the Senior Facility. The entire US\$5 million from

the GEF grant will be kept in the Senior Facility. Operationally, a consumer has to pay his/her electricity bill bimonthly in Mexico. If a participating consumer fails to pay his/her bill by the first billing cycle, the Junior Facility gets triggered and payment will be made. If the consumer is over 180 days behind in payment, the Senior Facility gets triggered and legal proceeding is undertaken to recuperate the loan and suspension of electricity to the consumer. The GEF resources are used only in the case when the Senior Facility gets triggered. Furthermore, the repayment to NAFIN will be consistent with proportional contribution to the Guarantee Facility to ensure that the GEF incrementality principle is intact.

19. *Reallocation of Unused Guarantee Facility Resources.* As described in Annex 6, the Facility will be capitalized by SENER (whether from the EE Trust Fund or the GEF Grant) by periodic transfers to NAFIN as holder of the facility. The disbursement will be proportional to the contribution levels of the EE Trust Fund or the GEF Grant to ensure that there is a relative risk sharing mechanism between GEF grants and other sources of financing. . Accordingly, a portion of the GEF grant allocated to the Facility may remain undisbursed or could remain unused by NAFIN. In the third year of Project implementation, an evaluation will be carried out to assess the prospects to reallocate those GEF resources used to capitalize the Guarantee Facility that have not been used or are not expected to be used to other activities to further complement the Project's overall objectives. At the end of the Project, any remaining unused GEF resources from the Guarantee Facility would remain in the Guarantee Facility if the program continues, or be reallocated to other energy efficiency activities, as agreed by SENER and the Bank.

20. *Carbon Finance and Montreal Protocol.* An associated Clean Development Mechanism (CDM) Program of Activities (PoA) is proposed for this Component (see Part A of Attachment 1 to this Annex). In addition, both refrigerators and air conditioners older than 10 years in Mexico commonly contain CFC-12 as a refrigerant in the compressor and coils; the Bank (using Montreal Protocol Multilateral Fund resources) is currently supporting SENER and SEMARNAT in assessing opportunities for financing the destruction of ODS collected from these appliances under the replacement program through the voluntary and potentially the compliance GHG markets GHG market (see Part B of Attachment 1 to this Annex).

21. ***Component 3: Technical Assistance and Institutional Strengthening*** (Estimated total cost: US\$6.32 million, of which GoM US\$4.20 million and GEF US\$2.12 million).

22. This component will enhance SENER's capacity to promote energy efficiency activities consistent with its new responsibilities under the Energy Efficiency Law, and will strengthen the ability of the implementing agencies to carry out the Project. Activities under this component include: (a) studies to expand the CFL replacement program; (b) development of Energy Efficiency Standards and Programs; (c) assessment of potential complementary demand-side management (DSM) activities; (d) information and awareness campaigns related to the CFL and appliances programs; (e) monitoring and evaluation activities for the Project components; (f) training and capacity building for the implementing agencies; and (g) support to the EE Administrative Unit.

(a) Expanding the CFL Replacement Program. This activity will include:

- *Promotion of CFL Recycling Centers* (total cost US\$0.10 million, of which GEF US\$0.10 million). This activity will support studies and activities aimed

at developing CFL recycling centers and disposal schemes, in particular related to the appropriate disposal management of mercury in CFLs.

- *Phase-out of Incandescent Bulbs (total cost US\$0.10 million, of which GoM US\$0.10 million).* Analytical work to underpin the development of a policy framework to gradually phase out the use of IBs in Mexico so as to ensure a sustainable transformation of the lighting market.

(b) Development of Energy Efficiency Standards and Programs. This activity will include:

- *Harmonization of energy efficiency standards (total cost US\$0.20 million, of which GoM US\$0.20 million).* This activity will involve studies and consultations related to the harmonization of energy efficiency standards with the USA, Canada and the countries of Central America.
- *Evaluation of the size and impact of imports of inefficient appliances (total cost US\$0.05 million, of which GEF US\$0.05 million).* Study to evaluate the size and impact of imports of inefficient appliances and to assess the need to ban the imports of inefficient appliances to ensure a sustainable transformation of the appliance market.
- *Designing EE Programs (total cost US\$2.07 million, of which GEF US\$0.57 million and GoM US\$1.5 million).* This activity will support the design of energy efficiency projects and programs in eligible private sector companies, municipalities and Federal Public Administration facilities, and the design of commercial and industrial lighting and other EE projects.
- *Training for Local Banks in Energy Efficiency (total cost US\$0.10 million, of which GoM US\$0.10 million).* This training will address the lack of awareness regarding EE technologies and projects in the banking sector to enhance the comfort of lenders responsible for appraising and managing loans for EE projects.

(c) Complementary DSM and Energy Efficiency Interventions in Transmission and Distribution Subsectors. This activity will include:

- *Demand-Side Management (total cost US\$0.10 million, of which GoM US\$0.10 million).* Preparation of a study to assess the benefits for Mexico and modalities of demand-targeted interventions among electricity consumers and power suppliers.
- *Reinforcement of Efficiency in Transmission and Distribution (total cost US\$0.10 million, of which GoM US\$0.10 million).* Preparation of a study to evaluate the need to reinforce the transmission and distribution subsectors to complement the investments in energy efficiency in the residential sector.
- *Reduction of Losses (total cost US\$0.10 million, of which GoM US\$0.10 million).* This activity involves a study to evaluate options on how to reduce system losses in the generation, transmission and distribution sub-sectors.

- (d) Information and Awareness Campaigns related to CFLs and Appliances¹⁸ (total cost US\$1.80 million, of which GoM US\$1.0 million and GEF US\$0.80 million). This activity will finance the implementation of a CFL and appliance information and awareness campaign to promote awareness among the Mexican population regarding the benefits of energy efficient CFLs and appliances and related behaviors for consumers to capture those benefits. Others area for information and awareness activities to address some of the key barriers to increasing energy efficiency in Mexico, include: (i) the lack of systemic and fully reliable market information available on the potential of energy efficiency initiatives within the Mexican economy, (ii) limited EE information dissemination capabilities for a large country with a dispersed population, and (iii) greater dissemination of information about the benefits of EE investments to overcome the low prioritization accorded to these activities.
- (e) Mid-term Review including Monitoring and Evaluation Activities (total cost US\$0.25 million, of which GoM US\$0.10 million and GEF US\$0.15 million). This activity will support the Project's Mid-term Review and monitoring and evaluation of the activities under Components 1 and 2 of the Project.
- (f) Training and Capacity Building for Implementing Agencies (total cost US\$0.15 million, of which GEF US\$0.15 million). This activity will support training activities for FIDE and SENER and potentially for other agencies in order to support Project implementation. This will include procurement training for FIDE as the CFL Executing Agency to support its actions in implementing Component 1 of the Project and procurement and financial management training for the EEAU.
- (g) EE Administrative Unit (total cost US\$1.20 million of which GoM US\$0.9 million and GEF US\$0.30 million). This activity will support a coordinator for the proposed Project during the duration of the Project. The coordinator for the Project will be under the overall responsibility of the EE Administrative Unit Coordinator and will be responsible for the timely and satisfactory production of financial management reports and procurement of activities contemplated in Component 3.

¹⁸ Information barriers constitute big hurdles to the implementation of energy efficiency activities in Mexico. As part of the communications strategy, which is vital for this project, SENER will undertake an awareness raising campaign that includes the use of public radio and other government media. Advertisements and air-time that will be co-financed by the GEF resources will acknowledge the support by the GEF.

Attachment 1 to Annex 4

Complementary Carbon Finance and Montreal Protocol Activities

Part A: Carbon Finance

23. Components 1 and 2 of the Project are designed to mobilize carbon finance using Clean Development Mechanism (CDM) Programs of Activities (PoA) to support the financing of the Project by generating fund flows or potentially by reducing the upfront cost of the CFLs or appliances. The CDM program activity (CPA) for Component 1 and the CPA for Component 2 will be implemented in geographically distinct areas across Mexico. The program boundary in both cases is the entire country, which will be divided into smaller distribution areas covering a fixed number of beneficiaries under each CPA for each POA. The maximum lifetime of a CPA will be 10 years and the maximum lifetime of the PoA will be 28 years.

24. For Component 1, consideration is being given to either using the approved methodologies for small-scale CDM project activities on the demand-side energy efficiency activities for specific technologies (AMS II C), or approved methodologies for small-scale CDM project activities on the demand-side activities for efficient lighting technologies (AMS II J). Component 1 is expected to generate up to 10 million CERs with estimated revenues of US\$100 million, assuming a price of US\$10/ton of CO₂e.

25. For Component 2, the program will apply the approved methodologies for small-scale CDM project activities on the demand-side energy efficiency activities for specific technologies (AMS II C). The estimated ERs would total about 0.6 million, with estimated revenues of US\$6 million, assuming a price of US\$10/ton of CO₂e.

26. While the Project Design Document (PDD) for applying for Clean Development Mechanism approval from the CDM Executive Board for the two components are being prepared separately, benefits from the carbon market are considered important for the long term viability of the programs.

Part B: Montreal Protocol Related Activities -- Generating Climate and Ozone Co-benefits through the Voluntary Carbon Market

27. Refrigerators and air conditioners older than 10 years in Mexico commonly contain CFC as a refrigerant (CFC-12) in the compressor and coils. The insulation foam of these refrigerators also contains CFC (CFC-11) as a blowing agent. These chemicals qualify as Ozone Depleting Substances (ODS) controlled by the Montreal Protocol¹⁹. Under

¹⁹ Following the discovery of the Antarctic ozone hole in 1985, the international community recognized the need for solid measures to reduce the production and consumption of substances that deplete the ozone. The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted on September 16, 1987 and entered into force on January 1, 1989. The Montreal Protocol now has universal ratification; no other global environmental treaty to date has achieved this feat.

All Parties, including developing countries, have committed to totally phasing out all controlled uses of the 96 chemicals presently regulated by the Montreal Protocol, including Chlorofluorocarbons (CFCs), Halons,

business-as-usual, ODS refrigerants may be recovered from discarded appliances and recycled for use in working refrigeration equipment, or are vented through inappropriate behavior. ODS blowing agents are typically released into the atmosphere when discarded refrigerators are scrapped and their foam is shredded or the unit is disposed in a landfill.

28. The Government of Mexico, through its Ozone Unit within the Ministry of Environment (SEMARNAT) is currently updating the assessment of the refrigerators market, as part of the government's commitment to the Montreal Protocol in reducing ozone depleting substances. Based on the most recent data on the domestic production capacity, Mexico produces over 3.9 million refrigerators per year. In 2009, the country imported about 50,000 units - 50% from the US and the rest from China, Korea and other countries, and exported about 1 million refrigerators to the US and Latin American markets. The domestic market, therefore, had just over 2.9 million refrigerators in 2009. With a joint set of policies and programs (investment and capacity building) carried out by the Government of Mexico in the last two decades, in partnership with multilateral and bilateral donors, private sector and others, Mexico was successful in phasing out CFC consumption (as defined by the Montreal Protocol, consumption=production+import-export).

29. Based on the international agreements and legally acceptable practices, the Mexican refrigerator industries have switched its technologies from CFCs to other non-ozone depleting technologies. The predominant technology in the refrigerator manufacturing industry in Mexico involves the use of HFC-134a as refrigerant, and in few cases hydrocarbons. Based on the imports and domestic production capacity, the Mexican market share for refrigerant fluid currently shows 98% HFC-134a and 2% HC-600 (hydrocarbon).

30. The proposed Project ensures that appliances replaced under this program follow proper scrapping procedures, i.e., CFCs are not vented but adequately collected and stored.

31. Due to their high GWP and because ODS emissions are not controlled by the MP (the MP controls consumption as defined by production + import - exports), standards in the Voluntary Carbon Market have taken an active interest in using ODS destruction to achieve significant environmental co-benefits. In this regard, The Government—through the World Bank—has requested support from the MP Multilateral Fund (MLF) to finance a study to assess opportunities in Mexico for financing ODS destruction through the

Carbon Tetra Chloride (CTC), Methyl chloroform, Hydrochlorofluorocarbons (HCFCs) and Methyl bromide (CH₃Br). The Protocol was designed so that the phase-out schedules could be revised on the basis of periodic scientific and technological assessments. From 1986 to 2007, the 195 countries that are currently party to the Montreal Protocol have achieved a 97 percent reduction in the consumption of substances that deplete the earth's ozone layer.

ODS not only destroy stratospheric ozone but are also powerful greenhouse gases: some have more than 10,000 times the global warming potential (GWP) of a ton of CO₂. UNEP (United Nations Environment Programme) estimates that avoided GWP from the global phase-out of ODS between 1990 and 2000 is in the order of 25 billion metric tons of CO₂ (compared to 1 billion MT to be achieved by the Clean Development Mechanism under the Kyoto Protocol (as at 2007)).

Source: Extract from the United Nations Millennium Development Goals 2009 Report, www.un.org/millenniumgoals

voluntary and potentially the compliance GHG markets. The scope of the study includes four stages: (1) data collection and analysis; (2) evaluation of ODS disposal strategies; (3) development of a Project Design Document (PDD); and (4) coordination of the submission of the PDD to the Executive Committee of the MLF.

Annex 5: Project Costs
MEXICO: Efficient Lighting and Appliances Project

Table 5.1: Project Costs

Project Cost By Component and/or Activity	Local US\$ million	Foreign US\$ million	Total US\$ million
Component 1	23.80	42.86	66.66
Component 2	574.29	0.00	574.29
Component 3	5.43	0.59	6.02
Total Baseline Cost	603.52	43.45	646.97
Price Contingencies (5 percent)*	30.18	2.17	32.35
Total Project Cost¹	633.70	45.62	679.32²

¹Identifiable taxes and duties are US\$m101.75, and the total Project cost, net of taxes, is US\$m576.57.

²Total Project cost does not include the US\$35 million Guarantee Facility

* The Project does not include physical contingencies.

Annex 6: Implementation Arrangements

MEXICO: Efficient Lighting and Appliances Project

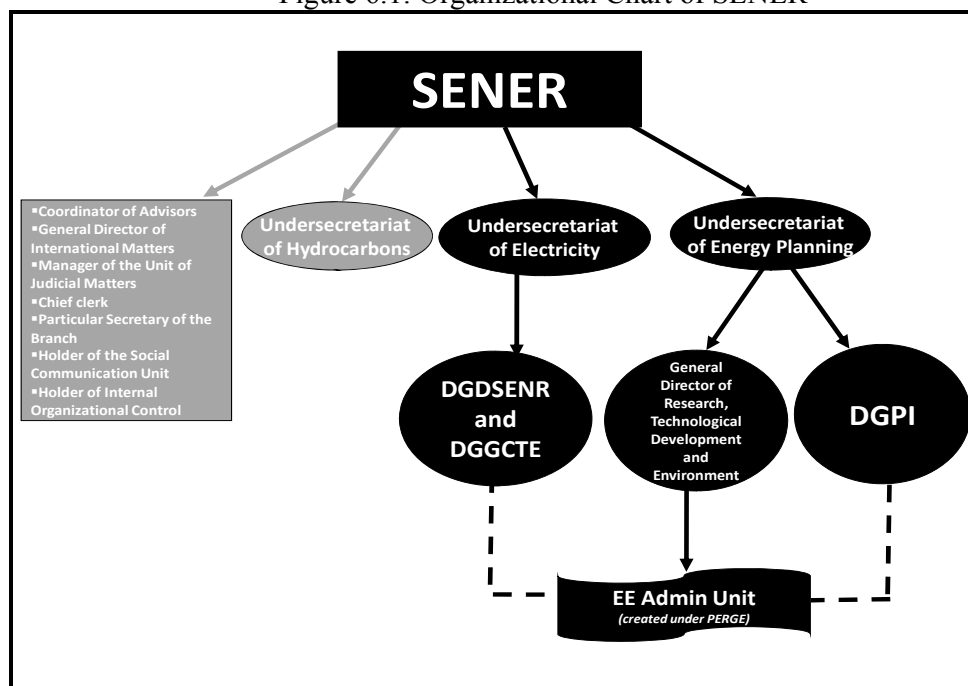
1. This Annex sets out the implementation arrangements relating to the overall organization of the Project and, with respect to each component, describes the corresponding physical delivery, institutional and financial arrangements.

A. Overall Organization

2. The *Secretaría de Energía* (SENER) is responsible for overall oversight, and is the World Bank's main counterpart for the Project. SENER is composed of several directorates, including: (i) the Directorate General for Promotion and Investments (DGPI), which has principal responsibility for Component 1, and (ii) the Directorate General for Distribution and Supply of Electricity and Nuclear Energy (DGDSENR) and the Directorate General for Generation, Conduction and Transmission of Electricity (DGGCTE), which have principal responsibility for Component 2 (see Figure 6.1). Each Directorate is also involved in the studies and other capacity building activities to be carried out under Component 3.

3. To support these Directorates and to strengthen SENER's ability to provide monitoring, financial management, reporting and other oversight functions, the Project will use the unit that was already established within SENER, under the Bank-financed Integrated Energy Services Project, to provide administrative support. This EEAU will report to the three SENER Directorates involved in Project implementation (see Figure 6.1). The responsibilities of the EEAU will include providing financial management services for the overall Project and procurement services for the activities to be undertaken by SENER under Component 3.

Figure 6.1: Organizational Chart of SENER



B. The Implementing Entities

4. As head of the energy sector, SENER is largely a regulatory and policy development agency with limited capabilities to implement projects. SENER faces operational and budgetary constraints, requiring that other entities participate in the implementation of the Project. In this context, the proposed implementation arrangements rely on several entities in addition to SENER, namely, FIDE, FIPATERM, CFE, CONUEE and NAFIN. These entities are involved in the various components as follows:

- SENER, the energy ministry which is involved in Components 1, 2 and 3;
- FIDE, the specialized energy efficiency entity involved in executing Components 1 and 2;
- FIPATERM, the specialized energy efficiency entity operating in selected Mexican states with FIDE in implementing Component 2;
- NAFIN, the national development bank involved in Component 2b;
- CFE, the vertically integrated national utility involved in Component 2. Although its basic function involves the generation, transmission and distribution of electricity, CFE is also involved in end-use energy efficiency activities, including through its participation as a shareholder in FIDE and FIPATERM; and
- CONUEE, the energy efficiency promotion agency which is involved in Component 3.

C. Detailed Implementation Arrangements

i. Component 1: Replacement of Incandescent Bulbs (IBs) with Compact Fluorescent Lamps (CFLs) in the Low to Medium-Income Residential Sector.

5. *DGPI and CFL Executing Agency.* DGPI is the Directorate within SENER responsible for the design and overall oversight of the component. In this regard, the DGPI provides guidance on strategic issues such as procurement, definition of the role of suppliers, the eligibility criteria for households, and the targeting of the program to urban and rural areas.

6. Given SENER's execution limitations, SENER appointed FIDE as the "CFL Executing Agency" responsible for operational aspects related to implementation of Component 1 of the Project. FIDE will be paid a fee (as a percentage of the total cost of the program) to implement the program. This implementation fee will not be financed by the proposed Project. FIDE will be responsible for the bulk procurement of the CFLs and associated services; it will sign contracts with the suppliers of CFLs and with the firms selected for the collection and disposal of the IBs. Households will exchange IBs for CFLs at approved retail stores, which stores will then deliver the IBs for proper disposal. FIDE will supervise and monitor activities under the Component, will ensure that the Operational Manual is appropriately followed by all parties and will also carry-out awareness and information activities designed under Component 3.

7. SENER and the CFL Executing Agency will enter into an implementation agreement (the CFL Implementation Agreement) setting out their respective responsibilities and rights. The Implementation Agreement will incorporate the Operational Manual. The signing of this agreement is a condition of effectiveness for

the MLA Financing Agreements.

8. FIDE has been selected as the “CFL Executing Agency” based on its capacity to undertake large-scale international procurement following IFI guidelines, its capacity to supervise and monitor a nationwide program, and its expertise and experience in implementing energy efficiency programs. Based on the results of the financial management and procurement capacity assessment, FIDE has been deemed to have adequate financial management capacity and to require some procurement training which will be provided to FIDE under Component 3 for the Project.

9. *Implementation/Distribution Arrangements.*

. A “three-track” implementation approach is envisioned that is designed to allow SENER to move the CFL replacement program from a centralized to a more market-based approach, as follows:

- a. The initial track (“Track 1”) will employ an “integrated” approach under which the acquisition and distribution of CFLs, their exchange for IBs, and the collection and destruction of IBs will be bundled into a single procurement. The contracts, to be awarded through international competitive bidding, will include about three separate lots covering different regions. Bidders can bid for one, two or all the lots to be procured. This initial “bundled” approach will allow SENER to begin to implement the program quickly and cost-effectively in some selected regions. FIDE, as the CFL Executing Agency, will be responsible for this bundled procurement of the CFLs, and for monitoring implementation. The bidding documents will specify factors such as the CFL technical requirements (see discussion in Annex 4), levels of national coverage, exchange procedures and reporting requirements. It is expected that interested CFL manufacturers, suppliers and retail store chains will associate within a consortium in submitting bids.
- b. In parallel, SENER will begin developing a separate track (“Track 2”), under which only the purchase and delivery to stores will be procured by the CFL Executing Agency in a bundled manner, and any retail store (or chain of stores) that meets SENER’s eligibility requirements will be able to participate as a point of exchange. Under this track, the CFL Executing Agency will conduct a bulk procurement of the CFLs, and will procure under a separate contract the services of IB collection from participating retail stores and their proper disposal. The objective of Track 2 is to move to a more open program in which a wider set of retail stores meeting the eligibility criteria for exchange and disposal are allowed to participate in the program. The detailed design of this phase will be supported by the technical assistance to be provided under Component 3; the modalities will be based in part on the results of Track 1 above.
- c. A longer-term objective of SENER is to move to a more market-oriented approach (“Track 3”) under which participating retail stores will, in addition to handling the exchange as contemplated under Track 2, also

directly purchase from the manufacturers CFLs that meet the standards set by SENER. It is anticipated that SENER would under this Track 3 pay the retail stores for the CFLs based on a voucher scheme. SENER would still bid out the collection and destruction of the IBs in the same manner as under the preceding Track 2. The modalities would be developed on the basis of the experience with and lessons learned from Tracks 1 and 2.

10. Eligibility information will be printed on eligible consumer bills during the promotional period, based on CFE's database targeting the households comprised in the four lowest deciles of electricity consumption (as described in Annex 4). The detailed implementation arrangements will be laid out in the Operational Manual.

11. *Information and Awareness Campaign and Monitoring.* A nationwide information and awareness campaign will be carried out to inform consumers and raise their awareness about the program; this campaign will be supported under Component 3 and will be complemented by information and awareness activities carried out by FIDE as the CFL Implementing Agency. In addition, SENER and the CFL Executing Agency will undertake various levels of program monitoring, such as periodic inspections of the participating stores, consumer surveys to ensure efficient and effective distribution of CFLs by the suppliers/retailers and to gauge the impact at the household level. This monitoring and evaluation activity will be supported under Component 3 of the Project and by the fee paid to FIDE by SENER to implement the Component.

12. *Flow of Funds.* Funds for the implementation of this Component will be withdrawn from the EE Trust Fund by the CFL Executing Agency to issue payments to suppliers and other service providers, including to suppliers under the bulk procurement of CFLs and to providers of IB disposal services.

ii. Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners (ACs) in the Residential Sector.

13. *DGDSENR, DGGCTE and Implementing Agencies.* DGDSENR and DGGCTE are responsible for the design and overall oversight of Component 2. In this regard, DGDSENR and DGGCTE provide guidance on strategic issues such as the structuring of the voucher program and of the credit line, and the eligibility criteria for households.

14. The respective main responsibilities of the various entities involved in the implementation of Component 2 are as follows:

- SENER is delegating to FIDE the responsibility for ensuring compliance with the Operational Manual, and for interacting with and supervising the retail stores that will sell the new appliances and dispose of the old ones. This supervision process will include telephone calls, periodic check-up visits, review of processes, and distribution of surveys to the beneficiaries. Through its regional offices, FIDE is also responsible for supervising the adequate scrapping of the appliances by the scrapping centers in accordance with the requirements of the EMP. For implementing this Component, FIDE receives a percentage of the total cost of the program (between 1 and 2 percent of the approved credits and [1 percent] of the vouchers redeemed. FIPATERM will provide administrative support to FIDE in several Mexican states

- CFE is responsible for receiving and administering the funds from the EE Trust Fund allocated to Component 2a.i. and managing FIDE's implementation of the activities related to Component 2a.i, under the CFE/FIDE Implementation Agreement. In addition, CFE is responsible for supervising FIDE and providing monthly reports to SENER on the status of the implementation of the component (how many appliances were exchanged, amount of vouchers and subsidies provided, etc.) pursuant to the SENER/CFE Implementation Agreement.
- NAFIN is the provider of the credit lines under Component 2a.ii, and, pursuant to the NAFIN/FIDE Implementation Agreement, will appoint FIDE to administer the credit line, including verification of credit documentation and effecting payments to retailers. SENER will transfer the moneys from the EE Trust Fund to NAFIN to fund the Guarantee Facility under Component 2b.

15. *Distribution/Replacement Process.* Consumers who are eligible for the replacement program would acquire a new appliance from eligible retail stores by using the instant discount voucher and/or credit. The consumers will provide to the retailers their electricity bills for scanning to consult with CFE's database to determine the consumer's eligibility and the amount of the instant discount voucher (which varies by the consumers' level of consumption, as described in Annex 4). The consumers can also apply directly at the store for the NAFIN credit (see below). Consumers purchase qualifying appliances (see definition in Annex 4) from eligible retail stores in Mexico. Eligible retail stores sell the appliances to eligible consumers (see Annex 4), and exchange the newly purchased appliance for the old and inefficient appliances, which will be collected and scrapped. After a beneficiary requests the voucher and/or credit at the participating store, the store checks the eligibility of the claim on CFE's software and database system and, when eligibility is confirmed, makes the sale. Subsequently, the store delivers the new appliance to the consumer's residence.

16. *Collection and Scrapping.* The retailers are responsible for picking up the old appliance from the consumer's residence when delivering the new model, and to transport the old appliance to a Center for Collection and Destruction (the "Scrapping Center"). The Center will scan the barcode of the old appliance, check the functioning of the equipment, and record the brand, color, model and serial number before destroying the equipment. The replacement program operates in all of the zones in Mexico where the infrastructure necessary exists for the distribution of the appliances and the destruction of the old appliances.

17. *Payments of Vouchers and Provision of Credit.* As described earlier, in order to make the appliance replacement program affordable and attractive for low-income consumers, the consumer's cost is subsidized by an instant discount voucher (provided notionally in the form of a virtual voucher provided through the consumer's electricity bill issued by CFE); a credit line at 12% per annum is also available to consumers. The amount of the voucher is paid directly by FIDE to the retail stores upon compliance with the program's requirements. A separate payment is made by FIDE to the stores based on approved and signed credits (see below). In addition, a payment is also made by FIDE to the retail stores for scrapping upon verification of proper delivery of the old, inefficient appliance to the scrapping center; the store in turn then pays the scrapping center for the cost of processing the old appliance. Under these arrangements, there is no procurement activity connected with this Component 2.

18. *Credit Arrangement Modalities.* Consumers who are eligible for the replacement program apply directly at the store for a credit from NAFIN; the cash incentive/credit percentage is based on the user's level of electricity consumption up to a maximum of MX\$8,700 (as described in Annex 4). The consumer signs a credit agreement with FIDE and a promissory note with NAFIN, and then repays the credit in monthly installments directly through the CFE electricity bill; CFE in turn makes the payment to NAFIN. Qualification to receive the credit are based on various elements, including an assessment of the consumers' credit standing; the elements include: (i) proof of residence, which should be the same address shown on the electricity bill; (ii) the request for financing, the authorization to conduct credit checks and the credit agreement must be signed by the same person whose name appears on the electricity bill; (iii) the beneficiary needs to provide the name, address and telephone number (when available) of a person who can corroborate that the beneficiary lives in the domicile as declared; and (iv) the beneficiary cannot have a negative rating from the *Círculo de Crédito, S.A. de C.V.*, a credit rating agency.

19. *Retail Store Eligibility Criteria.* Any retail store in Mexico that meets the eligibility criteria²⁰ will be accepted to join the program at any time. The Project is designed to increase participation and foster competition among the retail stores willing to increase sales of energy-efficient appliances by taking advantage of the incentives offered by the appliance replacement program, including the opportunity to increase sales to qualifying consumers. The participation of existing retail stores as a vehicle for the appliance replacement incentives program lends itself to an open market scenario in which economy, efficiency and national coverage are established.²¹ FIDE signs contracts with the participating stores defining the rules for the program (the FIDE/Participating Retailers Agreements); FIDE has provided a standard supplement to these agreements to incorporate the requirements of the Operational Manual and other provisions relating to the financing provided by the Bank (see conditions of negotiations).

20. *The Pricing Framework for Appliances.* Under the program, retail stores are not permitted to distinguish in pricing between consumers who are eligible for the vouchers and credit program and those who are not. FIDE surveys the national market, including a wide geographic range of store locations and sizes, to gather prices of energy-efficient equipment and to determine competitive market prices. When a retail store willing to join the program submits its list of models, prices, and other required credentials to FIDE, FIDE assesses the store's prices and compares them to the competitive market prices. These prices are recorded in the software by FIDE. If FIDE determines that the retail store's inputted price is not a competitive market price, the registration of that model/price will be rejected in the software system. This also applies for price changes. If a retailer increases its prices, the retailer must provide a justification to FIDE, which in turn has the right to accept or reject the increase as qualifying under the program.

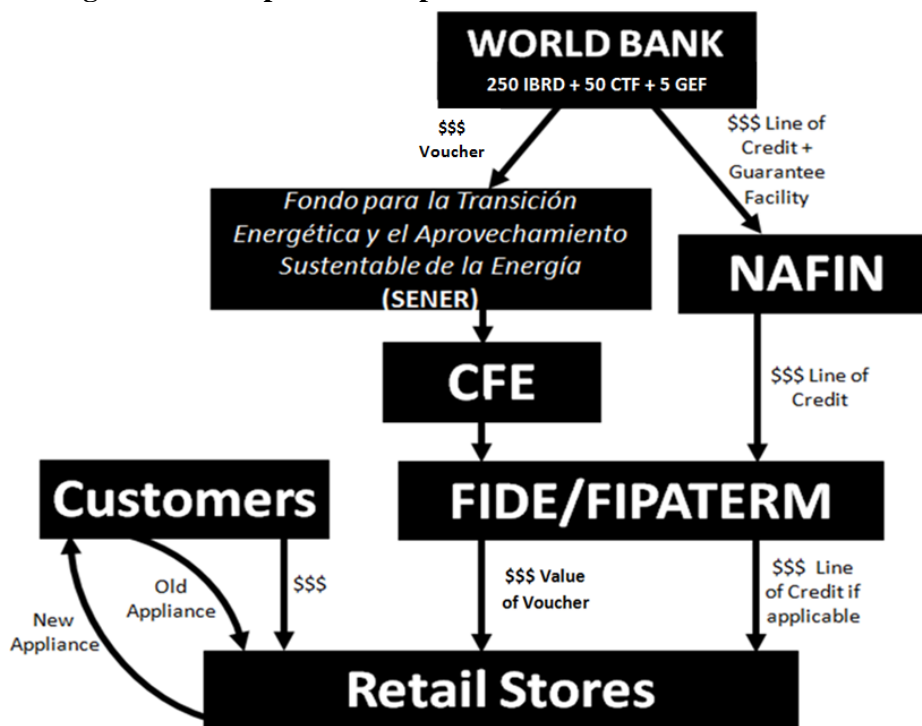
²⁰ To be eligible, the retail store must: (i) provide official identification of the person or legal representative (eligible identification documents include passport, military service card, *Instituto Federal Electoral* credential, or personal certificate); (ii) be established for at least two years; (iii) sign a "contract of participation" with FIDE; (iv) carry at least one refrigerator or air conditioner model that meets energy efficiency requirements; and (v) submit a complete list of prices for each eligible model, which will be recorded in the software database (*Sistema Integral de Atención*) and subject to FIDE verification.

²¹ In the ongoing pilot program, 8 large retail chain stores and 581 local stores are currently participating throughout the country, covering all 31 Mexican states as well as the Federal District.

FIDE does not usually authorize increases unless the justification is coupled with a letter from the manufacturers stating that the price of the appliance's materials/components has increased.

21. *Flow of Funds: Vouchers and Credit Program.* Based on the budget approved each year by Mexico's Congress, the Government will transfer resources to the EE Trust Fund managed by SENER. Upon approval of the appliance replacement program by the EE Trust Fund's Committee, the approved funds are transferred on an annual basis to CFE as trustee for the fund; the funds are held by CFE in a traditional commercial bank account and are transferred periodically to FIDE. FIDE receives documentation on the sale from the retailer, verifies the information and determines the payments due to the retailers. FIDE requests the necessary funds from CFE and pays the retailers. With respect to the credit portion, NAFIN transfers the resources requested by FIDE (according to the approved credits) to FIDE, which in turn pays the stores for the "closed" and verified transactions. The consumers pay the remaining balance themselves together with the old appliances to be replaced (see Figure 6.2). As noted above, repayments are made through the electricity bill payments to CFE, which in turn transfers the repayments to FIDE; FIDE then transfers them to NAFIN.

Figure 6.2. Component 2 Implementation Scheme: Flow of Funds



22. *Guarantee Facility.* The Guarantee Facility will be capitalized by SENER (whether from the EE Trust Fund or the GEF Grant) by periodic transfers to NAFIN as holder of the facility. The disbursement will be proportional to the contribution levels of the EE Trust Fund or the GEF Grant to ensure that there is a relative risk sharing mechanism between GEF grants and other sources of financing. The funds within the Guarantee Facility will be held in a commercial bank account opened by NAFIN. Disbursements from the facility will be made by NAFIN based on the default rate of consumers on the credits provided under Component 2a.ii. NAFIN is responsible for

providing monthly reports on the use of the Guarantee Facility resources in accordance with the rules established for determining a payment default by a consumer (defined as six months of no credit payment from consumers). SENER will capitalize/replenish the facility as a function of the defaults and corresponding draw downs by NAFIN. These arrangements are to be reflected in the SENER/NAFIN Coordination Agreement, to be signed as a condition of Effectiveness of the MLA Financing Agreements. Since the GEF resources will be provided to SENER to capitalize the Guarantee Facility, the proposed financing scheme does not exhibit any potential for “co-mingling” GEF and Clean Development Mechanism resources; moreover, the Project will ensure safeguards to avoid the potential for “co-mingling” of GEF and CDM resources.

23. *Monitoring and Oversight.* Effective monitoring and oversight procedures within the program design will help to ensure the economy and efficiency of the program. FIDE monitors the program in part through the *Sistema Integral de Atención* software database, which is used for the process until the appliance is delivered to the consumer and accounts payable are generated by FIDE to the participating stores.²² FIDE also verifies the proper destruction of the old appliances at the 99 scrapping centers located throughout Mexico. The coupling of the voucher directly with the CFE electricity bill ensures that only consumers who meet the electricity consumption requirements can redeem the voucher (Component 2a.i.) and access the credit facility (Component 2a.ii.). In addition, as part of the technical assistance and institutional strengthening funds under Component 3 of this Project, a portion of the World Bank’s GEF Grant resources will be devoted to implementing further monitoring, evaluation and oversight mechanisms.

24. *Implementation Agreements.* SENER and the other implementing agencies have entered into several agreements to support the implementation of the pilot appliance replacement program. These implementation agreements are as follows:

- SENER has entered into the following agreements for the implementation of the appliance replacement activity: (i) an agreement with CFE, dated February 13, 2009 regarding the flow of funds and other matters (the SENER/CFE Implementation Agreement), (ii) an agreement with FIDE dated February 18, 2009 regarding operational aspects (the SENER/FIDE Implementation Agreement), and (iii) an agreement with NAFIN dated February 12, 2009 regarding the Guarantee Facility operational modalities (the SENER/NAFIN Coordination Agreement).
- CFE has also entered into an agreement dated February 20, 2009 with FIDE relating to the flow of funds and operational aspects (the CFE/FIDE Implementation Agreement).
- NAFIN has entered into an agreement with FIDE, dated XX, 2009 (the NAFIN/FIDE Implementation Agreement) for the implementation of credit activities under Component 2a.ii.

²² After the delivery process is completed, FIDE monitors and supervises the rest of the process through another system called Enterprise Resource Planning. More details are available in Annex 7 of the PD.

25. These several implementation agreements (collectively, the RAC Implementation Agreements) will be signed as a condition of Effectiveness to incorporate the Operational Manual, to reflect the expanded and modified aspect of Component 2 as compared to the pilot program, and to include additional prescriptions mandated by the presence of Bank financing.

iii. Component 3: Technical Assistance and Institutional Strengthening.

26. DGPI within SENER is responsible for managing implementation of this component, with the support of the EEAU, and will coordinate with the other directorates within SENER (including the DGDSENR and DGGCTE), as well as FIDE and the other entities involved in Project implementation to be supported under this Component. CONUEE will support DGPI, and SENER generally, in implementing this Component. Procurement will be undertaken by the EEAU.

D. Anti-Corruption Clauses

27. The MLA Financing Agreements shall each contain the standard clause whereby the Borrower/Recipient—in this case UMS/GoM and NAFIN—agrees to ensure that the Project is carried out in accordance with the provisions of the Bank's 2006 Anti-Corruption Guidelines (GAC Guidelines). Accordingly, the GAC clauses shall be applied to the Government and NAFIN under the MLA Financing Agreements, as well as to FIDE, CFE and the retail stores. The precise modalities will be finalized during appraisal and negotiations.

Annex 7: Financial Management and Disbursement Arrangements

MEXICO: Efficient Lighting and Appliances Project

1. **Introduction.** This Annex documents the results of the Financial Management (FM) Assessment of the Mexico: Efficient Lighting and Appliances Project (the Project), as conducted by Bank staff in accordance with Bank policy.
2. **Summary.** The Project is complex in terms of FM arrangements, mainly because it involves several implementing entities that participate in the flow of funds and information process, including the following: private retailers, a private trust fund named FIDE (*Fideicomiso para el Ahorro de Energía Eléctrica*), a public trust fund named FIPATERM (*Fideicomiso 728*), NAFIN which is a government development bank (*Nacional Financiera*), the Mexican electricity utility company CFE (*Comisión Federal de Electricidad*), SENER (Secretariat of Energy), and the Fund for the Energy Transition and the Sustainable Use of Energy (*Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía*; for the purposes of this Annex “SENER Fund”).
3. The FM arrangements regarding Component 1 are relatively simple because there will only be a few payments to the suppliers of CFLs. However, Component 2 involves the financing of vouchers (under Component 2a.i.) and/or credit lines (under Component 2.a.ii.) for the replacement of appliances, and entails a complex operational process. This process is mainly carried out by NAFIN, CFE, FIDE and FIPATERM; in general terms it includes: (i) the definition of beneficiaries and the type of voucher or credit line that these are entitled to receive; (ii) ensuring that the vouchers and credits are received by the eligible beneficiaries; (iii) ensuring the proper controls and validation of the information received from retailers and making the payments to them; and (iv) requesting and receiving funds from NAFIN, CFE and the SENER Fund.
4. The issues described above also imply substantial challenges in terms of financial accounting reporting, auditing, and in general terms, in the overall Project FM coordination. It is also worth mentioning that the implementing entities have almost no previous experience in implementing Bank-financed projects.
5. The inherent FM risk is deemed substantial because of the abovementioned factors. The mitigating control measures described in this Annex include:
 - (i) Strong country public FM arrangements applicable to the program.
 - (ii) Because the appliance replacement program is an ongoing program of the Federal Government under SENER’s coordination, there is a strong control environment in place that includes: (a) suitable IT systems used to control the overall process of providing vouchers and credit lines to eligible beneficiaries, as well as for the accounting of program funds, and (b) an Operational Manual that contains a very prescriptive documentation of the policies of procedures applicable to the program.
 - (iii) The inter-institutional relationships and responsibilities among the program’s participants are documented in legal agreements.
 - (iv) As indicated in the Implementation Arrangements section (Annex 6) the Energy Efficiency Administrative Unit (EEAU) will incorporate one FM Specialist whose responsibilities will be the overall coordination of FM tasks,

such as the consolidation of the Project's financial records, reports, and the preparation of disbursement requests.

(v) Specific TORs will be required for the external audit of this program; the auditor's opinion on the adequacy of the application of the key operational and financial controls of the program will be requested.

6. Therefore, the residual overall FM risk, i.e., the inherent risk as mitigated by existing controls, is Modest. The Bank's supervision strategy for this Project includes: (i) A minimum of two full FM supervision missions per year to look into the operation of the control systems and arrangements described in this Annex, (ii) Desk reviews of semi-annual IFRs and annual audit reports.

7. At this stage, the FM action plan consists of the following aspects:

- Preparation of a Project Operational Manual, which will include a specific FM chapter, and must be provided to the Bank for its review and no objection; the draft final version is expected to be ready prior to negotiations.
- The inclusion of an FM specialist within the EEAU, under terms of reference and with qualifications satisfactory to the Bank, will be included as a condition of effectiveness and a covenant in the loan agreement.
- NAFIN is the trustee of the trust fund Fideicomiso 8013-9 "Guarantee Facility TF" created for the repayment of defaulted lines of credit to eligible beneficiaries under the existing appliances replacement program, which will be also used to manage the resources of the GEF Guarantee Facility under component 2b of the project. On this regard, NAFIN will need to fulfill in a manner satisfactory to the Bank the requirements established in paragraph 8 of OP 10.20 - Global Environment Facility Operations²³, which will be included as a covenant in the GEF legal agreement.

Description and Assessment of Project FM arrangements

8. **Country issues relevant to the Project.** In general, public financial management in the Mexican Federal Administration relies on strong budgeting, treasury, accounting and control systems. These FM country systems apply to Project transactions because Bank-financed operations form an integral part of the public budget and are executed accordingly. Moreover, specific financial reporting and

²³ Paragraph 8 of OP 10.20 establishes the following: the Bank may disburse GEF funds to capitalize a conservation fund¹² or a guarantee fund, provided that, throughout the duration of the Bank's supervision of the GEF-financed project for the capitalization of such a fund: (a). the Bank retains the right to request audits of the fund; (b). the board and/or management of the fund (or comparable organ(s) for the administration of the fund) are composed of professionals who have qualifications and experience satisfactory to the Bank and have the capacity to exercise satisfactory control over the use of the fund; (c). the fund is managed in accordance with operational and financial policies, and on the basis of a constitutive and/or statutory instrument, acceptable to the Bank; (d). the fund is subject to the Bank's policies on audits and financial reporting; and (e). the Bank has the right to require the recipient to repay the grant to the Bank if the recipient breaches any of the foregoing conditions, except for the amount of the grant that would be needed to meet the recipient's obligations under guarantees issued and existing before the recipient's receipt of the Bank's repayment notice.

auditing arrangements for projects financed by multilateral international institutions have been agreed with the government.

9. **Implementing entities.** The Project comprises several implementing entities, including the EE Trust Fund, SENER, CFE, FIDE, NAFIN and FIPATERM. It is worth mentioning that the implementation arrangements among these entities are supported in diverse legal agreements signed among them. The roles of these entities in terms of FM are described below:

- **SENER.** SENER is the overall coordinator of the program from a technical standpoint, and it will be in charge of managing the resources provided for technical assistance under component 3, for US\$ 2.12 million. Because SENER only manages a small budget, basically for its payroll, this institution does not have adequate FM capacity to manage the loan funds. This issue will be tackled by the administrative support that will be provided by the EEAU unit in SENER, the section on “staffing arrangements” contains more details on this regard.
- **BANOBRAS as fiduciary agent of EE Trust Fund.** The funds for the replacement of CFLs (Component 1) and for the replacement of appliances through vouchers (under Component 2.a.i.) will be financed by this Federal Government Trust Fund, created under the Renewable Energy Law in 2009 for the purpose of managing resources for sustainable energy projects. BANOBRAS (National Bank for Public Works and Services) is the fiduciary agent of this TF, and operates only by the instructions of SENER through a Technical Operational Committee created specifically for managing the Trust Fund and whose responsibilities include evaluating and approving the projects to be financed.
- **CFE.** This entity is only involved in the appliance replacement program (under Component 2.a.i.), in which it has relevant interaction with FIDE (supported in the legal agreement signed between the two entities). CFE’s main functions are: (i) to select and inform its clients that they are subject to participate in the replacement program; (ii) for the vouchers under Component 2.a.i., to receive the resources from the SENER Fund and make deposits to FIDE as per its instructions; and (iii) for the credits granted under Component 2.a.ii, to collect the payments from consumers through their monthly electricity bills and deliver the resources to FIDE.
- **FIDE.** This private trust fund has the most relevant role in the Project from an operational and financial management perspective, because all the funds (except for Component 3) will flow through this institution, and it will be in charge of several responsibilities such as: (i) issuing payments to the suppliers of goods under Component 1, and (ii) managing the vouchers and credit lines provided under Component 2.a. and issuing payments to retailers.
- **FIPATERM.** This entity is subcontracted by FIDE for the implementation of the program in the northern (and some southern) states of Mexico. However, it is worth mentioning that FIPATERM’s responsibilities will only concern the process of reviewing the program’s beneficiary files delivered by the retailers. None of the funds of this program would flow through FIPATERM because all the payments to retailers would be issued exclusively by FIDE.
- **NAFIN.** This entity will provide the funds for the credit lines to qualifying consumers, which as mentioned previously would be administered by FIDE. NAFIN is also responsible, for managing the Guarantee Facility TF as explained previously in the summary section.

10. **Financial administration.** NAFIN will be the financial agent for this Project. Among other functions, this entails managing the loan disbursement processes, administering the Project's designated account, and providing implementation support and oversight, based on NAFIN's many years of experience with Bank-financed projects.

11. **Budgeting arrangements.** The CFL and appliance replacement programs will be prefinanced through the budget of the SENER Fund. As explained above, this fund is financed by the Federal Government. The fund was created with an initial contribution of MX\$600 million, followed by a subsequent contribution of MX\$1,547 million. Some of these resources are expected to be disbursed in the following months of 2010 for the operation of the programs for the efficient use of energy currently in operation in Mexico.

12. **Accounting system.** All the entities involved in the Project will prepare their own accounting records for the components they are involved; however, the overall Project accounting will be consolidated and maintained by the EEAU in SENER.

13. FIDE has the ERP (Enterprise Resource Planning) system, which was designed by an external company (Intelisis), and is an integrated system (similar to SAP) used for budget, accounting, payments, and all other operational purposes. The system is quite robust; all the above mentioned processes are automatically interfaced, and it is capable of managing the accounting records prepared on cash and accrual bases, under economic, administrative, and functional/programmatic classifications. Financial reports are issued periodically on a timely basis.

14. The accounting for the EE Trust Fund is managed by BANOBRAS in its institutional system, which is capable of managing specific records and accounts for purposes of the Bank loan.

15. **Internal control and internal auditing.** All the implementing entities participating in the Project have their own internal auditing departments:

- For the public sector entities the internal audit function is carried out by the Internal Control Units (OIC), which report to the Ministry of Public Administration (SFP) and must follow the Public Audit Standards and Guidelines issued by SFP (*Secretaría de la Función Pública*). The latter also approves the OIC's annual work programs, oversees its operation and receives its audit reports. Good systems are in place for timely follow-up to internal audit observations and implementation of recommendations.
- The private entities (FIDE and FIPATERM) also have their own internal audit departments. However, because they are private entities, they do not report to the SFP.

16. For this project will be required that in case that the internal audit function of any implementing entity (either public or private) have any relevant finding regarding the project, that should be informed to the Bank as part of the annual audited financial statements, including its follow up, and if is the case, the measures taken for its solution.

17. **Staffing arrangements.** As a result of the FM assessment, it is considered that in general terms the entities involved are adequately staffed in order to handle this Project's FM matters.

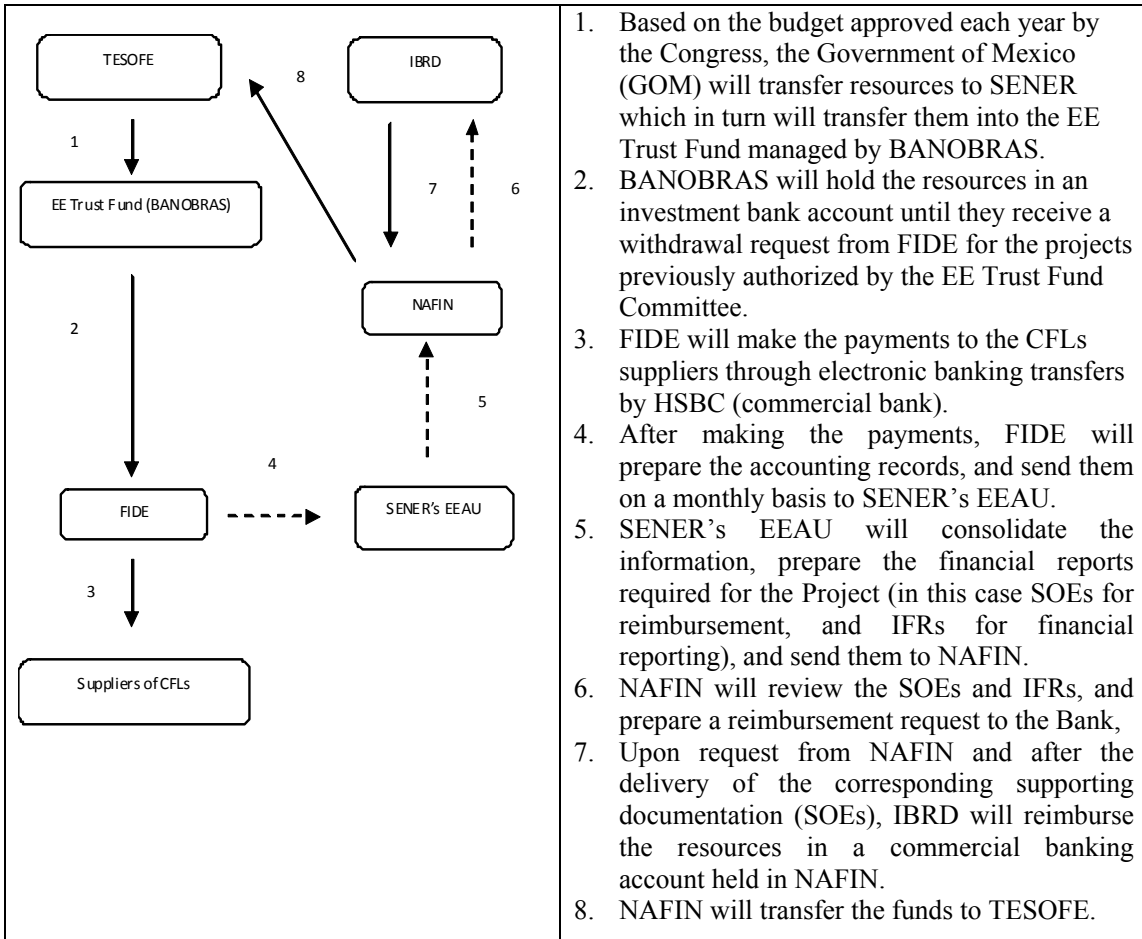
18. However, as explained in the implementation arrangements section in Annex 6, given the complexity of the Project's FM arrangements, within SENER the EEAU will

incorporate a FM Specialist who will assume an overall coordination role in terms of FM.

19. **General flow of funds and information.** The arrangements for the flow of funds for each one of the components vis-à-vis the disbursement categories of the Project are described in the following tables. It is worth mentioning that the flow of funds process described below is not impacted by the source of funds (IBRD, CTF or GEF); however, for clarity purposes the disbursement tables were presented by source of funds, and also in a consolidated version:

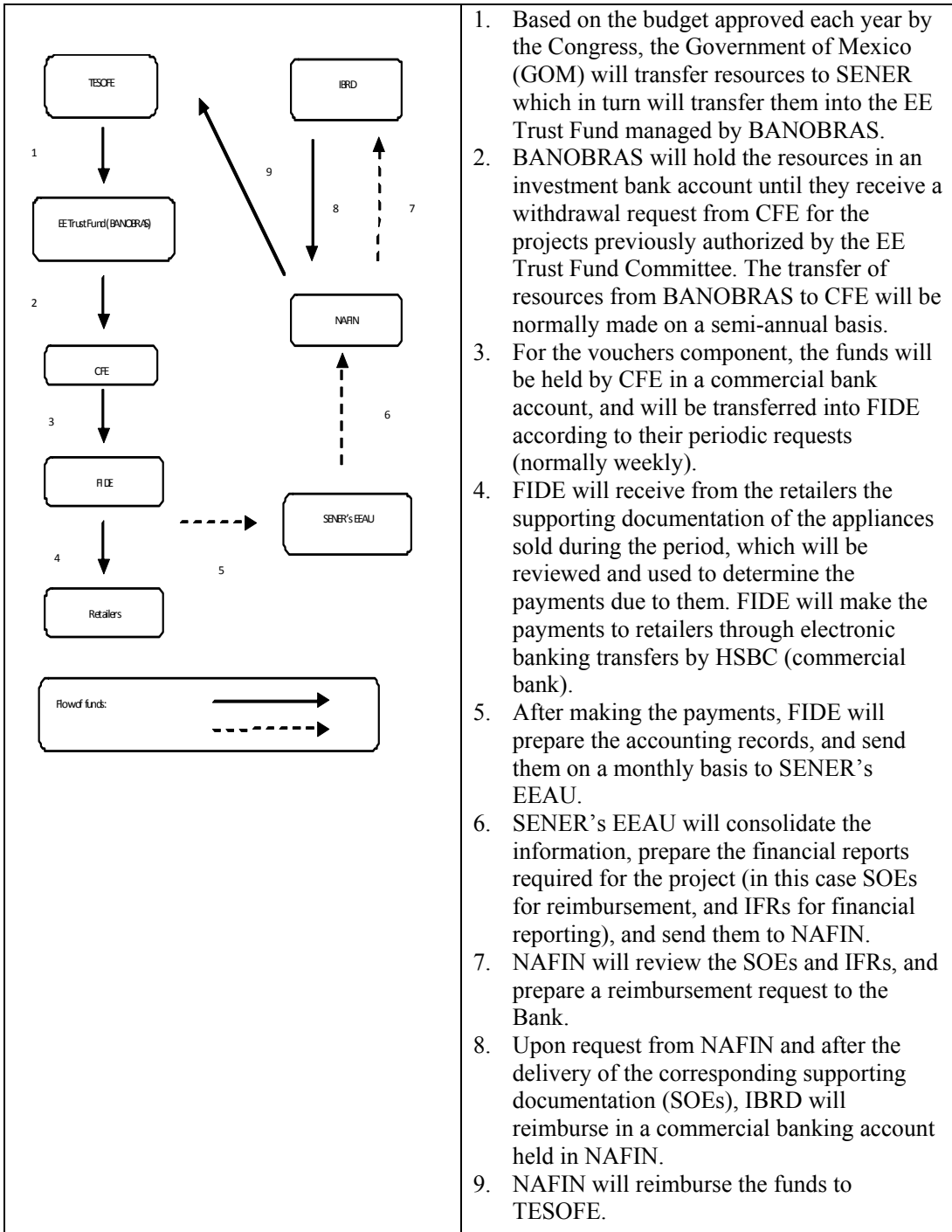
COMPONENT 1

CFLs under Component 1 of the project



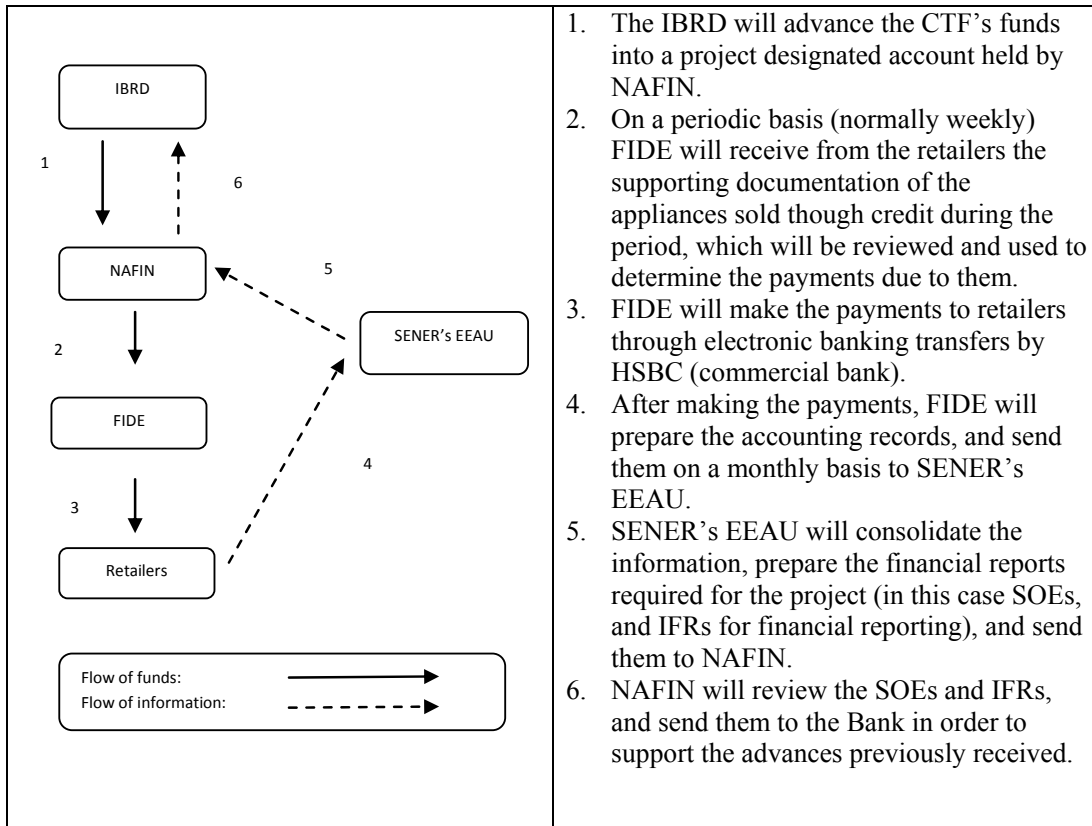
COMPONENT 2

Disbursement under Component 2.a.i. of the project



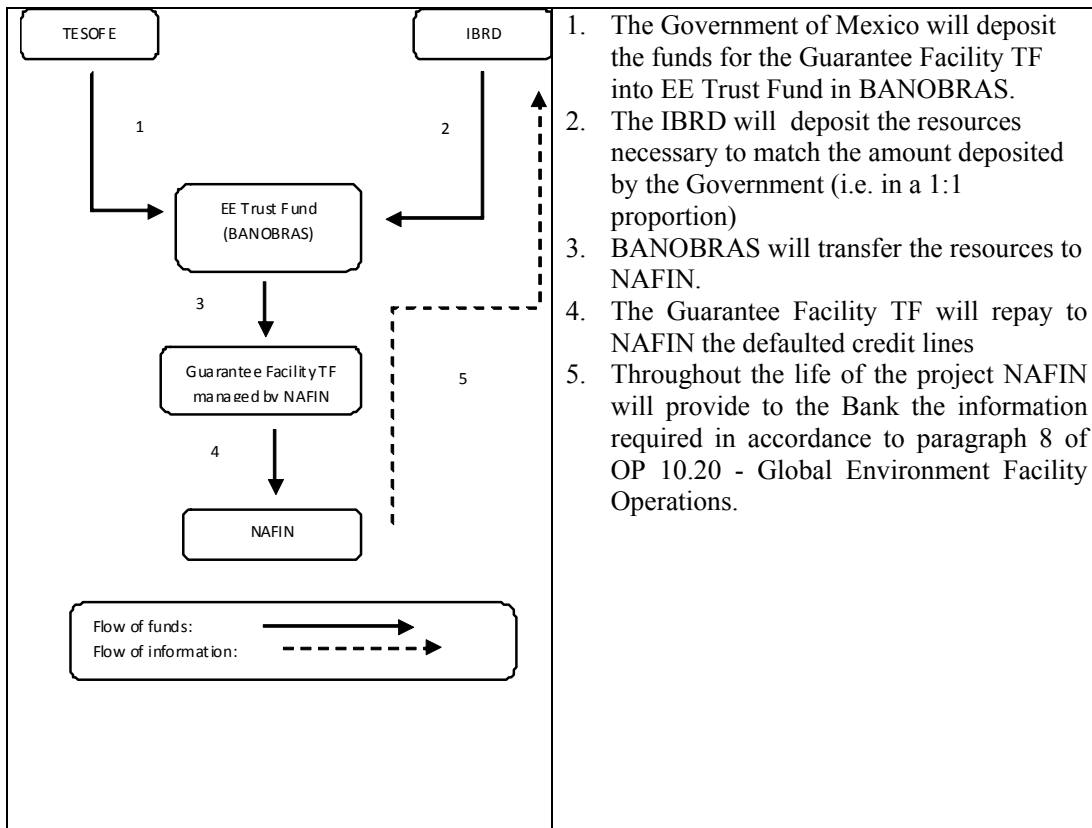
1. Based on the budget approved each year by the Congress, the Government of Mexico (GOM) will transfer resources to SENER which in turn will transfer them into the EE Trust Fund managed by BANOBRA.
2. BANOBRA will hold the resources in an investment bank account until they receive a withdrawal request from CFE for the projects previously authorized by the EE Trust Fund Committee. The transfer of resources from BANOBRA to CFE will be normally made on a semi-annual basis.
3. For the vouchers component, the funds will be held by CFE in a commercial bank account, and will be transferred into FIDE according to their periodic requests (normally weekly).
4. FIDE will receive from the retailers the supporting documentation of the appliances sold during the period, which will be reviewed and used to determine the payments due to them. FIDE will make the payments to retailers through electronic banking transfers by HSBC (commercial bank).
5. After making the payments, FIDE will prepare the accounting records, and send them on a monthly basis to SENER's EEAU.
6. SENER's EEAU will consolidate the information, prepare the financial reports required for the project (in this case SOEs for reimbursement, and IFRs for financial reporting), and send them to NAFIN.
7. NAFIN will review the SOEs and IFRs, and prepare a reimbursement request to the Bank.
8. Upon request from NAFIN and after the delivery of the corresponding supporting documentation (SOEs), IBRD will reimburse in a commercial banking account held in NAFIN.
9. NAFIN will reimburse the funds to TESOFE.

Disbursement under Component 2.a.ii. of the Project



1. The IBRD will advance the CTF's funds into a project designated account held by NAFIN.
2. On a periodic basis (normally weekly) FIDE will receive from the retailers the supporting documentation of the appliances sold though credit during the period, which will be reviewed and used to determine the payments due to them.
3. FIDE will make the payments to retailers through electronic banking transfers by HSBC (commercial bank).
4. After making the payments, FIDE will prepare the accounting records, and send them on a monthly basis to SENER's EEAU.
5. SENER's EEAU will consolidate the information, prepare the financial reports required for the project (in this case SOEs, and IFRs for financial reporting), and send them to NAFIN.
6. NAFIN will review the SOEs and IFRs, and send them to the Bank in order to support the advances previously received.

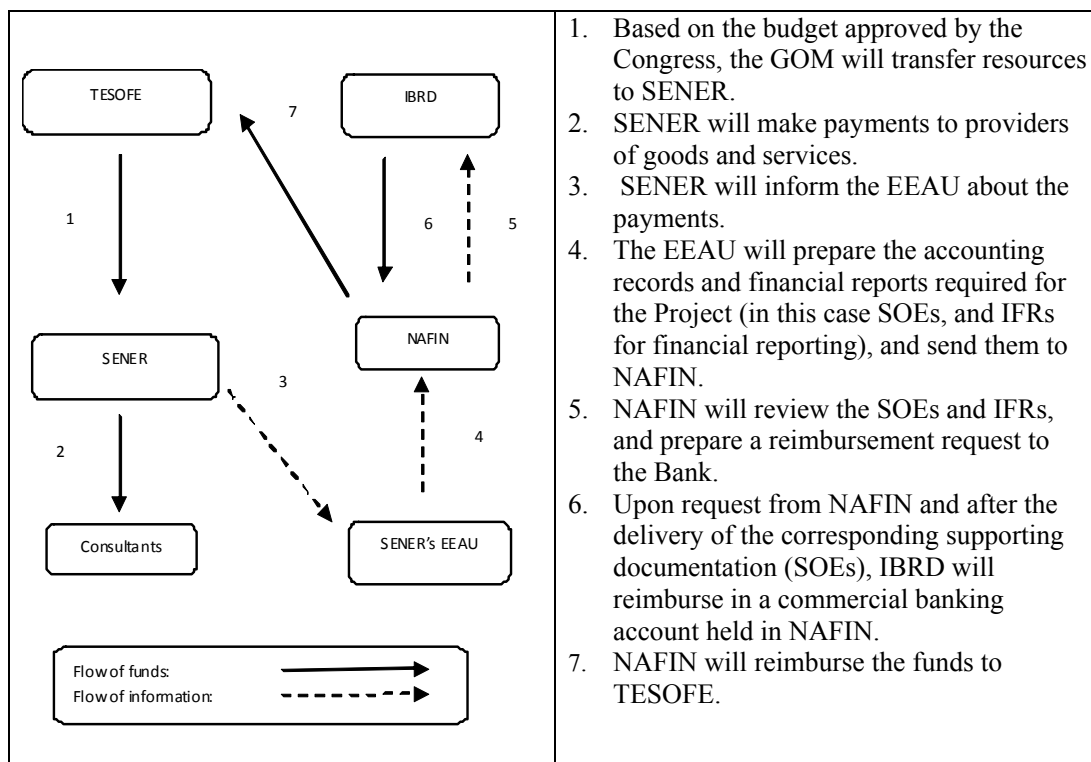
Disbursement under Component 2.b of the project



1. The Government of Mexico will deposit the funds for the Guarantee Facility TF into EE Trust Fund in BANOBRAS.
2. The IBRD will deposit the resources necessary to match the amount deposited by the Government (i.e. in a 1:1 proportion)
3. BANOBRAS will transfer the resources to NAFIN.
4. The Guarantee Facility TF will repay to NAFIN the defaulted credit lines
5. Throughout the life of the project NAFIN will provide to the Bank the information required in accordance to paragraph 8 of OP 10.20 - Global Environment Facility Operations.

COMPONENT 3

Consultants' services and Training under Component 3 of the project



1. Based on the budget approved by the Congress, the GOM will transfer resources to SENER.
2. SENER will make payments to providers of goods and services.
3. SENER will inform the EEAU about the payments.
4. The EEAU will prepare the accounting records and financial reports required for the Project (in this case SOEs, and IFRs for financial reporting), and send them to NAFIN.
5. NAFIN will review the SOEs and IFRs, and prepare a reimbursement request to the Bank.
6. Upon request from NAFIN and after the delivery of the corresponding supporting documentation (SOEs), IBRD will reimburse in a commercial banking account held in NAFIN.
7. NAFIN will reimburse the funds to TESOFE.

Description of the main operational and financial control framework of the Appliances Program financed under Component 2

20. As mentioned previously, a Pilot Program has been in place since March 2009 using the same implementation arrangements that will be used for this Project. The main operational and financial control framework is described below:

- The process begins when an eligible consumer buys a qualifying appliance at a participating retail store. The retailers capture the client's information in the *Sistema Integral de Atención* (SIA),²⁴ which is used for overall Project management. Using the client's number printed in the CFE bill (known as "RPU"), the SIA system will automatically verify in the CFE databases whether the client is eligible for the financial incentives and under which level.
- The retailers will sell the appliance, applying the voucher and or granting a credit line. Then the retailers will prepare a file with the appliances sold during the period and send it to FIDE. All this information is captured in the SIA, which issues a control number for each application.
- FIDE will receive the physical files from the retailers; using a checklist it will verify and reconcile the information with the data in SIA and determine the payments due to the retailers. With this information, each week FIDE will

²⁴ The SIA is a web-based system designed by FIDE. It is accessible to all program participants: CFE, FIDE, FIPATERM, participating retailers, and scrapping centers.

request the necessary funds from CFE for the vouchers and from NAFIN for the credit lines.

- Once the information in the files has been reviewed and validated by FIDE, it is marked in the SIA and then automatically sent to one of the modules of the ERP system (SAC, *Sistema de Administración de Cartera*).
- The SAC system generates a file with all the payments due to the retailers; this file is uploaded into the electronic banking system in order to deposit the resources. At all times the SAC system is able to issue reports on the status of operations by geographic location, control number assigned by SIA, specific date, retailer, and even by each of the appliance buyers.
- When the payments have been made, the SAC system automatically creates the accounting records; the files with the supporting documentation are stored for a period of five years.

21. **Disbursement arrangements.** The loan disbursement arrangements²⁵ are summarized below; however, these will be confirmed with SHCP and NAFIN during negotiations:

Disbursement method	The Government of Mexico normally requires to have available the advance and the reimbursement disbursement methods for all the disbursement categories, the primary disbursement methods that will be used for each of them are described in the following bullets: <ul style="list-style-type: none"> • For the disbursement categories financed under components 1, 2a.i. and 3, the primary disbursement method will be the reimbursement of eligible expenditures (prefinanced by the Government). • For the disbursement category financed under component 2.a.ii. the primary disbursement method will be advances into a designated account opened by NAFIN, according to the maximum authorized ceiling established in the disbursement letter. • For the disbursement category financed under component 2b, the funds for the capitalization of the Guarantee Facility will be deposited by the Bank into the EE Trust Fund in one or two payments, according to the requirements of SENER, which in turn will make the deposit into the Guarantee Facility TF. The eligible expenditures for this disbursement category will be the deposits into the Guarantee Facility TF.
Supporting documentation	SOEs. ²⁶
Currency conversion for documentation of eligible expenditures	Regarding the use of the advance method, because: (i) the currency requested for the DA is US dollars, and (ii) all the expenses of this Project are expected to be made in pesos, the applicable exchange rate will be that the corresponding to the date of the withdrawal of funds from the DA.
Limits	Different aspects such as the minimum value of applications for direct payments, ceiling of the Designated Account, and thresholds to deliver SOEs versus records, will be determined and agreed with SENER and NAFIN and confirmed with LOA.
Retroactive expenditures	Will be acceptable only regarding IBRD funds, under the following conditions: <ul style="list-style-type: none"> ▪ That do not exceed 20 percent of the loan amount.

²⁵ For details, see the Disbursement Handbook for World Bank Clients.

²⁶ All SOE supporting documentation would be available for review by external auditors and Bank staff at all times during Project implementation, until at least the later of: (i) one year after the Bank has received the audited Financial Statements covering the period during which the last withdrawal from the Loan Account was made; and (ii) two years after the Closing Date. The Borrower and the Project Implementing Entity shall allow the Bank's representatives to examine these records.

	<ul style="list-style-type: none"> ▪ Eligible expenditures made by the Borrower one year before the date of the Loan Agreement. ▪ The retroactive expenditures will be subject to the same systems, controls and eligibility filters described above in this Annex. These expenditures will also be subject to the regular Project external audit (see below).
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Disbursement Tables [to be confirmed at negotiations]

22. The disbursement tables for the IBRD Loan to the UMS, for the CTF Loan to NAFIN and the GEF Grant to the UMS are presented below. Further below is a table that aggregates these various items for the Project as a whole.

a. Disbursement table for the IBRD Loan to the UMS:

Category Description	Amount of the Loan Allocated (US\$ million)	Percent of Expenditures to be Financed
CFLs under Component 1 of the project	55.00	100%
Redeemed Vouchers under Component 2.a.i of the project	195.00	100% of payments made by FIDE to Eligible Retailers for the reimbursement of redeemed Vouchers.
Front-end fee	TBD	
Total	250.00	

b. Disbursement table for CTF Loan to NAFIN

Category Description	Amount of the Loan Allocated (US\$ million)	Percent of Expenditures to be Financed
Lines of Credit under Component 2.a.ii. of the project	50.00	60% of amounts paid by FIDE to Eligible Retailers.
Front-end fee	TBD	
Total	50.00	

c. Disbursement table for GEF grant to UMS

Category Description	Amount of the Loan Allocated (US\$ million)	Percent of Expenditures to be Financed
Capitalization of the Guarantee Facility under Component 2.b of the project	5.00	50%
Consultants' services and Training under Component 3 of the project	2.12	100%
Total	7.12	

d. Aggregated disbursements under the IBRD Loan (with unallocated notionally allocated to categories), the CTF Loan and the GEF Grant:

Category Description	Amount of the Loan allocated (US\$ million)	Financing Agreement	Recognition of Expenditures	Percent of Expenditures to be Financed
CFLs under Component 1 of the project	55.00	IBRD Loan to UMS	Payment to suppliers of goods and services	100%
Redeemed vouchers under Component 2.a.i of the project	195.00	IBRD Loan to UMS	Payments by FIDE to retailers	100% of payments made by FIDE to Eligible Retailers for the reimbursement of redeemed Vouchers.
Lines of Credit under Component 2.a.ii of the project	50.00	CTF Loan to NAFIN	Payments by FIDE to retailers	60% of amounts paid by FIDE to Eligible Retailers.
Capitalization of the Guarantee Facility under Component 2.b. of the project	5.00	GEF Grant to UMS	Deposit into the Guarantee Facility TF	50%
Consultants' services and Training under Component 3 of the project	2.12	GEF Grant to UMS	Payment to suppliers of goods and services	100%
Front-end fee	TBD	IBRD Loan to UMS		
Front-end fee	TBD	CTF Loan to NAFIN		
Total	307.12			

23. **Financial reporting.** With the information provided by the different entities participating in the program, SENER’s coordination unit will prepare semi-annual unaudited Project Interim Financial Reports (IFRs) and the annual audited Project financial statements. These will be prepared on a cash basis using the standard formats agreed with the Ministry of Public Administration (SFP) for the Mexico portfolio.

24. The IFRs will be prepared in local currency (i.e., Mexican pesos) and the exchange rates used for conversion purposes (as explained in the disbursement arrangements section) will be indicated in the financial reports.

25. After loan effectiveness, the following financial reports will be presented by the coordination unit to NAFIN for subsequent submission to the World Bank:

Report	Due date
Semi-annual unaudited Project IFRs	Within 45 days after the end of each six-month calendar period.
Annual audit report on Project financial statements and eligibility of expenditures	Within six months after the end of each calendar year of loan disbursements (or other period agreed with the Bank).

26. **External audit.** Annual audits of Project financial statements and eligibility of expenditures will be performed in accordance with Bank policy, as reflected in the audit terms of reference and memorandum of understanding agreed between the Bank and SFP. An independent audit firm selected by SFP and acceptable to the Bank will conduct the Project audits.

27. Because of the nature of this Project, additional TORs will be included with the objective of expanding the traditional role of external auditors, covering the most relevant control and technical points of the project²⁷. This TORs will require an opinion of the auditors at least on the following technical matters:

- The reliability and integrity of the information produced by the SIA and SAC systems, including the existence of adequate automated interfaces between both systems.
- With regard to the files of the program’s beneficiaries held in FIDE, the following must be reviewed: (a) the adequate integration of the information according to the requirements established in the “*Manual Operativo del Programa de Sustitución de Equipos Electrodomésticos para el Ahorro de Energía*”; and (b) a sample of cases (determined in accordance with acceptable auditing principles), the correct application of the voucher and/or credit line according to the characteristics of each client, and of the appliance, including the appropriate reference to the client’s RPU number in the electricity bill.

28. NAFIN, SENER, FIDE²⁸ and CFE are subject to the audit scope of the Federal Supreme Audit Institution (ASF), which regularly executes a number of performance, financial and compliance audits. The results of these audits are made public in the

²⁷ The specific audit TORs for this project will be required in addition to those already agreed between the Bank and the SFP for the audit of projects financed with World Bank’s resources.

²⁸ The ASF has faculties to review FIDE are only with regard to the resources received from the Federal Government.

annual audit reports on Federal Public Accounts. These external checks provide additional assurances about the program's operation and financial management.²⁹

29. The financial statements of FIDE are currently audited by the firm Del Barrio y Cia Moore Stephens (which is acceptable to the Bank). For 2008 the firm issued an unqualified audit report.

30. **Written procedures.** Project financial procedures will be documented in an Operational Manual (a condition for negotiations) defining the roles and responsibilities of the participating entities. The OM should include, among other financial procedures: (i) accounting and budgeting policies and procedures; (ii) formats of the consolidated IFRs for the Project; (iii) internal controls including the procedures for managing the bank and designated accounts, and for processing disbursements; (iv) records, management; and (v) audit arrangements.

31. **Risk assessment.** On the basis of the Bank's Project FM assessment, the overall FM residual risk is considered Moderate, as explained in the following table:

FM Risk Table			
Risk type³⁰	Risk Rating	Comments/risk mitigating measures incorporated into Project design	Residual Risk Rating
Inherent risk	S		S
Country level	M		M
Entity	S	The Project implies the participation of multiple implementing entities. However, it is worth mentioning that a strong mitigating control is in place because the inter-institutional relationships and responsibilities between the participants of the program are documented in legal agreements.	M
Project	S	The implementation arrangements for each of the Project's components are different and quite complex, especially for Component 2. In this case, the FM risk is mitigated primarily by the strong institutional control systems already in place, particularly in FIDE.	M
Control risk	M		M
Budgeting	M		M
Accounting	M		M
Internal Control	S	Because the appliance replacement program is an ongoing Federal Government program under SENER's coordination, an Operational Manual is in place, containing a very prescriptive documentation of applicable policies and procedures. Almost all the processes involved in this program are supported by an	M

²⁹ ASF audit reports on Federal Public Accounts are issued 15 months after the end of the calendar year. Thus, while they remain an important source of information for fiduciary purposes, they cannot be used by themselves to meet the Bank's project financial audit requirements.

³⁰ The **inherent FM risk** is that which arises from the environment in which the project is situated. The **FM control risk** is the risk that the project's FM system is inadequate to ensure that project funds are used economically and efficiently and for the intended purpose. The **overall FM risk** is the combination of the inherent and control risks as mitigated by the client control frameworks. The **residual FM risk** is the overall FM risk as mitigated by the Bank supervision effort.

		intensive use of technology through automated systems such as the SIA and SAC. As an additional assurance process, the Bank will require to be informed of any relevant internal audit finding related to the project.	
Funds Flow	S	The flow of funds is also quite complex in view of the Project's multiple actors; however, the risk is mitigated by the fact that the flow of money is tracked in different systems. This information is reconciled periodically.	M
Financial Reporting	M	The FM Specialist within SENER's EEAU will prepare semiannual unaudited Project Interim Financial Reports (IFRs) and annual audited financial statements.	M
Auditing	M	An independent audit firm selected by SFP and acceptable to the Bank will conduct the annual audit of Project financial statements and expenditure eligibility. Specific TORs will be required for the external audit of this program, requesting the auditor's opinion on the adequate application of the program's key operational and financial controls.	M
Overall risk	M		M
Residual risk			M

H: High; S: Substantial; M: Moderate; L: Low

32. The Bank's FM supervision strategy will consist of the following:

- A minimum of two full FM supervision missions per year, which will look into the operation of the control systems and the arrangements described in this Annex, including but not limited to the beneficiary payments system, the reconciliation process and the eligibility filters.
- Desk reviews of IFRs and audit reports.

Annex 8: Procurement Arrangements
MEXICO: Efficient Lighting and Appliances Project

A. General

1. Procurement for the proposed Project will be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004 and revised in October 2006 and May 2010; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004 and revised in October 2006 and May 2010, and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the Loan, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect actual Project implementation needs and improvements in institutional capacity.
2. **Procurement of Works:** Not expected in the Project.
3. **Procurement of Goods:** Under Component 1, goods procured under this Project will include compact fluorescent lamps (CFLs) for residential lighting. The procurement will be carried out using unified Standard Bidding Documents (SBD) agreed with the Bank for all International Competitive Biddings (ICB) and National Competitive Biddings (NCB). Contracts for small purchases in individual contracts to cost less than \$100,000.00 will be carried out through shopping.
4. **Procurement of non-consulting services:** Non-consultant services under Component 1 of the Project will include logistics, distribution of CFLs and collection and destruction of IBs. Under Component 3 these services will include procurement of facilities for training and workshops, including expenditures incurred in connection with the conduction of capacity building activities. These activities will also include preparation and production of dissemination and training materials. Most of these services are expected to be procured by shopping.
5. **Selection of Consultants:** The Project will require consulting services to provide technical assistance to relevant energy sector agencies in order to operationalize and implement the Energy Efficiency Law. Technical assistance is also expected to be needed for SENER to carry out planning and assessment work related to energy security in the context of the new Energy Efficiency Law.
6. Firms. Most contracts for firms are expected to be procured using the Quality and Cost-based Selection Method (QCBS). Consultant assignments of specific types, as agreed previously with the Bank in the Procurement Plan, may be procured with the use of the following selection methods: (i) Quality-based Selection (QBS); (ii) Selection under a Fixed Budget (SFB), especially for works supervision contracts; (iii) Least-cost Selection (LCS); (iv) Selection Based on Consultants' Qualifications (CQS), for contracts estimated to cost less than US\$200,000 equivalent; and exceptionally (v) Single-source Selection (SSS), under the circumstances explained in paragraph 3.9 of the Consultant Guidelines. The unified RFP must be used.

7. Individuals. Individual consultants will be hired to provide technical advisory and Project support services and selected in accordance with Section V of the Guidelines.

8. **Operating Costs:** The Project may finance Implementation Team operating expenses, including logistical services for trainings and workshops; travel expenses of approved personnel commissioned under Project activities; Internet connectivity; communications expenses; office consumables; printing and reproduction services; publication of procurement notices; publicity and marketing efforts.

10. Under Component 2 no procurement actions were identified because the Project will support the subsidy or the IBRD and CTF Loans to the UMS and NAFIN as described in Annex 4 and not the procurement of any specific goods or services. The Project will strengthen and monitor the mechanism within FIDE-SENER to supervise the retailers' system of reference prices to ensure they are based on market prices that ensure economy, efficiency and transparency in the use of Bank funds.

B. Assessment of the Agency's Capacity to Implement Procurement

11. Procurement activities will be carried out by FIDE and SENER. FIDE has well-trained procurement staff within its Administrative Unit with previous experience in ICB. SENER has previous experience in Bank-financed projects, but will need to strengthen its procurement capacity within the unit in charge of Project coordination. An assessment of the implementing agency's capacity to implement procurement actions for the Project was carried out by the Bank's Procurement Accredited Staff (PAS) assigned to the Project in November 2009 and February 2010. The assessment reviewed the organizational structure for implementing the Project and the interaction among Project staff responsible for procurement. The key issues and risks concerning procurement for Project implementation have been identified and include the multiple executing agencies involved in the Project. The corrective measures agreed with SENER and FIDE are :

Activity	Agency Responsible	When
Procurement consultant	FIDE, SENER	Throughout Project implementation
Operational Manual	SENER	Prior to negotiations
Procurement and SEPA training	Bank	Prior to effectiveness

12. The overall Project risk for procurement is Substantial. This rating will be reviewed during the first year of Project implementation.

C. Procurement Plan

13. During appraisal, the Borrower will develop a procurement plan for Project implementation, providing the basis for the procurement methods. This plan will be

agreed with the Borrower by the close of negotiations and it will be available in the Project's database and on the Bank's external website. It will also be available in SEPA. The procurement plan will be updated in agreement with the project team annually or as required to reflect actual Project implementation needs and improvements in institutional capacity.

D. Frequency of Procurement Supervision

14. In addition to the prior review supervision to be carried out from Bank offices, the capacity assessment of the Implementing Agency has recommended two supervision missions to carry out a post review of procurement actions.

E. Details of Procurement Arrangements Involving International Competition

1. Goods, Works, and Nonconsulting Services [TBC during negotiations]

(a) List of contract packages to be procured following ICB and direct contracting:

1	2	3	4	5	6	7	8	9
Ref. No.	Contract (Description)	Estimated Cost	Procurement Method	P-Q	Domestic Preference (yes/no)	Review by Bank (Prior/Post)	Expected Bid Opening Date	Comments
1	CFL	TBD	ICB	TBD	No	Prior		This bid could include logistics and distribution

(b) ICB contracts for works estimated to cost above US\$5,000,000.00 and goods estimated to cost above US\$3,000,000.00 per contract and all direct contracting will be subject to prior review by the Bank as agreed in the procurement plan.

2. Consulting Services

(a) List of consulting assignments with short-list of international firms. [TBC during negotiations]

1	2	3	4	5	6	7
Ref. No.	Description of Assignment	Estimated Cost	Selection Method	Review by Bank (Prior/Post)	Expected Proposals Submission Date	Comments
1	Certification of energy-efficient processes in industries study	\$500,000.00	QCBS	Prior	Q3	Costs and expected proposal submission date to be reviewed

(b) Consultancy services estimated to cost above US\$200,000.00 per contract and all single-source selections of consultants (firms) will be subject to prior review by the Bank as agreed in the procurement plan.

(c) Short lists composed entirely of national consultants: Short lists of consultants for services estimated to cost less than US\$500,000.00 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

Annex 9: Economic and Financial Analysis
MEXICO: Efficient Lighting and Appliances Project

A. Overview

1. An economic and financial analysis of the proposed Project was carried out. The economic analysis takes the perspective of Mexico as a whole, looking at all of the economic costs and benefits accruing to the country from the Project, including not only the values related to capital equipment and operating costs, but also monetized values for environmental benefits. The financial analysis assesses the costs and benefits from the perspective of NAFIN. In addition, a consumer affordability analysis was carried out to analyze the direct financial impact on households of participating in the Project.

B. Project Economic Analysis

2. The economic benefits of energy efficiency investments in lighting and appliances being supported in this Project include:

- **Delaying or avoiding new power generation infrastructure** by reducing the demand for electric power from the residential sector. Energy efficiency savings would result in both a reduction in peak and base load electricity demand, and the delay in or avoidance of constructing new electric generating capacity.
- **Reduced fuel consumption for power generation** resulting from the lowered demand for power from the residential sector. In Mexico, a significant portion of power generation is oil- and gas-based generation plants, with electricity savings avoiding the corresponding need for fuel. This reduces total energy costs and improves the competitiveness of the economy.
- **Consumers' electricity bills are reduced** through the adoption of CFLs and the replacement of inefficient appliances by reducing the amount of electricity consumed by households' principal electricity-consuming equipment.
- **Mitigation of the burden of the electricity subsidies** currently being provided to the residential sector. Although the absolute tariff levels for residential consumers in Mexico are not particularly low by regional standards, the total amount of residential subsidies—notionally, the difference between accounting costs and tariffs—is large, estimated to be equivalent to 1 percent of GDP in 2006. Reducing end-use consumption through energy efficiency directly reduces the fiscal burden associated with the provision of electricity subsidies.
- **Energy security is enhanced** by reducing the overall energy needs of the economy and thus increasing reserve margins and reducing the risk of energy shortfalls.
- **Environmental benefits** associated with improved energy efficiency include:
 - a. Reduction of greenhouse gas (GHG) emissions from Mexico's largely thermal-based power system, which reduces Mexico's contribution to global climate change.
 - b. Reduction of local and regional air pollutants from electricity generation that contribute to acid rain and adverse health impacts from respiratory disease.

- c. The avoidance of vented chlorofluorocarbons (CFCs), powerful GHGs that will be captured from old appliances and destroyed. The economic benefits of avoided CFC venting are due to both the gas's global warming potential (GWP) and its contribution to ozone depletion.³¹

Baseline Economic Analysis

3. The baseline economic analysis involved estimating the available costs and benefits for the two main components: (1) residential lighting, and (2) residential appliances.

4. *Costs.* Costs are estimated using market prices for CFLs, refrigerators and air conditioners (AC), exclusive of taxes, and in the case of CFLs, assuming bulk procurement as is planned under the Project. It is assumed that the prices available in Mexico are similar to “border” prices, and thus reflect the true costs to the Mexican economy of acquiring (or selling) goods and services.

5. The costs used for the economic analysis are as follows: for Component 1, a cost of US\$1.56/CFL was used, i.e., US\$70 million for the replacement of 45 million CFLs. For Component 2, an average cost of US\$359/refrigerator and US\$316/AC was used. The analysis assumes a 90:10 ratio for refrigerators and ACs, which implies a total of 1.53 million refrigerators and 0.17 million ACs. This yields a total cost for Component 2 of US\$603 million and a total Project cost (Components 1 and 2) of US\$673 million.

6. *Benefits.* The following approach was taken in calculating the economic benefits:

- The economic benefits are attributable primarily to the electricity savings that result from substituting more efficient CFLs and appliances for the less-efficient models currently in use, valued at the shadow price of electricity.
- The Project's global environmental benefits were estimated by using the GHG emissions reductions – using a country-specific coefficient for Mexico that reflects the “carbon-intensity” of electricity generation – multiplied by the “market” price of carbon.
- For simplicity, and with limited comparable data, the following benefits were not included:
 - No quantitative benefit was attributed to the delay in building new power generating capacity, even though this would be significant in light of the electricity savings.
 - The health effects associated with reduced local air pollutants were also not included in the benefits of the Project, even though such benefits have been shown to be significant in other studies conducted for Mexico and other countries.

³¹ The economic effects of ozone depletion include reduced human immune responses (increasing the incidence of infectious disease and reducing the efficacy of vaccination programs), disrupted growth processes in plants (leading to reduced yields for certain crops and forest trees), and disrupted development in fish (estimated to reduce ocean fish stocks by several million tons per annum).

Source: International Development Research Center (IDRC), “Human and Economic Costs of Ozone Depletion”, <http://www.idrc.ca>, 1997, February 26, 2010, <http://archive.idrc.ca/books/reports/1997/14-02e.html>

- Other benefits that were not quantified and that were not included in the cost-benefit analysis were the reduced electricity subsidy payments and the energy security benefits by reducing overall electricity consumption.

7. *Calculating Energy Savings and GHG benefits.* The Project’s economic benefits arise from the two main categories mentioned above: (1) the energy savings from the more efficient CFLs and appliances, and (2) the GHG benefits resulting from reduced fuel consumption for electricity production. The CFL and appliance substitution will take place over an initial five-year period, with the deployment over these years shown in Table 9.1.

Table 9.1: Deployment of CFLs/Appliances

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Number of CFLs (millions)		15	20	10	
Number of Appliances	450,000	450,000	400,000	400,000	

8. The electricity savings from CFLs were calculated using the estimate of energy savings per CFL compared to the baseline incandescent bulb that they would replace. The calculation for CFLs assumes a conservative estimated average usage of 3.5 hours/day and an average life of 3 years (i.e., 3,832 hours/CFL). The lighting baseline was constructed using a 30–60–10 weighting of 60W, 75W, and 100W bulbs, based on the average situation in Mexican households included in the Project. The baseline incandescent bulbs to be replaced therefore consumed an average of 73W of power. The CFL bulbs to be supplied under the Project, with the same level of luminescence as the incandescent bulbs, are rated at 20W; each replaced light bulb therefore provides 53W of savings. These per bulb savings were multiplied by the number of hours per use per day (3.5), times the number of days in the year, times the number of CFL bulbs deployed, to arrive at the total KWh savings.

9. In the case of appliances, two assumptions are critical to the calculation of energy savings. First, it was assumed that 90 percent of the appliances replaced would be refrigerators; this results in a 90:10 blended average of electricity savings from refrigerators and air conditioners. Second, the average efficiency of appliances was constructed using an equal weighted average of consumption data for inefficient appliances in Mexico and Brazil. Data on inefficient appliances in Mexico were provided by FIDE while Brazilian data were obtained from consultant reports.³² The average energy consumption was 1.281 MWh/year for inefficient appliances and 0.513 MWh/year for efficient appliances. The average energy savings per appliance (assuming 10% T&D losses) is 0.84 MWh/year.

³² Gilberto De Martino Jannuzzi, “Considerações para Programas de Eficiência Energética para consumidores residenciais de baixa renda”, UNICAMP, 2006. The data from FIDE yielded a relatively high baseline while data on Brazilian consumption was conservative. An equal weighted average seemed a reasonable solution to preserve the unique characteristics of the Mexican experience while incorporating the conservatism inherent in the Brazilian experience. This assumption was adopted so as not to overestimate the energy savings of appliances.

10. To calculate the benefits for both the CFLs and the appliances, the energy savings were valued using an “economic price” of electricity in Mexico of US\$0.12 per kilowatt-hour (Table 9.2).³³

11. The climate mitigation benefits were calculated by multiplying the amount of energy savings (GWh) by the estimated emission factor for Mexico, i.e., 514 tons CO₂e/GWh (see Table 9.2). These GHG reductions were in turn multiplied by the market price of CO₂, using a value of US\$10/tCO₂. As noted above, neither the benefits due to the reduction in the avoided cost of new power generating capacity, nor the local health benefits from reductions in air pollutants by reduced energy production were included in the benefit calculation.

Table 9.2: Energy Savings and GHG Reductions

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Energy savings (GWh)		380	1,765	3,444	4,452
Energy Savings (\$ million at 12 US¢/kWh)		46	212	413	534
GHG reductions (thousand tCO ₂ e)		195	907	1,770	2,288
GHG reductions (\$ million at \$10/tCO ₂ e)		2	9	18	23

12. *Base Case Results.* The overall Project economic analysis was computed by adding the costs and benefits of Components 1 and 2. The economic rate of return for the Project as a whole is estimated to be 40 percent, with a Net Present Value at 12 percent of US\$860 million. The results of the economic analysis are presented in Table 9.3 below.

Table 9.3: Base Case Results

	ERR	NPV at 12% (US\$ million)
Project	40%	860
Component 1 (<i>residential lighting</i>)	182%	600
Component 2 (<i>appliance substitution</i>)	21%	260

13. The economic rate of return calculated for residential efficiency programs is generally quite high, based on the costs of the purchasing and installing the equipment versus the energy saving benefits over the lifetime of the equipment. For the residential lighting component of this Project, economic rate of return is well over 100 percent, levels that are consistent with other residential CFL lighting programs worldwide. The majority of the benefits come from electricity savings, with the CFLs consuming only

³³ An economic price of US\$0.12/KWh was used to reflect the higher value of electricity in Mexico compared to the average residential tariff of around US\$0.10/KWh (Komives and others 2009). Other assessments have estimated the shadow price of electricity at above US\$0.15/KWh, but a more conservative value was chosen for this analysis.

about one-fourth as much electricity as an incandescent bulb for the same amount of light.

14. *Least-cost Alternative.* As reflected in the economic analysis, expenditures on energy-efficient equipment are a lower cost means (averaging about US\$0.03/KWh) of meeting the demand for electricity by the residential sector. This compares to the cost of new power supply (including investments in generation, transmission and distribution), which in Mexico, as noted above, has been estimated at US\$0.12/KWh for purposes of this analysis.³⁴

Sensitivity Analysis

15. A sensitivity analysis was performed on the Project by developing alternate scenarios for (a) variation in energy savings associated with the substitutions, (b) variation in the number of CFLs and appliances replaced, and (c) the cost of substitutions under the residential lighting and appliance replacement components. The analysis is presented in detail below:

a. *30 percent reduction in energy savings.* An alternate scenario was created by assuming lower energy savings by CFLs for IBs for Component 1 and for more efficient appliances in Component 2. A 38-watt reduction in load was used in place of the baseline 53-watt reduction in load for the residential lighting component, while a 90:10 blended average of appliance consumption data for Brazil and Mexico was used in place of an equal weighted average of the two for the appliance replacement component; this alternate scenario had the effect of reducing the spread in energy consumption between the more and less efficient appliances by approximately 30 percent. The overall Project NPV and ERR were reduced to US\$460 million and 29 percent, respectively (see Table 9.4).

Table 9.4: Scenario of 30 Percent Lower Energy Savings

	ERR	NPV at 12% <i>(US\$ million)</i>
Project	29%	460
Component 1 <i>(residential lighting)</i>	146%	410
Component 2 <i>(appliance substitution)</i>	14%	50

Not surprisingly, the Project is highly sensitive to estimates of energy savings. While the ERR of the residential lighting component remained above 100 percent, the ERR of appliance substitution decreased by 7 percentage points to 14 percent. However, even under these levels of savings, the Project still generates a robust return.

³⁴ The economic benefits of this Project are large due to the lower energy requirements of more energy-efficient equipment and appliances, resulting in high rates of return for Mexico. However, as in other countries, many of these energy efficiency measures are not being undertaken on a larger scale due to a number of constraints: (i) a lack of knowledge of the actual energy savings associated with lighting and appliance investments, (ii) benefits and costs of the investments accruing to different entities—the so-called “principal-agent” problem—such as the costs of purchasing appliances resting with consumers and the avoided costs of new generation capacity accruing to the power utility, and (iii) lack of financing available to cover higher upfront costs of more efficient lights and appliances.

b. *40 percent reduction in the number of substitutions.* The number of inefficient appliances and IBs substituted were each reduced by 40 percent to 1.02 million and 27 million, respectively. While the Project NPV was reduced to US\$510 million, the ERR remains constant at 40 percent (see Table 9.5). These results in Project economics for a reduction in the number of substitutions were to be expected since the NPV of the Project is the arithmetical sum of the NPV of each individual substitution, while the ERR is a measure of cost-benefit per unit and would be independent of proportionate reductions in the number of substitutions.

Table 9.5: Scenario of Lower Volume of Replacements

	ERR	NPV at 12% <i>(US\$ million)</i>
Project	40%	510
Component 1 (<i>residential lighting</i>)	182%	360
Component 2 (<i>appliance substitution</i>)	21%	150

c. *25 percent increase in the price of CFLs and appliances.* The average price of appliances (excluding substitution logistics) and CFLs was increased by 25 percent to US\$441 per refrigerator, US\$387 per air conditioner and US\$1.94 per CFL. This increase in price reduced the economic returns as reflected in Table 9.6, but the returns still remain robust.

Table 9.6: Scenario of 25 Percent Increase in Cost of Replacements

	ERR	NPV at 12% <i>(US\$ million)</i>
Project	33%	720
Component 1 (<i>residential lighting</i>)	158%	580
Component 2 (<i>appliance substitution</i>)	16%	140

C. Financial Analysis: NAFIN

16. The financial analysis was conducted from the perspective of NAFIN as owner of the line of credit to consumers under Component 2b. The financial analysis first assumes that 80% of the 1.7 million appliances to be replaced (i.e. 1.36 million) will be financed through the credit line and therefore have the deployment schedule as shown in Table 9.7. The financial analysis further assumes that loans will be issued evenly throughout a given year.

Table 9.7: Appliances Financed Under Credit Line

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Number of Appliances	360,000	360,000	320,000	320,000

17. Given the credit amounts available for each level of consumer (see Annex 4), the calculation assumes an average a loan of US\$206 will be issued per appliance. To finance these loans for the above schedule of deployment of appliances, NAFIN would

issue just over US\$280 million in loans in accordance with the schedule shown in Table 9.8.

Table 9.8: Schedule of Loan Issuance

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Value of Loans Issued (US\$ million)	74.39	74.39	66.12	66.12

18. As described in Annex 4, loans issued by NAFIN will have a 4-year maturity and will carry a 12 percent per annum interest rate. NAFIN will therefore receive US\$370 million in consumer debt service over 8 years. As loans are issued throughout a calendar year, consumer debt service occurs over 5 calendar years. The values presented in Table 9.9 are cumulative amounts as of end-of-year.

Table 9.9: Consumer Debt Service

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	Year 8	Total
Loans Issued (US\$ million)	Consumer Debt Service (US\$ million)								
74.39	14.29	24.49	24.49	24.49	10.20				98
74.39		14.29	24.49	24.49	24.49	10.20			98
66.12			12.70	21.77	21.77	21.77	9.07		87
66.12				12.70	21.77	21.77	21.77	9.07	87
Total	14	39	62	83	78	54	31	9	370

19. To issue loans in Year 1, NAFIN will require US\$74.39 million in cash as shown in Table 9.8. From the second year onwards however, NAFIN will have the benefit of reflows from consumer debt service from the previous year to be re-ploughed into the program. Therefore, to issue US\$74.39 million in Year 2, NAFIN will have the benefit of approximately US\$14 million in consumer debt service from Year 1. To issue US\$66.12 million in YEAR 3, NAFIN will have the benefit of approximately US\$62 million in consumer debt service from YEAR 2. As a result of these consumer reflows, NAFIN will require a credit line of just US\$177 million to issue a total of US\$280 million in loans over 4 years.

20. While it is appropriate to assume that a certain percentage of the consumer credits will be in default, NAFIN is protected by a US\$35 million guarantee facility that will shield the financial institution from up to 9 percent of consumer defaults, which is higher than expected actual defaults. Accordingly, no reduction in revenues to NAFIN as a result of credit defaults has been included in the analysis.

21. In addition, the net cash flow analysis for NAFIN nets out two cost elements: (i) a 1.8 percent spread of interest to cover NAFIN’s loan administration costs, and (ii) a 2 percent spread of interest payments to be transferred to FIDE for that institution’s operating costs.

22. The US\$177 million in new cash that NAFIN would inject will be funded as follows: (a) US\$50 million from CTF, (b) US\$127 million of internal capital (composed of €25 million (US\$32.5 million at an exchange rate of 1.3 US\$/€) from KfW, and US\$94.5 million of NAFIN’s own funds). NAFIN’s weighted average cost of capital ((WACC) on the entire US\$177 million credit line has been calculated at 5.4% based on the following elements:

- With respect to the US\$50 million loan from CTF: the cost of capital was calculated using a 255 basis-point spread to account for currency risk on loans from CTF (0.75 percent), i.e., 3.3 percent.
- With respect to the US\$123 million of internal funds: (i) a 205 basis-point spread was used to account for currency risk on the €25 million (US\$32.5 million) loan from KfW at 3.75 percent, i.e., 5.8 percent; and (ii) the cost of internal capital for NAFIN on the balance of \$94.5 million is 6.3 percent.

Base Case Results

23. The FIRR of Component 2a.ii. is 7.4 percent and undiscounted financial payback occurs in 5.5 years. Discounting project cash flows at the weighted average cost of capital derived above of 5.4%, the NPV of Component 2b is US\$15 million.

Table 9.10: Base Case Financial Return

	FRR	NPV at 6.4% <i>(US\$ million)</i>
Component 2a.ii	7.4%	15

Sensitivity Analysis

24. *Increasing NAFIN internal cost of capital.* NAFIN’s internal cost of capital was estimated at 7.25 percent but could conceivably be as high as 10 percent. This as an appropriate condition for sensitivity analysis because it assumes that NAFIN would price loans so as to earn no real spread on the US\$94.5 million of its own funds since a 2 percent spread of interest payments are passed to FIDE and loans to consumers are issued at 12 percent. At this higher figure, NAFIN still generates a positive, though small, return.

Table 9.11 Sensitivity: Increasing Assumptions on NAFIN Internal Cost of Capital

	Sensitivity on Increased Cost of Capital
NAFIN cost of capital (percent)	10
NPV (US\$ million)	0.3

25. *Decreasing the volume of loans financed through the NAFIN line of credit.* The financial analysis assumed that 80 percent of the appliances replaced in the program were financed through the credit line. As the number of appliances financed through the credit line decreases, the size of the credit line changes as does the amount and configuration of the funding sources to be used by NAFIN. Two volume sensitivity analyses were undertaken under the following related assumptions: (i) one sensitivity analysis assuming that 60 percent of the 1.7 million appliances to be replaced would be financed through the credit line, and a separate sensitivity analysis assuming that only 40 percent of the appliances would be financed; (ii) the WACC would remain constant at 6.4 percent (the value used in the base case financial analysis). The WACC could presumably be lower under the scenario of reduced volume of loans financed through the credit line since NAFIN could blend a larger percentage of less expensive CTF resources in loans it will issue. Conservatism is therefore built into the sensitivity analysis by making the assumption concerning a constant WACC. The Project would continue to generate a positive NPV (using the derived WACC of 6.4%).

Table 9.12 Sensitivity: Decreasing the Volume of Loans Financed through the NAFIN Line of Credit

	60 Percent of Appliances Financed through the Line of Credit	40 Percent of Appliances Financed through the Line of Credit
Total Line of Credit (US\$ million)	133	89
FRR	7.4%	7.4%
NPV@ 5.4% (US\$ million)	11	7

D. Consumer Affordability

26. A financial analysis was also undertaken from the perspective of the consumers, integral in achieving overall Project objectives, to evaluate the Project's affordability for households. The nature of the affordability issue differs for Components 1 and 2.

27. *CFL Replacement Program:* Under Component 1, participating households receive the CFLs at no expense. Because the CFLs are more efficient than IBs, the consumers' expenditures for electricity will decrease and the resulting affordability is positive. The NPV (i.e., the present value of the savings in electricity bills) is on average US\$41 per household (i.e. US\$10.25 per bulb assuming 4 bulbs per household and an electricity tariff (price) of US\$0.10/kWh). The FRR for consumers is 158 percent.

28. *Appliance Replacement Program:* The program under Component 2 involves the replacement of refrigerators and air conditioners. The characteristics of these two appliances differ, and they are addressed in turn.

29. *Refrigerators.* The following inputs were used:

- SENER estimates that 97 percent of refrigerators in the program will be classified under Levels 1 through 3 (as described in Annex 4), and Level 4 will

contain the remaining 3 percent. These figures are used to calculate a weighted average cost and benefit for consumers.

- The cost to consumers was calculated taking into account the average price of refrigerators net of the value of the instant discount vouchers. The average price of a refrigerator purchased by consumers in Levels 1 through 3 is MX\$4,547. The average price of a refrigerator purchased by consumers in Level 4 is MX\$8,700. Some Levels receives an instant discount voucher that includes a purchase component and/or an exchange/disposal component as follows: Level 1 consumers are offered an MX\$1,800 purchase voucher and an MX\$400 exchange/disposal voucher; Level 2 consumers are offered an MX\$1,000 purchase voucher and an MX\$400 exchange/disposal voucher; Level 3 consumers are offered only the MX\$400 exchange/disposal voucher; and Level 4 consumers receive no vouchers (they only qualify for the credit line). The resulting weighted average net investment for consumers is US\$211 (using an exchange rate of 13 MX\$/US\$).
- The benefits are calculated based on the energy savings over the assumed 10-year life of the refrigerator. The average consumption of an old refrigerator in Levels 1 through 3 is 1,113 kWh per year while the average consumption on an efficient refrigerator for these consumers is 370 kWh. Consumers in Levels 1 through 3 therefore experience 743 kWh of annual energy savings. The average consumption on an old refrigerator in Level 4 is 1,213 kWh per year while the average consumption on an efficient refrigerator for these consumers is 407 kWh per year. Consumers in Level 4 therefore obtain 806 kWh of annual energy savings. The dollar-value of energy savings is calculated using an electricity tariff (price) of US\$0.10/kWh for residential consumers. The weighted average annual energy savings for consumers is US\$74.49.

30. *Refrigerator Base Case Results.* In comparing the average costs to the average energy savings, the FRR per refrigerator on the investment is 34 percent and the NPV (at 12%) is US\$222, indicating consumer affordability.

Table 9.13: Base Case Financial Return

	FRR	NPV at 12% (US\$)
Refrigerator Affordability	34%	222

31. In addition, these results illustrate that the combination of vouchers and credit line is sufficient to support the uptake of the credit line by those consumers who choose to borrow to finance the refrigerator since the FRR of the investment is greater than the 12 percent interest rate on the line of credit. Detailed analysis indicates that the return for Consumers in Level 4 (who constitute 3 percent of the program) may be less than 12%, which would indicate that consumers who choose to access the credit line are doing so for reasons and benefits which extend beyond the energy savings of the new appliance.

32. *Air Conditioners.* The calculation for air conditioners used the following elements:

- SENER estimates that 97 percent of air conditioners in the program will be purchased by consumers within Levels 1 through 3, with the remaining 3% purchased by consumers in Level 4.
- The average cost of an air conditioner purchased by consumers in Levels 1 through 3 is MX\$3,996. The average cost of an air conditioner purchased by consumers in Level 4 is MX\$4,130. As with the refrigerators, some Levels receive an instant discount voucher that includes a purchase component and/or an exchange/disposal component. The amounts for ACs are as follows: Level 1 consumers are offered an MX\$1,800 purchase voucher and an MX\$400 exchange/disposal voucher. Level 2 consumers are offered an MX\$1,000 purchase voucher and an MX\$400 exchange/disposal voucher. Level 3 consumers are offered the MX\$400 exchange/disposal voucher while no explicit price incentives are offered to Level 4 consumers. The resulting weighted average of the net investment for consumers is US\$160 (using an exchange rate of 13 MX\$/US\$).
- The benefits are calculated based on the energy savings over the assumed 10-year life of the AC. The average consumption on an old air conditioner in Levels 1 through 3 is 2,208 kWh per year while the average consumption on an efficient air conditioner for these consumers is 1,773 kWh per year. Consumers in Levels 1 through 3 therefore obtain 435 kWh of annual energy savings. The average consumption on an old air conditioner for Level 4 is 2,250 kWh per year while the average consumption on an efficient air conditioner for these consumers is 1,695 kWh per year. Consumers in Level 4 therefore experience 555 kWh of annual energy savings. The dollar-value of energy savings was calculated using an electricity price of US\$0.10/kWh for residential consumers. The resulting weighted average of annual energy savings for consumers is US\$43.85.

33. *Air Conditioner Base Case Results.* The FRR on the average consumer investment in an AC is 25 percent and the NPV (at 12%) is US\$95, indicating consumer affordability for this exchange.

Table 9.14: Base Case Financial Return

	FRR	NPV at 12% <i>(US\$)</i>
Air Conditioner Affordability	25%	95

34. As with the results for the refrigerators, these results illustrate that the combination of vouchers and credit line is sufficient to support the uptake of the credit line by those consumers who choose to borrow to finance the refrigerator since the FRR of the investment is greater than the 12 percent interest rate on the line of credit. Detailed analyses indicate that the return for Consumers in Level 3 (who constitute 4 percent of the program and receive the MX\$400 exchange voucher) and in Level 4 (who constitute 3 percent of the program) may be less than 12 percent, which would indicate that consumers who choose to access the credit line are doing so for reasons and benefits which extend beyond the energy savings of the new appliance.

35. *Sensitivity Analysis: Reduction in baseline consumption of appliances.* Consumer financials are sensitive to assumptions concerning energy consumption of the

old appliances that are currently in operation. With the price of electricity held constant at US\$0.10/kWh, consumer financials were analyzed for (i) a 25 percent reduction in the consumption of old refrigerators, and (ii) a 10 percent reduction in the consumption of old air conditioners.

36. The results of the sensitivity analysis are presented in Table 9.15. For refrigerators, which constitute 90 percent of all substituted appliances, consumer affordability remains strong even with a major reduction in energy savings. However, for ACs, consumers would need to derive other benefits from the new appliance to merit the exchange if the energy savings are limited to the lower level used in this sensitivity analysis.

Table 9.15: Sensitivity Analysis: Reducing Baseline Consumption of Appliances

Type of Appliance	FRR	NPV (US\$)
Refrigerator	19%	60
Air Conditioner	6%	(33)

Annex 10: Safeguard Policy Issues
MEXICO: Efficient Lighting and Appliances Project

1. The Secretariat of Energy (*Secretaría de Energía*, SENER) has completed an Environmental Assessment of the Project, including an Environmental Management Plan (EMP) which has been reviewed and found satisfactory to the Bank. Implementation of the EMP is one of the Project covenants. The environmental issues that need to be addressed during Project implementation are: (i) the proper disposal of incandescent bulbs (IBs) and compact fluorescent lamps (CFLs) in the case of Component 1, and (ii) the proper scrapping of the replaced appliances in Component 2. Environmental impacts are considered manageable if the mitigation actions described in the EMP are followed as described below.

2. **Component 1: CFL Replacement Program.** IBs do not contain toxic elements that require special treatment/handling in cases of breakage or once the IBs' useful lifetime is completed. Thus, proper disposal involves collection and destruction following the approved regulatory procedures for nonhazardous waste in Mexico. Recycling of the constituent materials will be encouraged during Project implementation, although this is dependent on recycling being commercially viable and of interest to the waste management market. On the other hand, CFLs contain mercury (although in minimal volumes), which is a toxic substance classified as hazardous waste under Mexican environmental regulations. This calls for specific disposal procedures once the CFLs' useful lifetime is completed. Recycling and/or specific take-back disposal schemes will be developed during Project implementation as a new market develops for such purposes (at present only one company in Mexico deals with fluorescent tube disposal). With regard to proper handling of CFLs by consumers, instructions will be given to the beneficiaries on how to use and handle CFLs in cases of breakage.

3. **Component 2: Appliance Replacement Program.** This component is based on previous experiences in Mexico carried out successfully by the Trust Fund for the Energy Transition and the Sustainable Use of Energy (*Fideicomiso para el Ahorro de Energía Eléctrica*, FIDE), including SENER's pilot program. The replaced appliances will be collected by authorized companies at the homes of beneficiaries and transported to one of the 99 authorized scrapping centers located throughout the country. The appliances will undergo a dismantling process that includes the recovery of refrigerant gases and hazardous wastes, such as lubricant oils, and the segregation of all metal and plastic components. The refrigerant gases will be transferred to one of 14 centers authorized by the Secretariat of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*, SEMARNAT) gas recycling; the lubricant oil will be collected and managed by SEMARNAT-authorized companies according to Mexican legislation, and the remaining scrap metal and plastics will undergo a recycling process with local- or state-authorized companies. FIDE/SENER will periodically supervise all scrapping centers. SEMARNAT is currently assessing options for future destruction of refrigerant gases (chlorofluorocarbons or CFCs).

4. On March 16, 2010 a public consultation was held in Mexico City with the participation of relevant stakeholders such as Government agencies (SENER, SEMARNAT, National Commission for the Efficient Use of Energy [*Comisión Nacional para el Uso Eficiente de la Energía*, CONUEE], Federal Electricity Commission [*Comisión Federal de Electricidad*, CFE], Federal Consumer Protection Agency [*Procuraduría Federal del*

Consumidor, PROFECO]), NGOs, professional associations, academic institutions, environmental foundations and the general public. The consultation resulted in a very good acceptance of the Project's objectives and scope and yielded valuable suggestions on waste management plans that were incorporated to the Environmental Assessment (EA)/EMP final report.

B. Social

5. In 2005, Mexico had 103.3 million inhabitants in 24.8 million households; the rural population (those living in localities with fewer than 2,500 inhabitants) constituted 23.5 percent of the total, with 24.3 million persons residing in 5.5 million households. The rural population lives in nearly 185,000 localities, of which 137,000 (74.4 percent) have fewer than 100 inhabitants and a total of 569,000 households; 33,406 localities have from 100 to 500 inhabitants with 7.9 million households.

6. **Indigenous Peoples (OP/BP 4.10)**. Indigenous peoples reside in several of the areas where the Project will be implemented. In order to ensure outreach and the social inclusion of indigenous peoples, SENER has prepared a social assessment and an Indigenous Peoples Planning Framework (IPPF) as required by OP/BP 4.10 when the specific beneficiaries are not known at appraisal, as is the case with this Project. Due to the challenges of having specific distribution channels to reach the Indigenous households in each and every locality in the country the IPPF includes a culturally appropriate communication strategy to ensure that the project is well disseminated in rural areas and includes indigenous peoples as project beneficiaries.

7. As part of the preparation of the IPPF, a consultation process has been carried out with the national indigenous leadership in coordination with the National Commission for the Development of Indigenous Peoples (*Comisión Nacional para el Desarrollo de los Pueblos Indígenas*, CDI). This leadership, composed of nearly 200 representatives, is the only unified body representing all of Mexico's indigenous peoples.

8. The IPPF is part of the project design and will be included in the Operational Manual.

9. The social assessment and the IPPF indicate that two-thirds of Mexico's indigenous peoples inhabit rural areas while one-third of them are located in communities undergoing a process of urbanization. The main challenge for this Project with respect to the inclusion of indigenous peoples is their highly dispersed location.

10. According to the social assessment, those settlements that have more than 2,500 indigenous persons and have electricity represent more than 70 percent of the indigenous population but they inhabit more than 18,000 localities, while another segment of settlements with more than 1,000 indigenous peoples are located in 290 localities and represent 21 percent of Mexico's indigenous peoples. If properly targeted, Component 1 could benefit as much as 90 percent of Mexico's indigenous peoples with around 6 million CFLs.

11. For Component 1, SENER is exploring the likelihood of using a household registry to identify and count the number Indigenous Peoples households as beneficiaries. This will require a specific register tool in the hands of the distributors' personnel, which is something to be assessed during project implementation.

12. In the case of Component 2, the Social Assessment has identified locations with more than 2,500 indigenous peoples who currently own refrigerators. They inhabit 477 localities and represent more than 22 percent of Mexico's indigenous peoples. If properly targeted, Component 2 could reach as much as 43 percent of Mexico's indigenous peoples distributed in 746,000 households.

13. The IPPF shows that the *Oportunidades* program has proven to be the most efficient way to ensure the inclusion of indigenous peoples as Project beneficiaries. Its roster encompasses 86.5 percent of the localities of Component 1 and 93.8 percent of those of Component 2. However, this project will not make use of the *Oportunidades* program as a targeting scheme but rather CFE's electricity database to ensure that beneficiaries are actually connected to the grid. For Component 2, the store chains Elektra and Coppel are the best options for reaching dispersed populations due to these stores' wide coverage and their credit system.

14. In order to facilitate subsequent social evaluations, the social assessment includes a list of localities where at least two thirds of the population is Indigenous Peoples. This list shows that there are around 13,000 localities that have electricity access where the indigenous population represents 70 percent or more of the total population. These localities include over one million households, which include approximately 5.5 million indigenous inhabitants. The list of all 13,000 localities is too long to be attached, but it is in the project files. By targeting these areas the project will ensure that a significant number of indigenous households will have benefitted from the Project.

15. The IPPF includes a communication strategy to disseminate Project information among indigenous localities through culturally appropriate means. The strategy includes: (i) use of the 20 radio stations managed by CDI. Because most of the personnel in these stations are indigenous peoples, this facilitates the task of translating Project messages into the various indigenous languages; (ii) creation of a Web page with a virtual assistant service; and (iii) traditional communication media such as the use of songs and street theater to overcome the challenges posed by illiteracy.

16. The consultation with the indigenous peoples' representatives of the Consultative Council (*Consejo Consultivo*) of the CDI was held on March 13, 2010, during the annual meeting of the Consultative Council in Oaxtepec (Morelos State). The Project and the IPPF were presented to the Environment and Natural Resources Roundtable (*Mesa de Ambiente y Recursos Naturales*) that included delegates from 14 states and the newly elected president of the Consultative Council.

17. The participants requested that Project implementation be as precise as possible in order to avoid excluding small indigenous communities under Component 1. They also suggested the use of the State Delegations (*Delegaciones Estatales*) and Indigenous Coordination Centers (*Centros Coordinadores Indigenistas*) for the distribution of CFLs, and requested that the more than 1,000 children's houses (for indigenous students) be beneficiaries of the CFLs and the new refrigerators.

18. SENER intends to continue coordinating with CDI to ensure that indigenous peoples' households benefit from the Project.

19. The social assessment and the IPPF were fully disclosed end of June 2010, both in the Bank's Infoshop as well as in-country. These documents will be kept in the Project files.

Annex 11: Project Preparation and Supervision
MEXICO: Efficient Lighting and Appliances Project

	Planned	Actual
PCN review	April 2009	April 2009
Initial PID to PIC	December 2009	
Initial ISDS to PIC	December 2009	
Regional Operations Committee Meeting	December 2009	June 2010
Appraisal	January 2010	August 2010
Negotiations	February 2010	
Board/RVP approval	March 2010	
Planned date of effectiveness	May 2010	
Planned date of midterm review	May 2012	
Planned closing date	December 2015	

Key institutions responsible for preparation of the Project: The World Bank and SENER.

Bank staff and consultants who worked on the Project included:

Name	Title	Unit
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Ashok Sarkar	Sr. Energy Specialist	ETWEN
Alan Poole	Energy Efficiency specialist, consultant	LCSEG
Arianna Legovini	Head, Development Impact Evaluation Initiative	DECOS
Mame Fatou Niasse	Impact Evaluation Specialist	DECOS
Dinesh Aryal	Sr. Operations Officer	LCSSEN
Jozef Draaisma	Sr. Country Economist	LCEPG
Chandra Shekhar Sinha	Lead Climate Change Specialist	LCSEG
José Andreu	Sr. Carbon Finance Specialist	ENVCF
Adrien de Bassompierre	Carbon Finance Specialist	ENVCF
Luis de la Plaza	Lead Financial Officer	BDM
Dolores López-Larroy	Lead Financial Officer	BDM
Alonso Zarzar	Sr. Social Scientist	LCSO
Rohit Khanna	Sr. Operations Specialist	FEUFG
Jose Luis Calderon	Environmental Specialist, consultant	LCSEG
Evelyne Rodriguez	Social Specialist, consultant	LCSO
Mariana Montiel	Sr. Counsel	LEGLA
Flavia Rosembuj	Sr. Counsel	LEGCF
Juan Carlos Serrano	Financial Management Specialist	LCSFM
José Janeiro	Sr. Finance Officer	CTRFC
Tomás Socias	Sr. Procurement Specialist	LCSPT
Gabriel Peñaloza	Procurement Specialist	LCSPT
Khalid Siraj	Financial Intermediary Lending, consultant	LCSEG
Rodrigo Aragón Salinas	Operations Analyst, ET Consultant	LCSEG
Pamela Sud	Junior Professional Associate	LCSEG
Shern Frederick	Junior Professional Associate	LCSEG
Alma Domenech	Program Assistant	LCSEG
Karina Kashiwamoto	Language Program Assistant	LCC1C

Bank funds expended to date on Project preparation:

1. Bank resources: US\$280,000.
2. GEF resources: US\$30,000.
3. Total: US\$310,000

Estimated approval and supervision costs:

1. Remaining costs to approval: \$US45,000
2. Estimated annual supervision cost: US\$100,000.

Annex 12: Documents in the Project File
MEXICO: Efficient Lighting and Appliances Project

1. Manual Operativo del Programa de Sustitución de Equipos Electrodomésticos para el Ahorro de Energía, CFE, FIDE, y SENER. February 2009.
2. Program for Energy Efficiency in Public Lighting. CONUEE (Draft Document), September 28, 2009.
3. Presentación: ¡Cambia tu viejo por uno nuevo! Programa de Sustitución de Equipos Electrodomésticos para el Ahorro de Energía, SENER, July 2009.
4. CONXCORP: An Urban HEF Lighting Program. Proposal to Ashok Sarkar, World Bank, 2009.
5. GEF Project Proposal, CC: CC-SP1–Lighting and Appliances Efficiency Project, Mexico. World Bank, 2009.
6. Targeting and Operational Scheme for Fluorescent Bulb Subsidies, Options for Social Implementation Vehicle for Mexico CFL Replacement Program. World Bank, May 22, 2009.
7. Ley para el Aprovechamiento Sustentable de la Energía, Mexico, November 2008.
8. Project Document: Framework for Green Growth Development Policy Loan, World Bank, 2006.
9. Project Document: Mexico Urban Transport Transformation Program, World Bank, 2009.
10. Evelyn on social programs for Mexico, the report on Component 3 prepared by Alejandro Guevara, the presentation on Component 2 prepared by SENER, the Manual for Implementation on Component 2 (if we have it), etc.
11. Improving Air Quality in Metropolitan Mexico City: An Economic Valuation, Policy Research Working Paper, World Bank, February 2002.
12. Air Quality Management Report, National Institute of Ecology, Mexico, 1996.
13. COMETRAVI, Volumes 1–8, Mexico, 1999.
14. Inventario de Emisiones a la Atmósfera en la Zona Metropolitana del Valle de Mexico, CAM (Comisión Ambiental Metropolitana), Mexico, 1999.
15. Mexico 3a. Comunicación Nacional ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) e Instituto Nacional de Ecología (INE), Mexico 2008.
16. Mexico 4a. Comunicación Nacional ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) e Instituto Nacional de Ecología (INE), Mexico 2009.

17. Programa para Mejorar la Calidad del Aire de la Zona Metropolitana del Valle de Mexico 2002–2010, Secretaría de Ecología del Gobierno del Estado de México, Secretaría de Medio Ambiente del Gobierno del Distrito Federal, Secretaría de Medio Ambiente y Recursos Naturales y Secretaría de Salud, Mexico 2002.
18. Reducing Greenhouse Gases and Air Pollution: A Menu of Harmonized Options, STAPPA and ALAPCO, October 1999.
19. Introducción de medidas ambientalmente amigables, SMA, 2009. Informe final.
20. Estrategia Nacional para la Transición Energética y el Aprovechamiento Sustentable de la Energía, Mexico, June 2009.
21. Reglamento de la Ley para el Aprovechamiento Sustentable de la Energía, Mexico, September 2009.
22. Programa Nacional para el Aprovechamiento Sustentable de la Energía 2009–2012 (PRONASE), Mexico, December 2009.
23. Ley para el Aprovechamiento de Energías Renovables y el Financiamiento de la Transición Energética, Mexico, November 2008.
24. Reglamento de la Ley para el Aprovechamiento de las Energías Renovables y la Transición Energética.
25. Programa Especial para el Aprovechamiento de Energías Renovables, Mexico, SENER.
26. Estrategia Nacional de Energía, Mexico, February 2010.
27. México: Cuarta Comunicación Nacional ante la Convención Marco de Las Naciones Unidas Sobre el Cambio Climático. December 2009.
28. “Electric energy-saving potential by substitution of domestic refrigerators in Mexico”. F.G. Arroyo-Cabañas a,b, J.E.Aguillón-Martínez c, J.J.Ambríz-García d, G.Canizal b.
29. “Energy-saving equipment and services in Mexico”. Arturo Dessomes.
30. “Future Air Conditioning Energy Consumption in Developing Countries and what can be done about it: The Potential of Efficiency in the Residential Sector”, McNeil, Michael A., Letschert, Virginie E.
31. Gilberto De Martino Jannuzzi, “Considerações para Programas de Eficiência Energética para consumidores residenciais de baixa Renda”, UNICAMP, 2006.
32. FIDE’s evaluation of SENER’s appliance replacement pilot program.

Annex 13: Statement of Loans and Credits
MEXICO: Efficient Lighting and Appliances Project

Project ID	FY	Purpose	Original Amount in US\$ Millions					Cancel.	Undisb.	Difference between expected and actual disbursements	
			IBRD	IDA	SF	GEF	Orig.			Frm. Rev'd	
P116965	2010	MX Influenza Prevention and Control	491.00	0.00	0.00	0.00	0.00	491.00	0.00	0.00	
P116226	2010	MX Social Protection in Health	1,250.00	0.00	0.00	0.00	0.00	1,250.00	0.00	0.00	
P101369	2010	MX Compensatory Education	100.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	
P112262	2010	MX Upper Secondary Education DPL	700.00	0.00	0.00	0.00	0.00	700.00	0.00	0.00	
P107159	2010	MX Urban Transport Transformation Progr	150.00	0.00	0.00	0.00	0.00	150.00	0.00	0.00	
P106261	2009	MX Sustainable Rural Development	50.00	0.00	0.00	0.00	0.00	49.88	0.00	0.00	
P106528	2009	MX Results-based Mgmt. and Budgeting	17.24	0.00	0.00	0.00	0.00	17.24	9.04	0.00	
P106589	2009	MX IT Industry Development Project	80.00	0.00	0.00	0.00	0.00	80.00	34.35	0.00	
P112258	2009	MX Priv Housing Finance Markets Strngth	1,010.00	0.00	0.00	0.00	0.00	7.48	3.36	0.00	
P114271	2009	MX Customs Institutional Strengthening	10.03	0.00	0.00	0.00	0.00	10.00	0.61	0.00	
P115067	2009	MX Support to Oportunidades Project	1,503.76	0.00	0.00	0.00	0.00	1.23	-	0.00	
									1,498.77		
P088996	2008	MX (CRL2) Integrated Energy Services	15.00	0.00	0.00	0.00	0.00	14.96	8.67	0.00	
P085593	2006	MX (APL I) Tertiary Educ Student Ass	180.00	0.00	0.00	0.00	0.00	60.35	58.44	0.00	
P087038	2006	MX Environmental Services Project	45.00	0.00	0.00	0.00	0.00	10.23	7.31	0.00	
P074755	2005	MX State Judicial Modernization Project	30.00	0.00	0.00	0.00	16.50	10.08	26.58	0.00	
P089865	2005	MX-(APL1) Innov. for Competitiveness	250.00	0.00	0.00	0.00	0.00	31.94	29.00	0.00	
P087152	2004	MX (CRL1)Savings & Rurl Finance(BANSEFI)	154.50	0.00	0.00	0.00	0.38	33.50	-44.99	30.84	
P070108	2003	MX Savings & Credit Sector Strengthening	85.60	0.00	0.00	0.00	0.00	12.46	-8.49	6.84	
		Total:	6,122.13	0.00	0.00	0.00	16.88	3,030.35	-	37.68	
									1,374.89		

MEXICO
STATEMENT OF IFC's
Held and Disbursed Portfolio
In Millions of US Dollars

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
1998	Ayvi	2.14	0.00	0.00	0.00	2.14	0.00	0.00	0.00
	BBVA-Bancomer	6.63	0.00	0.00	0.00	6.63	0.00	0.00	0.00
2006	Banco del Bajio	0.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	Baring MexFnd	0.00	0.29	0.00	0.00	0.00	0.29	0.00	0.00
1999	Baring MexFnd	0.00	1.41	0.00	0.00	0.00	1.41	0.00	0.00
1998	CIMA Puebla	3.25	0.00	0.00	0.00	3.25	0.00	0.00	0.00
2005	CMPDH	14.50	0.00	0.00	0.00	14.50	0.00	0.00	0.00
2006	Carlyle Mexico	0.00	20.00	0.00	0.00	0.00	8.44	0.00	0.00
	Chiapas-Propalma	0.00	0.97	0.00	0.00	0.00	0.97	0.00	0.00
2001	Compartamos	0.00	0.66	0.00	0.00	0.00	0.66	0.00	0.00
2004	Compartamos	15.58	0.00	0.00	0.00	15.58	0.00	0.00	0.00

2002	Coppel	25.71	0.00	0.00	0.00	25.71	0.00	0.00	0.00
1999	Corsa	2.79	3.00	0.00	0.00	2.79	3.00	0.00	0.00
2005	Credito y Casa	21.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	DTM	17.04	0.00	0.00	0.00	17.04	0.00	0.00	0.00
2001	Ecomex	4.00	0.00	0.24	0.00	2.00	0.00	0.24	0.00
2000	Educacion	3.54	0.00	0.00	0.00	3.54	0.00	0.00	0.00
2005	FINEM	15.12	0.67	0.00	0.00	4.86	0.67	0.00	0.00
1998	Forja Monterrey	3.71	3.00	0.00	3.71	3.71	3.00	0.00	3.71
2001	GFNorte	95.63	0.00	0.00	0.00	45.63	0.00	0.00	0.00
1996	GIBSA	5.41	0.00	0.00	18.19	5.41	0.00	0.00	18.19
2000	GIRSA	22.50	0.00	0.00	30.00	22.50	0.00	0.00	30.00
2005	GMAC Financiera	120.67	0.00	0.00	0.00	32.52	0.00	0.00	0.00
1998	Grupo Calidra	4.00	6.00	0.00	0.00	4.00	6.00	0.00	0.00
2004	Grupo Calidra	20.89	0.00	0.00	0.00	20.15	0.00	0.00	0.00
1989	Grupo FEMSA	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00
1996	Grupo Posadas	1.60	0.71	0.00	0.00	0.00	0.71	0.00	0.00
1999	Grupo Posadas	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00
1998	Grupo Sanfandila	4.09	0.00	0.00	1.33	4.09	0.00	0.00	1.33
2005	Grupo Sanfandila	0.00	0.00	0.00	6.49	0.00	0.00	0.00	0.00
	Grupo Su Casita	0.00	7.08	0.00	0.00	0.00	7.08	0.00	0.00
2006	Grupo Su Casita	0.00	7.68	0.00	0.00	0.00	7.68	0.00	0.00
	Infologix BVI	3.50	0.00	0.00	0.00	3.50	0.00	0.00	0.00
2000	Innopack	0.00	12.81	0.00	0.00	0.00	12.81	0.00	0.00
	Interoyal	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
2005	La Bene	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	Lomas de Real	47.46	0.00	20.00	95.22	46.18	0.00	20.00	95.22
1998	Merida III	24.86	0.00	0.00	52.30	24.86	0.00	0.00	52.30
2003	Mexmal	0.00	0.00	0.80	0.00	0.00	0.00	0.80	0.00
1995	Mexplus Puertos	0.00	0.55	0.00	0.00	0.00	0.55	0.00	0.00
1999	Mexplus Puertos	0.00	0.25	0.00	0.00	0.00	0.25	0.00	0.00
2003	Occidental Mex	24.90	0.00	0.00	33.20	24.90	0.00	0.00	33.20
	Occihol	0.00	9.99	0.00	0.00	0.00	9.99	0.00	0.00
2003	POLOMEX S.A.	4.94	0.00	0.00	0.00	4.94	0.00	0.00	0.00
2000	Pan American	0.00	0.92	0.00	0.00	0.00	0.92	0.00	0.00
2002	Puertas Finas	8.94	0.00	0.00	0.00	8.94	0.00	0.00	0.00
2000	Rio Bravo	44.10	0.00	0.00	48.26	44.10	0.00	0.00	48.26
2004	SSA Mexico	44.50	0.00	0.00	0.00	44.50	0.00	0.00	0.00
2000	Saltillo S.A.	31.16	0.00	0.00	34.89	31.16	0.00	0.00	34.89
2000	Servicios	5.92	0.65	0.00	5.07	5.92	0.65	0.00	5.07
2004	Su Casita	16.49	0.00	0.00	0.00	16.49	0.00	0.00	0.00
2005	Su Casita	50.68	0.00	0.00	0.00	50.68	0.00	0.00	0.00
2006	Su Casita	71.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	TMA	1.06	0.00	3.29	3.68	1.06	0.00	3.29	3.68
2005	UNITEC	30.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	Valle Hermoso	50.68	0.00	20.00	103.49	50.10	0.00	20.00	103.49
2006	Vuela	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ZN Mexico II	0.00	7.07	0.00	0.00	0.00	5.51	0.00	0.00
1998	ZN Mxc Eqty Fund	0.00	1.69	0.00	0.00	0.00	1.69	0.00	0.00
Total portfolio:		915.96	130.43	54.33	435.83	593.38	72.31	54.33	429.34

FY Approval	Company	Approvals Pending Commitment			
		Loan	Equity	Quasi	Partic.
2006	Bajio	0.08	0.00	0.00	0.00
2001	Ecomex	0.00	0.00	0.00	0.00
2003	Mexmal	0.00	0.00	0.01	0.00
2005	Coppel II	0.01	0.00	0.01	0.00
2000	Educacion	0.00	0.00	0.00	0.00
2006	Metro-WHL	0.05	0.00	0.00	0.00
2001	GFNorte-CL	0.00	0.00	0.00	0.10
2006	BANSEFI AFORE	0.00	0.00	0.00	0.00
2006	Protego Sofol	0.00	0.00	0.00	0.00
2005	Credito y Casa	0.02	0.00	0.00	0.00
2006	Mexico MBS CEF	0.03	0.00	0.00	0.00
2005	Pan American 2	0.00	0.00	0.00	0.00
1998	Cima Hermosillo	0.00	0.00	0.01	0.00
2007	Nexus III Fund	0.00	0.02	0.00	0.00
2006	Compartamos III	0.05	0.00	0.00	0.00
2006	Irapuato-Piedad	0.01	0.00	0.00	0.00
2006	Su Casita WHL II	0.17	0.00	0.00	0.00
Total pending commitment:		0.42	0.02	0.03	0.10

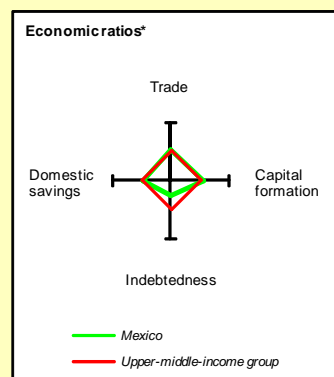
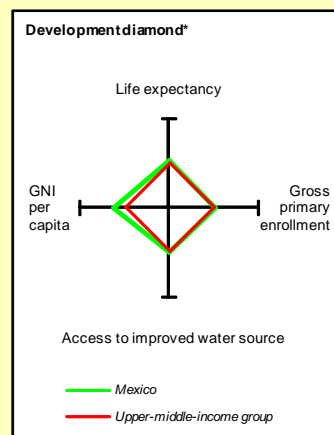
Annex 14: Country at a Glance

MEXICO: Efficient Lighting and Appliances Project

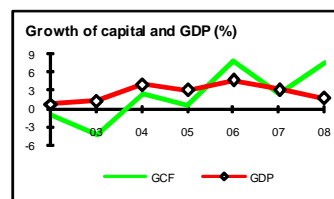
Mexico at a glance

12/9/09

POVERTY and SOCIAL	Mexico	Latin America & Carib.	Upper-middle-income		
2008					
Population, mid-year (millions)	106.4	565	949		
GNI per capita (Atlas method, US\$)	9,990	6,781	7,878		
GNI (Atlas method, US\$ billions)	1,062.4	3,833	7,472		
Average annual growth, 2002-08					
Population (%)	10	12	0.8		
Labor force (%)	18	2.2	17		
Most recent estimate (latest year available, 2002-08)					
Poverty (% of population below national poverty line)	18	..	..
Urban population (% of total population)	76	79	75		
Life expectancy at birth (years)	75	73	71		
Infant mortality (per 1,000 live births)	15	22	21		
Child malnutrition (% of children under 5)	3	5	..		
Access to an improved water source (% of population)	95	91	94		
Literacy (% of population age 15+)	93	91	94		
Gross primary enrollment (% of school-age population)	113	117	110		
Male	114	119	112		
Female	112	115	108		
KEY ECONOMIC RATIOS and LONG-TERM TRENDS					
	1988	1998	2007	2008	
GDP (US\$ billions)	183.1	421.2	1,022.8	1,088.1	
Gross capital formation/GDP	22.6	24.3	26.0	26.4	
Exports of goods and services/GDP	19.9	30.7	28.3	28.3	
Gross domestic savings/GDP	24.0	22.2	24.3	24.2	
Gross national savings/GDP	21.2	20.5	25.3	24.3	
Current account balance/GDP	-1.3	-3.8	-1.9	..	
Interest payments/GDP	4.8	2.6	1.2	1.0	
Total debt/GDP	54.2	37.8	18.8	18.7	
Total debt service/exports	37.1	20.9	12.3	12.5	
Present value of debt/GDP	17.8	18.2	
Present value of debt/exports	55.9	59.9	
	1988-98	1998-08	2007	2008	2008-12
(average annual growth)					
GDP	2.9	2.8	3.2	1.8	0.2
GDP per capita	1.1	1.7	2.2	0.7	-3.0
Exports of goods and services	12.4	6.1	6.2	1.0	0.5



STRUCTURE of the ECONOMY	1988	1998	2007	2008
(% of GDP)				
Agriculture	7.9	5.3	3.7	3.8
Industry	32.1	28.6	35.9	37.1
Manufacturing	23.9	21.3	18.6	18.8
Services	60.0	66.1	60.3	59.1
Household final consumption expenditure	67.6	67.4	65.4	65.5
General gov't final consumption expenditure	8.4	10.4	10.2	10.3
Imports of goods and services	18.5	32.8	29.9	30.5
(average annual growth)				
Agriculture	1.7	2.1	2.1	3.1
Industry	3.5	1.9	1.9	0.5
Manufacturing	3.9	1.8	2.7	0.2
Services	2.8	3.3	3.9	2.3
Household final consumption expenditure	2.5	4.0	4.2	1.3
General gov't final consumption expenditure	2.0	0.5	1.0	2.1
Gross capital formation	4.2	1.7	2.7	7.6
Imports of goods and services	12.2	7.0	7.0	4.1



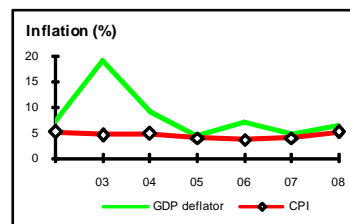
Note: 2008 data are preliminary estimates.

This table was produced from the Development Economics LDB database.

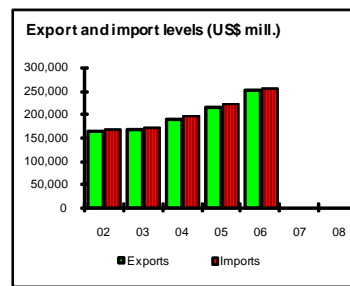
* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

PRICES and GOVERNMENT FINANCE

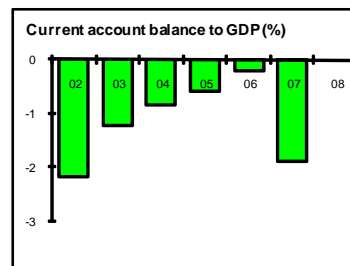
	1988	1998	2007	2008
Domestic prices (% change)				
Consumer prices	14.2	15.9	4.0	5.1
Implicit GDP deflator	12.7	15.4	4.7	6.5
Government finance (% of GDP, includes current grants)				
Current revenue	27.7	20.3	29.4	..
Current budget balance	-5.3	1.8	2.8	..
Overall surplus/deficit	..	-5.9	-3.7	..

**TRADE**

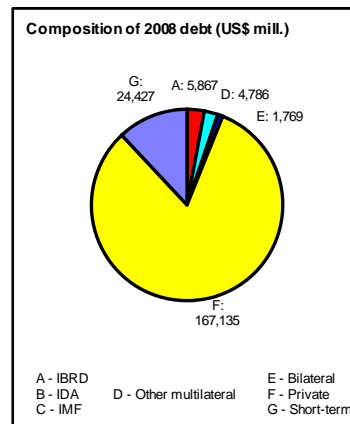
	1988	1998	2007	2008
TRADE (US\$ millions)				
Total exports (fob)	30,692	117,460	..	..
Oil	6,711	7,134	..	..
Agriculture	1,670	3,797	..	..
Manufactures	21,650	106,062	..	..
Total imports (cif)	28,082	125,373	..	..
Food	..	..	..	..
Fuel and energy	..	..	..	..
Capital goods	4,027	17,329	..	..
Export price index (2000=100)	81	90	..	..
Import price index (2000=100)	83	98	..	..
Terms of trade (2000=100)	97	91	..	..

**BALANCE of PAYMENTS**

	1988	1998	2007	2008
BALANCE of PAYMENTS (US\$ millions)				
Exports of goods and services	36,760	129,062	310,216	..
Imports of goods and services	34,146	137,801	338,329	..
Resource balance	2,614	-8,739	-28,113	..
Net income	-7,246	-13,266	-18,855	0
Net current transfers	2,257	6,012	27,441	..
Current account balance	-2,376	-15,993	-19,527	..
Financing items (net)	-4,262	19,188	21,706	..
Changes in net reserves	6,638	-3,195	-2,178	..
Memo:				
Reserves including gold (US\$ millions)	5,399	31,863	87,211	95,556
Conversion rate (DEC, local/US\$)	2.3	9.1	10.9	11.1

**EXTERNAL DEBT and RESOURCE FLOWS**

	1988	1998	2007	2008
EXTERNAL DEBT and RESOURCE FLOWS (US\$ millions)				
Total debt outstanding and disbursed	99,216	159,188	192,764	203,984
IBRD	7,427	115,14	4,540	5,867
IDA	0	0	0	0
Total debt service	15,473	29,147	39,895	41,332
IBRD	1,246	2,024	574	796
IDA	0	0	0	0
Composition of net resource flows				
Official grants	76	61	120	139
Official creditors	999	-809	628	1,304
Private creditors	-2,487	12,521	8,798	12,062
Foreign direct investment (net inflows)	2,011	12,413	27,528	22,481
Portfolio equity (net inflows)	0	-666	-482	-3,503
World Bank program				
Commitments	1,265	1,767	230	2,299
Disbursements	1,347	1,283	671	1,940
Principal repayments	673	1,257	342	596
Net flows	674	26	329	1,343
Interest payments	574	767	232	200
Net transfers	101	-741	97	1,144



Note: This table was produced from the Development Economics LDB database.

12/9/09

Annex 15: Incremental Cost Analysis

MEXICO: Efficient Lighting and Appliances Project

Overview

1. Mexico is both a large producer and exporter of energy, and also a major consumer of energy. For example, it is the world's sixth-largest oil producer and Latin America's largest energy consumer. As a result, the energy sector is of strategic importance to the economy and is a driver of economic growth, productivity and competitiveness. For years, the country has relied on a generous endowment of petroleum to meet domestic energy needs as well as to generate significant revenues through the international sale of crude oil; however, oil production has dropped from a high of approximately 3.4 million barrels per day in 2004 to approximately 2.6 million barrels per day in 2009. Fossil fuels (including imported gas) represent a large portion of the generation matrix (about 80 percent); as a consequence, enhancing energy efficiency and diversification through the expanded use of renewable energy sources are key elements to strengthening the long-term sustainability of the Mexican electricity matrix.

2. Addressing climate change has also become a major policy objective for the Government of Mexico. It is the second-largest emitter in Latin America and ranks twelfth in the world in terms of total GHG emissions. Energy-related emissions (including from energy-use in the transport sector) contribute to over 60 percent of Mexico's total GHG emissions, with land use, industrial processes and wastes accounting for the majority of the remaining emissions. Due to the prominence of energy-related emissions, including those related to electricity generation, the Government has embarked on an aggressive program of energy efficiency that is integrally linked to its climate change agenda.

3. The Government has made mitigation of climate change a priority. In May 2007, President Calderón announced the National Climate Change Strategy (*Estrategia Nacional de Cambio Climático*, ENACC), thereby placing climate change at the heart of the national development policy. ENACC sets the country's long-term climate change agenda, together with medium- to long-term goals for adaptation and mitigation. According to Mexico's Fourth National Communication to the UNFCCC, Mexico emitted 711 million tons of carbon dioxide equivalent (Mt CO₂e) in 2006, of which over 400 Mt CO₂e (60.4 percent) came from energy-related emissions (including from energy-use in the transport sector). In August 2009, Mexico officially launched a Special Climate Change Program (*Programa Especial de Cambio Climático*, PECC), that operationalizes ENACC. The PECC identifies a range of climate change interventions at the sectoral and subsectoral levels and quantifies the potential impact and cost of each intervention in terms of policy, regulation and technology adoption. The program sets emission-reduction targets, including an electricity-related emissions reduction goal of 14 to 28 Mt CO₂ by 2012. Under a longer-term vision, PECC establishes the formal objective of reducing GHGs by 50 percent by 2050 against the baseline of 2000. Energy efficiency (EE) is a key pillar of the PECC program.

4. Although Mexico, as a non-Annex I country, is not mandated to limit or reduce its GHG emissions under the Kyoto Protocol, the country has firmly adopted the UNFCCC principle of "common but differentiated responsibilities" and has pledged to voluntarily reduce its GHG emissions. In December 2008, at the 14th Session of the Conference of the Parties to the UNFCCC in Poznan, Poland, Mexico announced that it would reduce its GHG emissions in 2050 by 50 percent below 2002 levels, and restated that commitment during the January 2009

meeting of the World Economic Forum in Davos. Furthermore, Mexico will host the 16th Conference of the Parties of the UNFCCC at the end of 2010, demonstrating its commitment to achieve an international climate change agreement. The relevance of climate change to the energy sector has been addressed in various and interrelated analytical and policy works, including the Government's climate change strategy, PECC and the Low-Carbon Development for Mexico (MEDEC) study, as described below

Government Energy Efficiency (EE) Strategy

5. To achieve its energy efficiency and climate change mitigation goals, the Government has developed a national strategy that lays the groundwork for the implementation of a comprehensive energy efficiency plan. The strategy includes regulatory changes accompanied by institutional strengthening of key government agencies, and the establishment of financial mechanisms to implement key programs and projects. Key measures are described below:

- On the regulatory side, the *Ley para el Aprovechamiento Sustentable de la Energía* (the Sustainable Use/Energy Efficiency Law) was signed into law in November 2008 which establishes the enabling environment for promoting energy efficiency.
- In July 2009, SENER issued the *Estrategia Nacional para la Transición Energética y el Aprovechamiento Sustentable de la Energía* (National Strategy for the Energy Transition and Sustainable Use of Energy) which outlines the framework to promote policies, programs, actions and projects to increase the use of renewable energy, and to promote energy efficiency.
- The Government's Energy Sector Program 2007–2012 (PROSENER) provides a comprehensive policy framework that addresses energy security, technical efficiency, environmental sustainability and climate change.
- On the financing side, the *Fideicomiso para la Transición Energética y el Uso Sustentable de la Energía* (the Trust Fund for the Energy Transition and the Sustainable Use of Energy, the "EE Trust Fund") provided for in the Renewable Energy Law has been established with the purpose of increasing financing to advance the energy transition from hydrocarbons to renewable energy and energy efficiency.
- On the institutional front, the *Comisión Nacional para el Uso Eficiente de Energía* (CONUEE) has been established as provided in the Sustainable Use/Energy Efficiency Law, drawing on the staff and institutional capacity of the former *Comisión Nacional para el Ahorro de Energía* (CONAE).

6. The strategies and programs are supported at the operational level by two independent entities (legally established as trust funds): the private-sector *Fideicomiso para el Ahorro de Energía Eléctrica* (FIDE) and the public sector *Fideicomiso para el Programa de Aislamiento Térmico* (FIPATERM). Both FIDE and FIPATERM were established in 1990 at the initiative of CFE, and today serve as key vehicles for implementing energy efficiency programs.

7. In application of the abovementioned laws, policies and strategies, the Government has begun to implement the following key energy efficiency programs: (i) the replacement of 47.2 million incandescent bulbs (IBs) with compact fluorescent lamps (CFLs) in the

residential sector over a three-year period, including an initial phase targeting 2.2 million bulbs; (ii) the replacement of over two million appliances (refrigerators and ACs) over a four-year period; (iii) promoting more energy efficient public transport systems for local and long-distance travel; (iv) municipal-level replacement of existing streetlamps with more efficient public lighting; (v) greater efficiency in the industrial and commercial sub-sectors; (vi) supply-side energy efficiency activities by CFE; and (vii) an energy efficiency initiative within PEMEX. The Government is interested in mobilizing assistance from multilateral banks and other financial institutions, including the World Bank and the Clean Technology Fund (CTF), to support the implementation of these programs.

Proposed Project

8. The Project Development Objectives are to promote Mexico's efficient use of energy and to mitigate climate change by increasing the use of energy-efficient technologies at the residential level. The Project's Global Environmental Objectives are to support efforts to mitigate climate change by expanding the use of energy-efficient equipment and services. The Project will promote the development of a sustainable market for energy efficiency equipment among the large and fast-growing energy end-use sectors for lighting, refrigeration and air conditioning.

9. The proposed Project is also consistent with the GEF Climate Change Focal Area, in particular with GEF Operational Program 5: Energy Efficiency, and the climate change strategic program under GEF-4: SP1 "Promoting Energy Efficiency in Residential and Commercial Buildings". GEF incremental financing would help to ensure that Project activities would promote global environmental benefits in addition to national and state benefits in Mexico. The activities to be included to achieve this would encourage the adoption of globally beneficial energy-efficient appliances in households and efficient lighting, and would contribute to the Government's National Climate Change Strategy (*Estrategia Nacional de Cambio Climático*, ENACC).

Baseline Scenario

10. Under the baseline scenario, the Government would implement a project with two major activities: (i) replacing incandescent bulbs (IBs) with compact fluorescent lamps (CFLs) in the low to medium income residential sector; and (ii) providing incentives to qualifying consumers for the replacement of old, inefficient refrigerators and air conditioners (ACs) in the residential sector. Although the baseline scenario will generate global environmental benefits, without the GEF alternative the potential significant global environmental benefit in terms of GHG emission reductions from adopting energy efficiency measures in the residential sector will not be fully realized and several of the key components of the planned program for appliances would be dropped. The GEF alternative will help to ensure the involvement of the country's development banks, which are essential to the mainstreaming of the Government's climate change mitigation agenda. Under the baseline scenario, the risks associated with consumer default would create a major market barrier for the residential end-use sector to fully participate in the Government's program, thus severely limiting potential reduction in GHG emission and generating global environmental benefits. In particular, without the GEF alternative, the total number of appliances to be financed under the project decreases from 1,700,000 to 1,458,030 in four years. This is about a 14 percent reduction in the number of appliances, which leads to a proportionate decrease in energy savings and emission reductions. In the four years of the Project, the baseline energy savings are expected to be only 9,376 GWh, with emission reductions of 4.8 M tCO₂e. Furthermore,

under the baseline scenario, technical capacities of the key institutions would not be further augmented to fully achieve the objectives of the overall Project.

11. Total expenditures under the *baseline scenario during the lifetime of the Project are estimated at about US\$587 million*³⁵ which is the cost of baseline activities explained below.

12. The following sections provide further detail on the baseline scenario for each component and what global environmental benefits they will provide.

Component 1: Replacement of Incandescent Bulbs (IBs) with Compact Fluorescent Lamps (CFLs) in the Low-Income Residential Sector.

13. The objective of Component 1 is to replace incandescent bulbs (IBs) with compact fluorescent lamps (CFLs) in eligible households in order to reduce energy consumption. This component finances the replacement of 45 million IBs with CFLs in 11.25 million low to medium income households over a two-year period as part of the Government's national program on energy efficiency. The replacement program involves the purchase and distribution of new CFLs and the collection and proper disposal of the replaced IBs. The replacement of 45 million CFLs will support Mexico's efforts to achieve the targets outlined under PECC, which aims to replace 47.2 million incandescent bulbs (IBs) with compact fluorescent lamps (CFLs) in the residential sector.

14. The global environmental benefit of this component is significant. *The Government is financing this component through the US\$55 million IBRD Loan and US\$15 million of its own resources.*

Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners (ACs) in the Residential Sector.

15. The objective of Component 2 is to provide incentives to qualifying consumers to replace old, inefficient household appliances with energy-efficient appliances in order to reduce energy consumption. The component supports two types of incentives for the replacement (including collection and scrapping) of approximately 1.7 million old, inefficient refrigerators and ACs over a four-year period as part of the Government's national energy efficiency program. These incentives include vouchers as instant discounts and affordable credits to eligible consumers. Without the appropriate financial benefits and incentives, the households would not choose to buy more efficient equipment unless old equipment is outdated beyond repair and the cost of new energy-efficient equipment is equal to or less than the cost of conventional equipment. As such, this component removes the high initial investment cost barrier for low-income households to participate in the Government's appliance replacement program. In addition, this component will finance the collection and scrapping of the old working appliance to ensure: (i) the permanent reduction in electricity consumption, and (ii) reductions in the emissions of CO₂ and refrigerants that would otherwise be vented to the atmosphere.

³⁵ This figure is calculated under the following approach: (i) it is assumed that the US\$5 million from GEF for the GF is not provided; (ii) it is assumed that as a result NAFIN reduces the availability of its credit line to a corresponding extent; which (iii) in turn reduces the number of appliances replaced; yielding (iv) an adjusted estimated cost for component 2 of US\$517 million. Note that the absence of the GEF funding does not affect the US\$70 million project cost for component 1.

16. Although the component would generate global environmental benefits, opportunities to enhance these benefits would be missed without the GEF Alternative that would contribute to reducing the credit risk to NAFIN, thus granting affordable credit for eligible medium-income households to participate in the program. Resources from the IBRD and CTF Loans would cofinance these activities along with resources from NAFIN and beneficiaries. *The total cost of these activities is expected to be US\$517 million.*

GEF Alternative Scenario:

17. The GEF Alternative Scenario would leverage the current baseline activities and build on them to generate additional global environment benefits. The GEF alternative would help to ensure the involvement of the country's development banks, which are essential to the mainstreaming of the Government's climate change mitigation agenda. Under the GEF alternative, market barriers to residential end-use sector efficiency measures would be lowered, in particular for medium-income households. Furthermore, with the GEF alternative, technical capacities of the key institutions would be further augmented to fully achieve the Project's overall objective.

18. With the GEF alternative, resources from CTF and GEF would be mobilized to ensure the design of a sustainable and innovative mechanism that will promote transformational and large-scale energy efficiency activities in Mexico and has potential for replication in other countries. With incremental GEF support, the expected emission reduction is calculated to be 5.14 million tons of CO₂e by the end of the Project.

19. Total expenditures under the GEF Alternative Scenario during the lifetime of the Project are estimated at about US\$678.32 million. Therefore, the total incremental costs of this Project—the difference between the Baseline Scenario and the GEF Alternative Scenario—are calculated to be US\$91.32 million, of which US\$7.12 million is being requested from the GEF.

20. The following sections provide further detail on the baseline scenario for each component and what global environmental benefits they will provide.

Component 1: Replacement of Incandescent Bulbs (IBs) with Compact Fluorescent Lamps (CFLs) in the Low-Income Residential Sector

21. The objective and activities of this component remain the same as explained under the Baseline Scenario.

Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners (ACs) in the Residential Sector

22. In addition to the activities explained under the Baseline Scenario, with the GEF incremental financing the Project component would provide incentives for eligible medium-income households to participate in the Project by creating a line of credit for NAFIN to provide affordable credits to qualifying consumers to pay for the replacement of inefficient appliances with more energy-efficient appliances. A secured debt service arrangement³⁶ and a related Guarantee Facility would minimize credit risks for NAFIN from credit defaults by consumers (see Annex 4). Because it involves financing of credits to eligible households for

³⁶ The repayment of the credit by the beneficiaries would be made through the electricity bill.

the acquisition of energy-efficient appliances, a Financial Intermediary Lending Assessment is provided in Annex 17. This type of support consists of financing provided by NAFIN, through FIDE, to consumers at a preferential financing rate of 12 percent per year to cover the portion of the appliance cost not covered by the voucher and up to a maximum of MX\$8,700 (this is the approximate value of a 14 cubic foot refrigerator) for consumers in tier 4, as explained in Annex 4. All financing is on a standard four-year basis. At the end of the four-year Project, any remaining non-used GEF resources from the Guarantee Facility could be reallocated to other energy efficiency activities. However, at the project midterm review, an evaluation would be carried out to assess the effective reallocation of any remaining non-used GEF resources to further complement the project’s overall objectives.

23. With the incremental GEF financing to capitalize the Guarantee Facility, the Project would finance activities to replace and safely scrap old appliances worth an additional US\$86 million during Project implementation. Therefore, the total costs of the GEF Alternative Scenario under this component are calculated to be US\$603 million.

Component 3: Technical Assistance and Institutional Strengthening

24. The objective of this component is to build necessary institutional and human capacity in SENER and CONUEE to effectively achieve the objectives of this Project and to carry out the new responsibilities in the area of energy efficiency assigned to the two institutions by the new Energy Efficiency Law (*Ley para el Aprovechamiento Sustentable de la Energía*), which was enacted in November 2008. The resources, technical expertise and institutional capacity in SENER to carry out the new responsibilities are not adequate. Specifically, the law mandates that SENER is now responsible for a new Program for the Sustainable Use of Energy (*Programa Nacional para el Aprovechamiento Sustentable de la Energía*), which has ambitious goals of strengthening energy efficiency standards for appliances and other equipment, and generating increased scientific and technological research in energy efficiency. In addition, the Energy Efficiency Law also established a new organization, CONUEE, replacing the CONAE (*Comisión Nacional para el Ahorro de Energía*), whose purpose is to advise the administration on energy efficiency issues, lead the energy efficiency dialogue and promote the implementation of best practices related to energy efficiency at the national level.

25. Under the baseline scenario, the capacities of these institutions are not sufficiently strengthened to effectively carry out Project activities. With the incremental GEF financing, the Project would enhance the institutional capacity including M&E activities to assess the success of the project and therefore the sustainability of Project outcomes. The total costs of the GEF Alternative Scenario under this component are calculated to be US\$6.32 million.

26. The matrix below summarizes the baseline and incremental expenditures during the Project period.

Table 15.1

Cost Category	US\$ Million	Domestic Benefit	Global Benefit
Component 1: Replacement of Incandescent Bulbs (IBs) with Compact Fluorescent Lamps (CFLs) in the Low-Income Residential Sector			
Baseline	US\$70 million	Significant GHG emission reduction along with socioeconomic benefits to low-income households.	Significant GHG emission reduction.

With GEF Alternative	Same as Baseline	Same as Baseline.	Same as Baseline.
Incremental	0		
Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners (ACs) in the Residential Sector			
Baseline	US\$517 million	Significant GHG emission reduction along with socioeconomic benefits to low-income households.	Significant GHG emission reduction.
With GEF Alternative	US\$603 million	Significant GHG emission reduction along with socioeconomic benefits to low-income households. Participation of Mexican development banks in replicating the outcomes and removing barriers for low- and medium-income households in government programs. Minimize solid waste and contamination in the local environment due to recycling and scrapping of old appliances.	The global environmental consequences of this would be to enhance the level of GHG emission reductions.
Incremental	US\$86 million		
Component 3: Technical Assistance and Institutional Strengthening			
Baseline	No baseline costs		
With GEF Alternative	US\$6.32 million	Capacity of SENER and CONUEE in supporting the implementation of the Project and the Government's Energy Efficiency Law enhanced.	With the increased technical capacity, the sustainability of Project impacts is strengthened, thereby enhancing the potential for GHG emission reductions through effective implementation of the Project and replication of its outcomes. In addition, the technical studies including harmonization of EE standards, certification of EE process, etc. have replication potential for furthering GHG emission reduction possibilities.
Incremental	US\$6.32 million		
Total Baseline: US\$587 million			
Total GEF Alternative: US\$679.32 million			
Total Incremental Costs: US\$92.32 million, of which US\$7.12 is being requested from the GEF			

Annex 16: Clean Technology Fund
MEXICO: Efficient Lighting and Appliances Project

A. Mexico's Commitment to Low-Carbon Economic Growth

1. The Government is committed to reducing its carbon footprint and has taken several significant measures in this regard. First, Mexico ratified the UN Framework Convention on Climate Change (UNFCCC) on March 11, 1993. Subsequently, Mexico's Congress ratified the Kyoto Protocol (April 2000) by unanimous consent. Mexico has also launched an effort to strengthen its institutional capacity through the development of a Climate Change Office (CCO). The CCO has been supported through an IDF (Institutional Development Fund) grant from the World Bank (WB). The IDF also supported the identification of economic instruments for the internalization of climate change concerns in economic planning.

2. As a non-Annex I country, Mexico is not mandated to limit or reduce its greenhouse gas (GHG) emissions under the Kyoto Protocol. Nonetheless, the country has firmly adopted the UNFCCC principle of "common but differentiated responsibilities" and has pledged to voluntarily reduce its GHG emissions. Recognizing the multisectoral dimension of the climate change challenge, Mexico established the Intersecretarial Commission on Climate Change (*Comisión Intersecretarial de Cambio Climático, CICC*) in April 2005. The CICC's key mandates include the formulation and coordination of national climate change strategies and their incorporation in sectoral programs.

3. In May 2007, President Calderón announced the National Climate Change Strategy (*Estrategia Nacional de Cambio Climático, ENACC*), thereby committing Mexico to place climate change at the heart of the country's national development policy. ENACC sets the long-term climate change agenda, together with medium- to long-term goals for adaptation and mitigation. It identifies options for decoupling GHG emissions from economic growth and proposes a long list of potential climate change mitigation activities, as well as ways to reduce vulnerability to climate change and raise public awareness. The World Bank is supporting its implementation through the Climate Change Development Policy Loan (P110849).

4. At the 14th Session of the Conference of the Parties to the UNFCCC in Poznan (December 2008), Mexico announced that by 2050 it would reduce its GHG emissions by 50 percent below 2002 levels through the use of clean and efficient technologies. At the January 2009 meeting of the World Economic Forum in Davos, President Calderón restated the Government's target to halve GHG emissions by 2050 depending on international financial cooperation and on international agreements on mitigation. This commitment has been hailed by the UNFCCC Secretariat as an example of a long-term vision for sustainable development.

5. The Government adopted the Special Climate Change Program (*Programa Especial de Cambio Climático, PECC*) on August 28, 2009. PECC identifies the interventions necessary at the sectoral and subsectoral levels, quantifying the potential impact and cost of each change in policy, regulation and technology adoption. The program sets further targets, including an annual electricity-related emissions reduction target ranging from 14 Mt CO₂ to 28 Mt CO₂ by 2012. Energy efficiency (EE) is an important thrust of the PECC program, because the energy sector contributes approximately 27 percent of Mexico's total GHG emissions, two-thirds of which come from the electricity sector. The relevance of climate change to the energy sector has been addressed in various, interrelated analytical and policy

works, including the Government's National Climate Change Strategy (*Estrategia Nacional de Cambio Climático*, ENACC), the Special Climate Change Program (*Programa Especial de Cambio Climático*, PECC) and the Low-Carbon Development for Mexico (*México: Estudio sobre la Disminución de Emisiones de Carbono*, MEDEC) study. In this context, the Government has embarked upon an aggressive program of energy efficiency that is closely linked to its climate change agenda.

6. Mexico has submitted four National Communications to the UNFCCC establishing the National GHG Inventory (including land-use change), reporting on the first studies of Mexico's vulnerability to climate change and laying out future emission scenarios.³⁷ Mexico is the only non-Annex I country to have submitted a Fourth National Communication. Furthermore, at the end of 2010 Mexico will host the 16th Conference of the Parties of the UNFCCC, demonstrating the country's commitment to combat climate change.

B. CTF Investment Plan

7. The proposed Project was included in the Clean Technology Fund (CTF) Investment Plan (IP) presented to and approved by the CTF Trust Fund Committee on January 26, 2009. The IP is a "business plan" agreed among, and owned by, the Government of Mexico for the International Bank for Reconstruction and Development (IBRD), the Inter-American Development Bank (IDB) and the International Finance Corporation (IFC) to provide support for the low-carbon objectives contained in Mexico's 2007–2012 National Development Plan, its ENACC and its PECC.

8. The CTF IP focuses on measures in three key sectors: Energy Efficiency, Renewable Energy, and Urban Transport; these reflect the Government's priorities, sector implementation readiness, each development finance institution's capacity and focus, and priorities established by the CTF. In this regard, the CTF IP seeks to address low carbon interventions that exhibit relatively low implementation risk and have high emissions reduction potential and/or low abatement costs. The WB's focus on energy efficiency builds on years of development experience and policy dialogue between these institutions and the Government, as most recently exemplified by the Green Growth DPL (P116808) which establishes the policy framework that enables the promotion of cost-effective reductions in the growth of GHG emissions.

C. Proposed Transformation

9. The proposed CTF-cofinanced Project is part of a broader energy efficiency program outlined in the CTF IP. The Project will support the Secretariat of Energy (*Secretaría de Energía*, SENER) in the design and implementation of a large-scale transformational energy efficiency program focusing on efficient residential lighting and domestic appliances (refrigerators and air conditioners) in low-income households throughout the country. The Project includes three components: (i) Component 1: Replacement of Incandescent Bulbs (IBs) with Compact Fluorescent Lamps (CFLs) in the Low to Medium-Income Residential Sector; (ii) Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners (ACs) in the Residential Sector; and (iii) Component 3: Technical Assistance and Institutional Strengthening.

³⁷See <http://unfccc.int/resource/docs/natc/mexnc4s.pdf>

10. Component 1 will not receive CTF funding given the estimated potential for high returns through carbon finance. The municipal street lighting component that was included in the CTF Investment Plan will be initially financed by the GoM through BANOBRAS. This component was separated from the current Project as it presented complexities on top of an already complex project. Consistent with the GoM's intentions to pursue energy efficiency gains in municipalities, BANOBRAS will implement a municipal lighting pilot program that could provide the basis for a follow-on larger scale activity supported with multilateral financing. With regard to efficiency interventions in commercial lighting and public buildings, the GoM is developing a program in these sub-sectors with NAFIN and KfW.

11. Thus, it was determined that the CTF resources under this Project should be allocated to **Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and ACs in the Residential Sector**. This component supports two types of incentives—vouchers and credits for consumers—for the replacement (including collection and scrapping) of approximately 1.7 million old and inefficient refrigerators and ACs over a four-year period as part of the Government's national energy efficiency program. Resources from the IBRD Loan to the Government will finance the vouchers; resources from the CTF Loan to *Nacional Financiera* (NAFIN) will support the credits as follows:

- **Component 2.a.i.: Financing of vouchers for low-income consumers** (including IBRD US\$195 million and GoM US\$55 million). Provision of vouchers as instant discounts to low income consumers to improve their ability to pay for the replacement of inefficient appliances with more energy-efficient appliances.
- **Component 2.a.ii.: Financing of NAFIN's credit line** (including CTF US\$50 million). Provision by NAFIN of credits at favorable interest rates to low-income and other qualifying consumers to pay for the replacement of inefficient appliances with more energy-efficient appliances. A related Guarantee Facility protects NAFIN from credit defaults by consumers (component 2.b).
- **Component 2.b. Capitalization of the Guarantee Facility** (including GEF US\$5 million). Provision by SENER of funds to capitalize the existing Guarantee Facility that protects NAFIN from credit defaults by consumers.

11. In addition, the Government is providing US\$30 million to capitalize the Guarantee Facility that will be complemented by US\$5 million from GEF. NAFIN will provide US\$127 million of internal capital while the "consumer contribution" is about US\$176 million. NAFIN's US\$177 million credit line for a revolving fund will be used to issue just over US\$280 million in loans during the project.

12. This component is designed to remove old and inefficient appliances from operation and ensure that their destruction is environmentally friendly. Environmentally friendly destruction primarily involves correct removal and disposal of CFC-12 refrigerant gases. Under the "business as usual" scenario, malfunctioning and non-repairable appliances are normally disposed of in an ad hoc manner that normally leads to leakage of refrigerant gases. The program provides incentives for consumers to trade in their old refrigerator or air conditioner—which will be dismantled in designated scrapping centers—for new, more efficient appliances. Appliances eligible for replacement must be at least 10 years old and in working condition. Qualifying new appliances are required to be at least five percent more

efficient than the current Mexican norm. The removal and scrapping of the inefficient appliances are crucial aspects of the program because they involve the adequate collection of refrigerants with high global warming potential, as well as the direct replacement of inefficient appliances with efficient new models.

13. The main barriers for the replacement of old and inefficient appliances are the high initial investment costs of new, more efficient appliances, the lack of financing for low-income groups, the perceived risks associated with efficient appliances because of consumers' skepticism about claimed energy savings, and the lack of public awareness of more efficient equipment. By providing incentives to low-income households to purchase new equipment, this Project removes the poor affordability and lack of credit barriers for this segment of the market, ensuring that the old equipment is scrapped and properly recycled to avoid leakage. The program and its marketing will also give credibility to the claims of savings in energy efficiency, raising awareness among consumers and helping them to make better-informed decisions on which technologies to choose when buying such appliances.

14. The market penetration of efficient appliances will be strengthened by price discounts through vouchers, the option to receive a line of credit, and the indirect savings incurred through lower electricity bills. As a result, it is expected that consumers will change their consumption behaviors and become permanent users of more efficient appliances. This market development is also expected to lead to increased competition among suppliers for this new market of efficient appliances; this in turn is expected to drive prices down and thus create a sustained market shift even after the incentive schemes have been exhausted.

D. Potential for GHG Emissions Savings

15. Emissions reduction potential of investment: The replacement of 1.7 million appliances under the Project would generate about 3,600 GWh of electricity savings during the implementation period (through June 30, 2014), thus yielding around 1.85 MtCO₂e of reductions from these savings.³⁸ Given the 10 million appliance market potential, full replication (i.e., 100 percent market conversion from inefficient to efficient appliances) over a 20-year period would yield about 85 MtCO₂e of emissions reductions. Under business as usual (without CTF financing), the country would generate around 145 MtCO₂e of emissions from the use of inefficient appliances over 20 years, while under full replication this will be reduced to approximately 60 MtCO₂e.³⁹

16. Additional emissions reductions: During the project implementation period (through June 30, 2014), an additional 2.2 MtCO₂e would be reduced by the program once the global warming potential (GWP) of the avoided CFC-12 venting is factored.⁴⁰ This program will monitor and verify that the refrigerants from old appliances (mostly CFC-12) are properly collected, stored and disposed of at qualified servicing/scrapping centers. Most old appliances (over 10 years old) suffer from refrigerant leakage, thus requiring regular servicing and recharges. Because only 5,500 technicians out of approximately 60,000 in Mexico have been

³⁸ Considering a grid emission factor of 0.514 tCO₂e/MWh.

³⁹ The average energy consumption was 1.281 MWh/year for inefficient appliances and 0.513 MWh/year for efficient appliances. The average energy savings per appliance (assuming 10 percent T&D losses) were 0.84 MWh/year. The full market is 10 million appliances and the transformation will proceed over 20 years.

⁴⁰ Refrigerators and air conditioners older than 10 years in Mexico commonly contain CFC-12 as a refrigerant in the compressor and coils.

trained to date in good refrigeration practices, the annual vented volume of refrigerants is potentially significant. New appliances typically neither leak nor require servicing during the first four to five years. Even if they do, the GWP of the most common refrigerant currently used for appliances in Mexico is about 1,430 (HFC-134a) whereas the GWP of CFC-12 is as high as 10,890 (a differential of 9,460). Though these emissions reductions (ERs) cannot be accounted for under the Clean Development Mechanism (CDM) due to the rules of the Kyoto Protocol concerning substances controlled by the Montreal Protocol, under the program they are avoided emissions that provide additional environmental benefits. In addition, the World Bank (using Montreal Protocol Multilateral Fund resources) is currently supporting SENER and SEMARNAT in assessing opportunities for financing the destruction of ozone-depleting substances (ODS)⁴¹ through the voluntary GHG market and potentially through the compliance GHG market.

17. Technology development status: The Project does not involve the development of new technology. It will implement technologies that are readily available in Mexico today but face significant barriers.

18. Mexican energy efficiency standards have been strengthened over time through a process of periodic updates. The first set of Minimum Efficiency Performance Standards (MEPS) implemented by the Government of Mexico was enacted in 1994 and took effect on January 1, 1995. Effective dates for initial standards and subsequent updates are as follows:

- *Refrigerators*: Original standard in 1995 (NOM-072-SCFI-1994). Updates in 1997 (NOM-015-ENER-1997) and 2003 (NOM-015-ENER-2002).
- *Air Conditioners*: Original standard in 1995 (NOM-073-SCFI-1994). Update in 2001 (OM-021-ENER/SCFI/ECOL-2000).

19. This update process has brought Mexican efficiency standards in line with some of the world's most stringent standards. Current Mexican MEPS for refrigerators and room air conditioners are equivalent to those in the US and Canada.⁴² The consumption required by the most recent refrigerator standard in Mexico implies a 62 percent improvement relative to the 1994 baseline. By 2005, air conditioners showed a 25 to 35 percent improvement relative to 1994 levels. Testing data collected by the national certification body showed that manufacturers largely complied with the standards.⁹ Furthermore, the data show that manufacturers in most cases exceeded the energy efficiency requirements. This is possibly explained by a desire to export to the US and Canada while avoiding separate production lines for the foreign and domestic market.

20. The 5% efficiency over the current EE standard (required for appliances to be eligible under this program) was determined by the GoM -through CONUEE- for the pilot program and for the expansion under this Project. This target represents efficiency gains in the range of 30-65% relative to the old equipment being replaced. Energy efficiency targets above 5% would reduce the number and affordability of eligible efficient models.

⁴¹ CFCs are a type of ODS.

⁴² "Assessment of the Impacts of Standards and Labeling Programs in Mexico (Four Products)". Itha Sánchez Ramos and Henry Anli Chu Pulido (Instituto de Investigaciones Eléctricas), Michael McNeil, Isaac Turiel and Mirka della Cava (Lawrence Berkeley National Laboratory). The Collaborative Labeling and Appliance Standards Program (CLASP) provided technical review to IIE for this report. January 2006.

E. Cost-effectiveness

21. CTF investment per ton CO₂-equivalent reduced: The direct emissions reduction of about 7.4 MtCO₂e over the useful economic life of the appliances will be achieved with US\$50 million of CTF funding combined with US\$553 million of non-CTF resources. Considering the emissions reductions due to energy savings, the CTF achieves a cost-effectiveness of about US\$7/tCO₂e of avoided emissions. When the emissions reductions due to avoided CFC venting are considered, the CTF cost-effectiveness improves to US\$3/tCO₂e of avoided emissions.

Table 16.1: Cost-effectiveness of CTF resources

Cost-effectiveness	CTF (US\$/tCO ₂ e)
Considering avoided CO ₂ e emissions from electricity savings	6.77
Considering avoided CO ₂ e emissions from electricity savings and avoided CFC emissions	3.08

22. Expected cost reduction of technologies: Real prices of major appliances, such as refrigerators and cooling equipment, have been falling since the late 1970s despite increases in appliance efficiency and other quality increases. In the US, for example, refrigerator efficiency levels (weighted average energy use based on sales) rose 72 percent from 1975 to 2003, while prices declined 62 percent over the same period (NRDC 2008). This effect can be explained by technological innovation (which lowers the cost of efficiency), by market changes contributing to lower markups and economies of scale in production of higher efficiency units,⁴³ and by the ongoing shift of manufacturing from developed countries to developing countries (notably China).

23. The CTF intervention has the potential to accelerate the rate of cost reductions for efficient appliances. The usual form of the experience curve is: $C_n = C_1 n^{-\lambda}$ where

- C_n = cost of the nth unit
- C_1 = cost of 1st unit
- n = cumulative number of units
- λ = elasticity of unit costs with respect to cumulative volume

λ is considered constant such that the cost falls by (1-k) percent each time experience doubles where

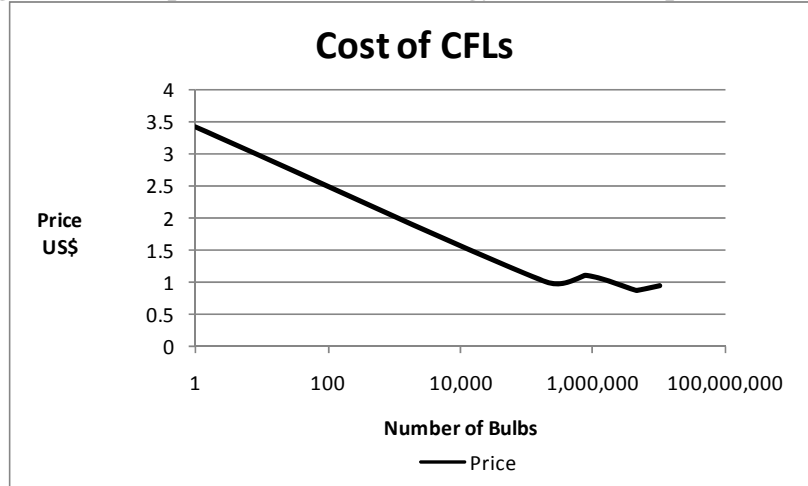
$$1-k = 1 - 2^{-\lambda}$$

24. Although limited experience curve data are available for the efficient appliance market, it is anticipated that market trends will occur, similar to those seen in other energy efficiency programs such as CFL replacement programs⁴⁴. Experience with CFLs (2004–2009) in Rwanda, Uganda, Ethiopia, Philippines and Bangladesh also reveals the experience curve depicted below. The price of CFLs was reduced 6 percent as the number of lamps doubled, if the empirical data from these programs were fitted to the model for the experience

⁴³ “Retrospective evaluation of appliance price trends”, Larry Dalea, Camille Antinoria, Michael McNeil, James E. McMahon and K. Sydney Fujita. Science Direct, Energy Policy, Volume 37, Issue 2, February 2009, Pages 597–605

curve. It is worth noting that the experience curves showing price reduction of CFLs as per increase in purchasing volumes are only presented as an example of experience to support the hypothesis of price reduction as volumes increase. The CFL component of the project however, does not benefit from CTF funding.

Figure 16.1: Experience curve for energy-efficient lamps (2004–2009)



25. Based on the experience curve outlined in Paragraph 23, conservatively assuming that the price of efficient appliances is reduced by a mere 0.25 percent (i.e. 1-k equals 0.25 percent) as the number of appliances manufactured doubles, then the cost of the appliances could be reduced by up to 5 percent if 1.7 million appliances are replaced during the program.

26. The “Retrospective evaluation of appliance price trends”⁴⁵ cited overall technological change (requiring fewer inputs in the manufacturing process for the same number of products), declining markups and economies of scale in the production of higher-efficiency units as contributing to the decline in efficient appliance prices over time. Declining markups and economies of scale are more likely to occur during the rollout of this program. By targeting a significant percentage of the market and involving retailers in the rollout, the Project will increase competition among retailers, thereby forcing a reduction in the retail price relative to the production cost. The large market share targeted will also reduce the average production cost of efficient appliances as the fixed costs of production are distributed over a larger number of products. The scale of the program creates a feedback effect among consumer demand, retail prices and production costs that can realize the transformational potential of the investment.

F. Demonstration Potential at Scale

27. The penetration of residential energy-efficient end-use appliances, such as refrigerators and ACs, has often relied on large-scale programmatic interventions by governments, mainly implemented through utilities. To date, several countries, including Brazil, the EU, the US and Cuba, have executed successful refrigerator replacement programs. An air conditioner replacement program also took place in Thailand. Successful

⁴⁵ “Retrospective evaluation of appliance price trends”, Larry Dalea, Camille Antinoria, Michael McNeil, James E. McMahon and K. Sydney Fujita. Science Direct, Energy Policy, Volume 37, Issue 2, February 2009, Pages 597-605

programs usually involved a demonstration phase, upfront market research and effective publicity. Dozens of countries (including Argentina, Bangladesh, Bolivia, China, Cuba, Ethiopia, India, Mexico, Philippines, Rwanda, South Africa, Sri Lanka, Thailand, Uganda and Vietnam) have promoted efficient light bulbs, mostly CFLs, through bulk procurement and distribution. Bulk purchases, utility financing and negotiated bulk discounts have been successful in bringing down incremental costs.

28. Demonstration is essential for financiers who assess an inordinate amount of risk for energy efficiency projects. NAFIN's high risk aversion, by requiring a Guarantee Facility that provides protection from residential client defaults, is an expression of concern about consumers' ability to repay loans through their electricity bills. Defaults were only 0.75 percent during the pilot program. However, the program's expansion and the increased focus on low-income consumers provide a higher perceived risk from financiers.

29. Demonstration is also critical to develop institutional capacity, creating a level of comfort within financial institutions to analyze and appropriately structure deals. Demonstration will therefore specifically address financial barriers, such as banks' risk-averse lending practices and financial institutions' lack of relevant expertise and capacity to analyze and appropriately structure energy efficiency deals.

30. Transformation potential: The pilot appliance replacement program implemented by SENER in 2009 reveals that attractive financing together with public support are necessary to gain traction. Typically, when a new refrigerator or AC is purchased, the old appliance remains in operation elsewhere; new appliances are purchased for households with higher incomes and the old appliances are passed on to poorer households. This Project breaks the dynamic by requiring that all consumers turn in their old appliance in exchange for the new one. In addition, size restrictions on eligible refrigerators and air conditioners ensure that consumers do not simply upgrade to a larger appliance, with the increased size offsetting any energy efficiency gains.

31. The Government estimates that 10 million inefficient appliances are currently in use and could potentially be eligible under the program. The proposed Project seeks to replace 1.7 million of these over a four-year period, targeting 17 percent of the market which is the critical mass necessary to generate interest from additional consumers and financiers. The 1.7 million efficient appliances send a strong signal for an increase in supply of more efficient models.⁴⁶ The scale of the operation is likely to demonstrate the energy savings that can accrue in more efficient residential products. As a greater number of consumers become aware of the cost savings that can be realized through the investment, a push for more efficient product choices from retailers will continue driving the market transformation. The transformational path of this intervention can be summarized as follows:

- i. Demonstration effect from scale, creating a high level of awareness in consumers and financiers;
- ii. Altered trajectory of the efficient appliance market in Mexico by increased private sector participation (retailers, carbon funds); and

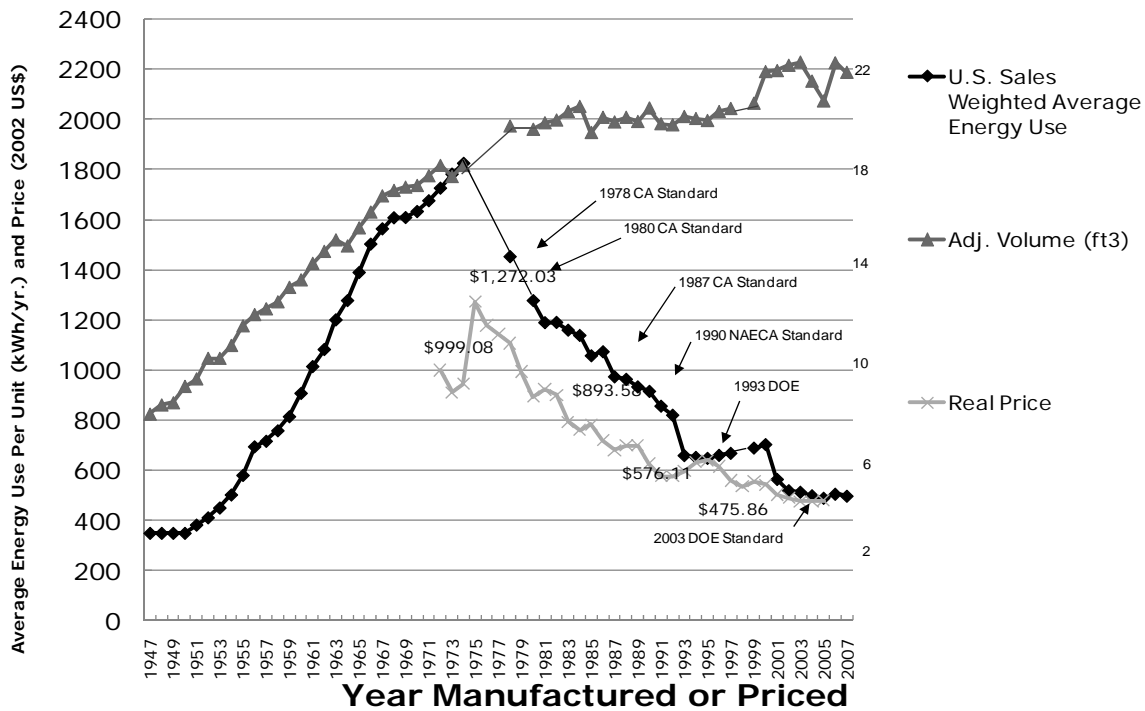
⁴⁶ "The experience of developed countries with energy-efficiency equipment substitution programmes," prepared by Navigant Consulting (March 2010), discusses the evidence supporting the decline in the cost increment for initial appliances once these appliances become mainstream.

iii. Attainment of benefits such as increased affordability of efficient appliances; these benefits extend beyond climate change to core development benefits (improved standard of living).

32. Minimum Efficiency Performance Standards (MEPS) effectively control appliance manufacturers by ensuring that only acceptable, efficient appliance models are available for sale. On the other hand, energy labeling educates consumers; its aim is to encourage more energy-efficient choices when consumers purchase appliances. These policy instruments have worked well together to transform the average appliance stock efficiency level in Organization for Economic Co-operation and Development (OECD) countries. As an illustration, average refrigerator prices in the US have steadily decreased since the 1970s even as efficiency levels rose due to US Government promotion, increased demand and more competition for the higher-end market.

33. Figure 16.2 shows the significant decrease in the average energy use per unit even as the volume of units continues to rise. However, in developing countries such as Mexico, refrigerator and AC ownership levels are more influenced by affordability. Old appliances that are replaced in one household typically end up in operation in another, lower-income household. Thus, while energy efficiency standards and appliance labeling do contribute toward improving average appliance stock efficiency levels, the improvement will not be as transformational in Mexico as was observed in the United States with these two policy tools alone. In Mexico, financial incentives, together with information and awareness campaigns, must complement energy efficiency standards and energy labeling so as to achieve the market transformation observed in other OECD countries.

Figure 16.2: US refrigerator energy use versus time with real price



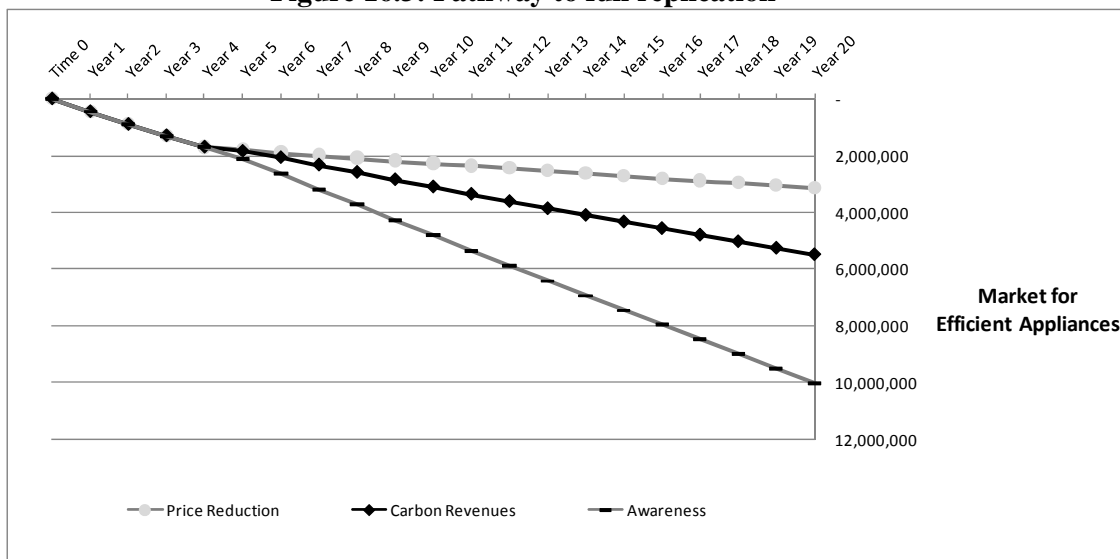
34. The CTF will serve as the catalyst for a transformation that will occur over 20 years (the term of the CTF Loan). In years 1 through 4, the Government will be providing cash

incentives in the form of instant discounts to stimulate the purchase of efficient appliances. These cash incentives, when combined with a convenient line of credit supported by a CTF loan, will expand the market for efficient appliances to 1.7 million appliances (17 percent of the market), assuming that the number of appliances eligible for replacement under the program are offset by the number of appliances that become obsolete.

35. Many markets in which efficient appliances are not the norm also suffer from a linked supply-demand problem: suppliers do not offer a wide variety of efficient models because such models are not in demand. By providing the first element of traction, CTF resources and Government cash incentives will focus on making typically expensive, efficient appliances more affordable to low-income consumers. These first four years of the program could be regarded as an incubation period in which the investments that are made establish traction for the program going forward, as visualized in Figure 16.3. The price reduction is the first element of traction, thus the reason for Government cash incentives. Although the price reductions through Government incentives will decline after the fourth year of the program, the growth in the market for efficient appliances over the first four years will result in more implicit price reductions. As the size of the efficient appliance market grows, increased competition among retailers will yield reduced retail margins. As demand for appliances grows, the fixed cost of manufacturing is spread over a greater number of appliances, resulting in reduced average production costs. Once the explicit price reductions cease, these implicit price reductions take full hold and will be responsible for another percentage of the total transformation of the efficient appliance market. Some evidence from other country case studies indicates that full replication is achievable.

36. Carbon revenues, the second element of traction for the program, are realized with some lag because the program needs to be registered under the UNFCCC CDM. Over time, carbon revenues are expected to support the financial costs of scrapping the inefficient appliances.

Figure 16.3: Pathway to full replication

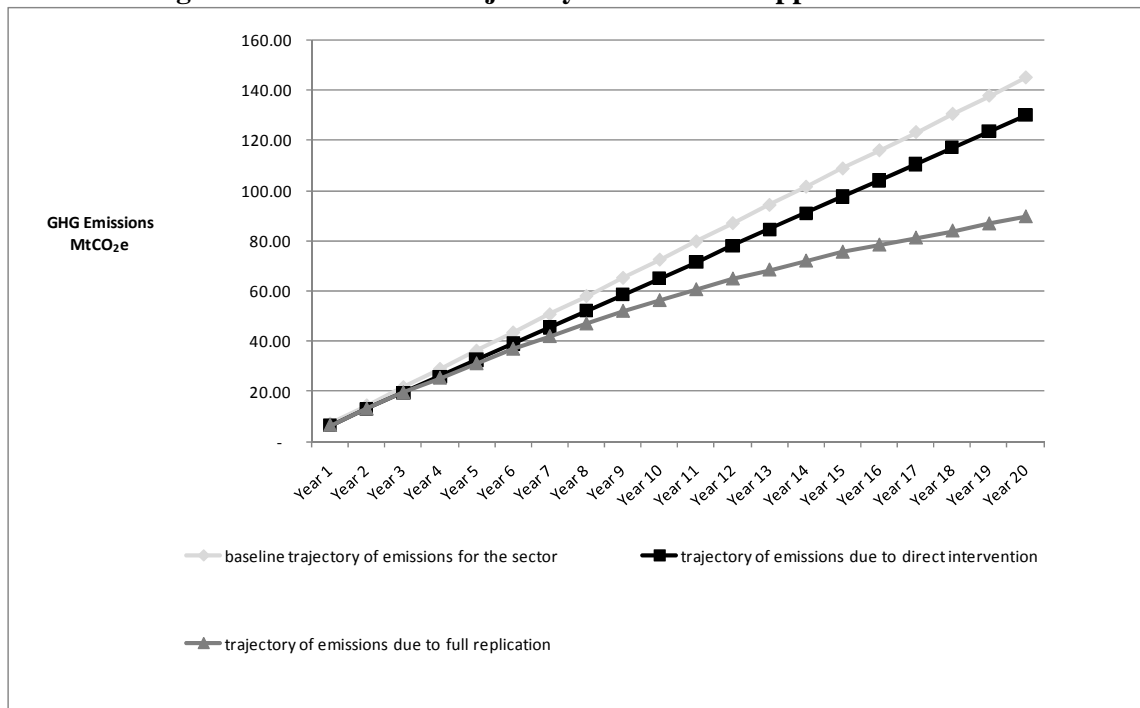


37. Awareness, the third and final element of traction, is undoubtedly a very important factor in the transformation of the market and will be responsible for the remaining percentage of the transformation. Awareness is developed by the demonstration effect of the

appliances in use and realization of the significant energy savings in practice. This is necessary for sustainability because the value of the transformation is in the appliances themselves. The energy savings are not only sufficient to provide a payback on the investment, but they also contribute to the overall standard of living. Awareness campaigns have proved to be effective vehicles for facilitating market transformation and encouraging the adoption of energy-efficient measures. During South Africa’s electricity-saving efforts in 2006, a “Power Alert” icon was displayed on the principal television channels on weekday evenings. The icon indicated the level of strain on the electricity supply and urged people to switch off their appliances when the icon indicated a significant strain. Surprisingly, this real-time awareness created a voluntary reaction by the public, resulting in energy savings of 400 MW.⁴⁷

38. The GHG trajectories for the baseline, the Project, and full replication are all shown below. While the Project itself yields a 10 percent reduction in GHG emissions from appliances in 10 years, full replication could yield a 60 percent reduction, resulting in a transformation potential of 6:1.

Figure 16.4: Emissions trajectory of residential appliance sector⁴⁸



Development Impact

39. The proposed Project is fully consistent with the Mexico–World Bank Group Country Partnership Strategy (CPS) for FY08–FY13 (Report No. 42846-MX) and the CPS Progress Report (Report No. 52776-MX, February 2010). The CPS focuses on the following strategic areas: accelerating growth, improving competitiveness, promoting social inclusion and

⁴⁷ “Managing an Electricity Shortfall: A Guide for Policymakers.” World Bank, January 2010.

⁴⁸ Although full replication is expected to occur over 20 years, emissions trajectories are presented over 10 years to facilitate a comparison with the proposed intervention.

reducing poverty, developing infrastructure and assuring energy security, strengthening institutions, and assuring environmental sustainability. The proposed Project will contribute to several interrelated CPS objectives, as follows:

(a) The Project aims to reduce electricity consumption by introducing more efficient technologies in the residential lighting sector throughout Mexico and by replacing old and inefficient appliances (refrigerators and air conditioners). The proposed EE measures provide direct benefits to end-users such as households (lower electricity bills) as well as to the Government (avoided new generation capacity, lower fuel consumption, reduced electricity subsidies). These energy efficiency measures will contribute to Mexico's energy security and competitiveness.

(b) Mexico has taken a major leap forward in integrating climate change considerations into its infrastructure and social programs under the *Programa Especial de Cambio Climático* (PECC). The Project will support these climate change mitigation efforts by introducing energy efficiency measures that will reduce GHG emissions.

(c) By providing free CFLs to low-income households under Component 1, and vouchers and credits at favorable interest rates to low-income consumers under Component 2, the Project also supports the Government's social objectives of promoting social inclusion.

40. The Project is also a cornerstone of Mexico's strategy for meeting the dual objective of enhancing energy security and mitigating climate change. These goals would be achieved by increasing the use of energy-efficient technologies at the residential level and by promoting the development of a sustainable market for energy efficiency equipment among the large and fast-growing energy end-use sectors for lighting, refrigeration and air conditioning. These actions will reduce GHG emissions caused by electricity generation based on fossil fuel consumption. The Government recognizes that reducing demand for electricity (including peak demand) brings a variety of economic and other benefits, notably:

- (a) savings from avoided or delayed capital investment for new power generation capacity;
- (b) savings from avoided tariff subsidy payments;
- (c) savings from avoided operating costs, notably for fuel (including imported gas);
- (d) benefits to Mexico's trade balance and related macroeconomic factors by reducing the amount of gas imports;
- (e) benefits to Mexico's population, notably its poorer households, by improving affordability (i.e., same quality of consumption of lumens, etc., at a lower price);
- (f) benefits to the climate change agenda by reducing GHGs through reduced energy consumption and avoided power generation capacity;
- (g) local environmental and health benefits by reducing pollutants such as fine particulates, sulfur, nitrogen and hydrocarbons related to fuel combustion; and
- (h) benefits to the manufacturing and service sectors resulting from additional business activity related to additional energy efficiency activities, such as appliance replacement and public lighting.

41. Potential efficiency gains: Baseline energy consumption by inefficient appliances has been estimated at 1.281 MWh/year while energy consumption by new and efficient

appliances has been estimated at 0.513 MWh/year. Therefore, the Project represents a 60 percent improvement in efficiency for the residential sector.

42. Impact on reducing energy supply costs and/or increasing reliability of power for industry and business: The estimated reduction in consumption due to CTF-supported measures yields 1,400 MW of conserved capacity. The alleviation of infrastructure constraints and discounted infrastructure investments for new generation improve energy security without hindering economic growth.

43. Environmental co-benefits: These include reduced local and regional environmental pollution from avoided electricity generation (environmental impacts are assessed in terms of emissions avoided by reductions in energy consumption). For each GWh not consumed, a certain amount of pollutants are not emitted, including greenhouse gases (CO₂, NO_x, SO_x), carbon monoxide and suspended particles.

44. Additional co-benefits: Avoided CFC-12 venting is an additional yet significant environmental benefit of the appliance replacement and scrapping scheme because of its high ODS potential and high GWP (over 10,000 times that of CO₂e). This program will monitor and verify that the refrigerants from old appliances (mostly CFC-12) are properly collected and stored/disposed at qualified servicing/scrapping centers. Most old appliances (over 10 years old) suffer from refrigerant leakages, thus requiring regular servicing and recharges. The economic effects of stratospheric ozone depletion identified by the World Health Organization (WHO) and the United Nations Environment Programme (UNEP) include reduced human immune responses (increasing the incidence of infectious disease and reducing the efficacy of vaccination programs), disrupted growth processes in plants (leading to reduced yields for certain crops and forest trees), and disrupted development in fish (estimated to reduce ocean fish stocks by several million tons per year).

G. Implementation Potential

Country/sector strategies

45. To achieve its energy efficiency and climate change mitigation goals, the Government has developed a national strategy that lays the groundwork for the implementation of a comprehensive energy efficiency plan. The strategy includes regulatory changes accompanied by the institutional strengthening of key government agencies, and the establishment of financial mechanisms to implement key programs and projects. Key measures are described below:

- a. On the regulatory side, the Sustainable Use/Energy Efficiency Law (*Ley para el Aprovechamiento Sustentable de la Energía*) was signed into law in November 2008. This law establishes the enabling environment for promoting energy efficiency in the residential, commercial and industrial sectors by providing the legal framework for the development and implementation of strategies, policies and programs.
- b. In July 2009, SENER issued the National Strategy for the Energy Transition and Sustainable Use of Energy (*Estrategia Nacional para la Transición Energética y el Aprovechamiento Sustentable de la Energía*). The Strategy outlines the framework to promote policies, programs, actions and projects

aimed at increasing the use of renewable energy, and to promote energy efficiency and energy conservation in order to decrease the use of fossil fuels.

- c. The Government's 2007–2012 Energy Sector Program (*Programa Sectorial de Energía*, PROSENER) provides a comprehensive policy framework that addresses energy security, technical efficiency, environmental sustainability and climate change. PROSENER identifies three goals in the energy sector: (i) to balance and diversify the primary sources of energy (e.g., reduce the share of fuel oil and coal-based generation from 38 to 30 percent by 2012 and increase the share of non-hydro renewable energy sources for power generation from 2 percent in 2006 to 6 percent by 2012); (ii) to promote the efficient production and use of energy in all sectors (e.g., increase energy savings from 21,686 GWh in 2006 to 43,416 by 2012); and (iii) to promote greater energy efficiency and conservation of electricity in the residential sector.
- d. On the financial side, the Trust Fund for the Energy Transition and the Sustainable Use of Energy (*Fideicomiso para la Transición Energética y el Uso Sustentable de la Energía*, FIDE), also referred to as the “EE Trust Fund”, provided for in the Renewable Energy Law has been established with the purpose of increasing financing to advance the energy transition from hydrocarbons to renewable energy and energy efficiency. The Fund can provide loans, credits, guarantees or other financial support to projects that comply with the National Strategy for the Energy Transition and Sustainable Use of Energy. The Government of Mexico made an initial contribution of US\$60 million to the Fund in 2009 to support a pilot appliance replacement program. In 2010, the Fund received an additional US\$125 million to be used for energy efficiency and renewable energy projects.
- e. On the institutional front, the National Commission for the Efficient Use of Energy (*Comisión Nacional para el Uso Eficiente de Energía*, CONUEE) has been established as provided in the Sustainable Use/Energy Efficiency Law, drawing on the staff and institutional capacity of the former National Commission for Energy Savings (*Comisión Nacional para el Ahorro de Energía*, CONAE). CONUEE's responsibilities include: (i) issuing recommendations to states, municipalities and individuals in relation to best practices for the sustainable use of energy; (ii) providing technical assistance on the sustainable use of energy to the agencies of the Federal Public Administration and to state governments and municipalities; and (iii) implementing the National Information Subsystem for the Sustainable Use of Energy (*Subsistema Nacional para el Aprovechamiento Sustentable de la Energía*). The creation of CONUEE provides a clearly differentiated distribution of responsibilities between SENER, which is in charge of sector planning, and CONUEE, which is in charge of the promotion of the sustainable use of energy in all sectors and levels of Government and the implementation of the National Program for the Efficient Use of Energy (*Programa Nacional para el Uso Eficiente de la Energía*).

46. The strategies and programs are supported at the operational level by two independent entities (legally established as trust funds): the private-sector Trust Fund for Electricity Savings (*Fideicomiso para el Ahorro de Energía Eléctrica*, FIDE) and the public-sector Trust

Fund for Energy Savings through Home Insulation (*Fideicomiso para el Programa de Aislamiento Térmico*, FIPATERM). Both FIDE and FIPATERM were established in 1990 at the initiative of CFE and today serve as key vehicles for implementing energy efficiency programs. FIDE encourages electricity conservation in most electricity-consuming sectors. It is 20 percent controlled by CFE; the other shareholders include public and private entities. While FIDE operates mainly in the central states of Mexico, FIPATERM serves a similar function to FIDE in several northern and southern states.

Institutional arrangements

47. **Overall organization.** SENER is responsible for overall oversight, and is the World Bank's main counterpart for the Project. SENER is composed of several directorates, including: (i) the Directorate General for Promotion and Investments (*Dirección General de Promoción e Inversiones*, DGPI), which has principal responsibility for Component 1, and (ii) the Directorate General for Distribution and Supply of Electricity and Nuclear Energy (*Dirección General de Distribución y Abastecimiento de Energía Eléctrica y Recursos Nucleares*, DGDSENR), which has principal responsibility for Component 2. Each directorate is also involved in the studies and other capacity-building activities to be carried out under Component 3.

48. To support these directorates and to strengthen SENER's ability to provide monitoring, financial management, reporting and other oversight functions, the Project will use the unit that has been established established within SENER under the Integrated Energy Services Project) to provide administrative support. This Energy Efficiency Administrative Unit (EEAU) will report to the two SENER Directorates involved in Project implementation. The EEAU's responsibilities will include providing financial management services for the overall Project and procurement services for the activities to be undertaken by SENER under Component 3.

49. As head of the energy sector, SENER is largely a regulatory and policy development agency with limited capabilities to implement projects. SENER faces both operational and budgetary constraints, requiring that other entities participate in Project implementation. In this context, the proposed implementation arrangements rely on several entities: FIDE, FIPATERM, CFE, CONUEE and NAFIN. The implementation arrangements for each component are briefly described below. Detailed implementation arrangements are described in Annex 6.

50. **Component 2: Incentives to Encourage the Replacement of Old and Inefficient Refrigerators and Air Conditioners in the Residential Sector.** DGDSENR is responsible for the design and overall oversight of Component 2. In this regard, DGDSENR provides guidance on strategic issues such as the structuring of the voucher program and the credit line, and the eligibility criteria for households.

51. The implementation arrangements for Component 2 build on the existing appliance replacement pilot program.

- The replacement of refrigerators and ACs takes place via eligible retail stores (see Annex 6) in Mexico. Participating retail stores sell qualifying energy-efficient refrigerators and ACs to consumers and also deliver the consumer's old and inefficient appliance to the scrapping centers.

- FIDE will be primarily responsible for the various operational aspects of the appliance replacement program. These aspects include reviewing consumer eligibility, managing payments to the retail stores under the vouchers and the credit lines, verifying compliance of sales with the program's requirements, and supervising the component (this includes compliance with the Operational Manual).
- CFE is responsible for managing the flow of funds under Component 2a from SENER to FIDE to issue the payments to the retail stores under the vouchers, and for administering the repayments under subcomponent 2b which are made through CFE's electricity billing system.
- NAFIN is the provider of the credit lines under Component 2b and will appoint FIDE to administer the credit line, including the verification of credit documentation and the issuance of payments to retailers.
- The Guarantee Facility will be funded by SENER and will be administered by NAFIN.

Sustainability

52. The sustainability of the Project is supported by several factors. These include a strong Government commitment, the anticipated positive demonstration effects of efficient household-level electric appliances, and various complementary actions beyond the Project's scope.

53. Government commitment: The Government is strongly committed to energy efficiency, as reflected in the approval of the Energy Efficiency Law, the development of the associated regulatory framework and the launching of the pilot CFL and appliance programs as key priorities supported by the Government. Energy efficiency is also an integral part of the Government's climate change mitigation strategy, as presented in the PECC. This context evidences the broad and deep-rooted commitment to energy efficiency and related areas of climate change and enhanced energy security; this commitment provides a strong supportive context to promote the sustainability of the activities and benefits to be derived from the Project.

54. Demonstration, market penetration and related effects: By encouraging the replacement of appliances through incentives (vouchers and/or credits) to a large number of consumers, the program will allow these consumers to experience the benefits of these energy-efficient appliances and to demonstrate these benefits to other households. Increasing the market for these appliances should help to drive their price down, thereby increasing affordability for additional exchanges.

55. Complementary technical assistance: Several of the technical assistance activities under Component 3, such as the standards and labeling programs, will also support the sustainability of the replacement activities. In addition, the information and awareness campaigns under Component 3 will reach a broader population beyond the households directly benefiting under the Project, thereby helping to create a broader context of support for the use of energy-efficient electrical appliances at the residential level. In addition, increased awareness by consumers will likely affect behaviors in other segments, such as the business and Government sectors.

56. Complementary energy efficiency actions: The sustainability of this effort will be supported by similar energy efficiency activities in other segments of the economy. For example, the Government is developing energy efficiency programs for the industrial, commercial and public lighting sectors. Once the cost savings and energy efficiency benefits of programs in these sectors are realized, together with the market development of residential lighting and appliance programs through this Project, a ripple effect is expected across a broad-based market in Mexico for the targeted technologies and sectors.

Leverage

57. US\$50 million from the CTF are leveraged at a rate of nearly 1:11 since approximately US\$553 million in financing is being mobilized from the following sources:

For appliance-replacement vouchers:

- US\$195 million IBRD Loan to the Government
- US\$55 million of the GoM's own resources

For NAFIN's line of credit to issue appliance loans (estimated at US\$177 million)⁴⁹:

- €25 million (US\$32.5 million at an exchange rate of 1.3US\$/€) from KfW
- US\$94.5 million from NAFIN's own resources

58. The "consumer contribution" is US\$176 million. In addition, a US\$5 million GEF Grant and US\$30 million from the Government will be used as a Guarantee Facility for NAFIN-issued credit lines for appliances.

H. Additional Costs/Risk Premium

59. In order to be transformational, this Project must target a sizable share of the market – estimated at and between 15 to 20 percent of the appliance market and which includes a significant number of low income consumers (this program targets 17 percent of the market). However, two barriers constrain the achievement of this scale of intervention.

60. First, FIDE, the organization mandated by the Government of Mexico to implement the program does not have sufficient institutional capacity to increase project scale from pilot (its current status) to a large-scale operation. . Second, the poor credit profile of low income consumers is perceived as an above-average lending risk by NAFIN, as a result of which a risk premium is required for funding at this scale. .

61. The concessional element of CTF funding, blended into the overall financing package, addresses these two barriers. First, NAFIN is able to transfer the benefit from the reduction in its cost of capital by providing an additional 1 percentage point spread of interest payments to FIDE. In the absence of concessional finance, NAFIN's weighted average cost of capital for the program would be 6.2% and its standard practice would be to assign a 1 percent spread of interest payments to FIDE. CTF financing reduces NAFIN's weighted average cost of capital to 5.4%.

62. By transferring the benefits of this concessional element to FIDE, its spread of interest payments increases from US\$6.5 million to US\$13 million over eight years. This will give

⁴⁹ See Annex 9, paragraphs 16 through 21 for calculations leading to US\$177 million of new cash that NAFIN must inject into the program.

FIDE the necessary capacity to implement the large-scale replacement. Strengthening of FIDE will also develop NAFIN’s institutional comfort with the risks of energy efficiency investments and would also enable FIDE to implement enhanced awareness campaigns to generate more traction in Level 4 (residential consumers with the highest consumption) which showed the lowest number of replacements in the pilot program.

63. Second, the reduction in the cost of capital reduces the hurdle rate to be cleared for NAFIN to be adequately compensated. The reduction in the discount rate reduces the risk of financial loss on the project. With a reduced risk of financial loss, NAFIN reduces the size of the Guarantee Facility while committing to issue the same dollar value of loans. The reduction of the Guarantee Facility from 15 percent to 12.5 percent of the total dollar value of loans issued frees government resources to be redirected to the cash incentives as a driver for the replacements under level 1 to 3, and thereby increasing the leverage of CTF funding.⁵⁰

Table 16.4: Financing Costs

	CTF(US\$)	KfW (€)	NAFIN
Market Rate (Mexican Pesos)	6.30%	6.30%	6.30%
Loan Rate (foreign currency)	0.75%	3.75%	--
Currency Swap Rate	2.55%	2.05%	--
Value of concession	3.00%	0.50%	--
Cost of Capital	3.30%	5.80%	6.30%

64. The following table summarizes the “Without CTF” and “With CTF results”.

	“Without CTF” scenario	“With CTF” scenario
WACC	6.2%	5.4%
NPV (US\$ million)	13	15

65. In summary, CTF loan proceeds will capitalize a revolving line of credit that makes the large scale transformation of the residential appliance market possible. The voucher amounts offered by SENER will decline over time because of cost reductions as experiences and market volume build and as generated carbon revenues replace the subsidy currently provided for exchange and scrapping. Together these factors will contribute to the intervention’s affordability and sustainability.

⁵⁰ A proxy for determining whether a consumer is a low- to medium-income household is its level of electricity consumption. Different levels of benefits are provided to different tiers of consumers, with lower tiers receiving larger amounts of vouchers.

Annex 17: Financial Intermediary Lending Assessment

MEXICO: Efficient Lighting and Appliances Project

1. The appliance replacement component under the proposed Project involves the granting and financing of a credit, on affordable terms, to eligible households for the acquisition of energy-efficient appliances. In reference to OP 8.30 on Financial Intermediary Lending applicable to Bank loans made available to financial intermediaries for on-lending, this Annex provides a brief discussion of the macroeconomic and financial sector context within which the proposed operation takes place, as well as an assessment of the institutional and financial viability and soundness of the proposed subcomponent.

2. From the start it should be kept in mind that the proposed operation is not a Financial Intermediary Loan with objectives to strengthen the working and efficiency of the financial sector or promote the development of the participating financial intermediaries. Instead the proposed investment operation aims at accelerating the replacement of old, inefficient appliances in the residential sector, in particular by lower-income households, by lowering the acquisition and financing cost of new and more energy-efficient appliances and by lifting credit constraints that qualifying consumers may face.

3. Lowering the acquisition cost is achieved by an up-front voucher that is targeted to lower-income households and funded through the government budget, with financial assistance under the proposed operation. The lower financing cost is attained by an innovative debt service payment scheme that relies on the periodic payment of electricity bills, thereby reducing payment transaction costs and lowering credit risk, because failure to pay the electricity bill leads to a suspension of connection to the electricity grid. In addition, a funded public sector guarantee to pay for first losses from lack of debt service payment and loan default allows for a lower end-user interest rate because the financial intermediary can reduce the amount of loan loss provisions by at least the amount of the guarantee. Finally, a lower cost of funding by making use of preferential multilateral credit lines may further diminish the credit cost to the final beneficiary, reduce the amount of the public sector guarantee or increase the scale of the operation through an upgrade in the administrative control systems financed by a part of the financial intermediation margin. The environmental and economic benefits of the project justify the costs associated with this project component (see Annexes 9 and 10).

A. Macroeconomic framework

4. The Mexican economy is starting to recover from a deep contraction of economic activity following the global economic and financial crisis. As a relatively open economy, Mexico was hard hit by the collapse of international trade during the last quarter of 2008 and the first quarter of 2009. As a result, annual economic growth in 2008 reached only 1.3 percent and GDP actually contracted by 6.5 percent in 2009.

5. Prior to the onset of the economic crisis, Mexico experienced moderate growth within a framework of macroeconomic stability. GDP growth averaged 3.8 percent annually between 2004 and 2007. The Government of Mexico maintains a solid track record of keeping the public sector deficit under control and reducing the public sector debt-to-GDP ratio. The conduction of monetary policy, under a framework of inflation targeting and a 3 percent medium-term price inflation objective, has successfully contributed to an environment of enhanced price stability. Public sector debt management has favored the

issuance of domestic-currency-denominated debt as well as an extension of the maturity of this peso debt and the creation of a fixed rate yield curve up to 30 years.

6. The severity of the economic downturn led the authorities to reduce their target for the overnight interbank interest rate by an accumulated 375 basis points between January and July of 2009, from 8.25 to 4.50 percent. The economic recession reduced consumer price inflation to 3.6 percent by the end of 2009. The Central Bank is projecting a temporary, one-time increase in consumer price inflation in 2010, to around 5 percent by year-end, due to tax and public sector price increases included in the 2010 budget. The monetary authorities have left the policy intervention rate unchanged in view of the temporary nature of the price increases as well as economic activity below potential output. The Central Bank currently expects to attain its medium-term inflation objective by the end of 2011.

7. Following the global economic recovery, economic activity in Mexico is showing a rebound. In line with global recovery, economic activity in Mexico picked up in the second half of 2009 and is off to a strong start in 2010. The recovery is led by resurgence in the demand for exports. Taking into account the depth of the recent recession, the current economic outlook for Mexico is that the economy will continue to operate below its potential output at least until 2012. Overall, the macroeconomic prospects of Mexico are reasonably stable.

B. Financial sector context and consumer credit in Mexico

8. Despite having a diverse, sophisticated financial system, Mexico faces a level of financial penetration that is significantly below what might be expected in view of its GDP per capita. In terms of credit to the private sector provided by banks and other financial intermediaries (as a percent of GDP), Mexico is at 23.5 percent, significantly below countries such as Chile and Brazil at 86.5 and 54.5 percent, respectively.⁵¹ Numerous other indicators confirm a picture of limited penetration and use of financial services, particularly in rural areas and among lower-income groups.

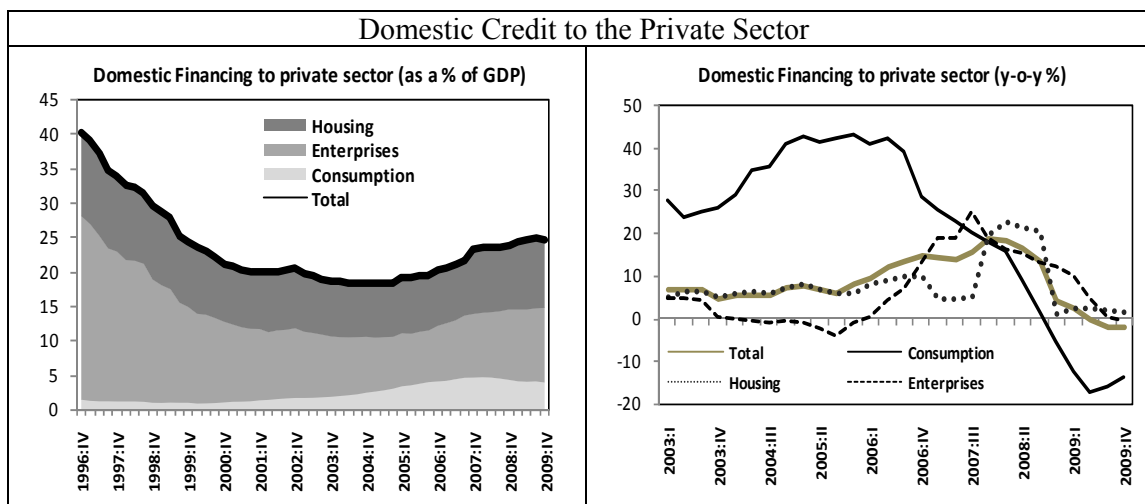
9. Increasing access to the financial system in Mexico and a broader financial inclusion agenda are part of the government's development agenda aimed at accelerating economic growth and improving the population's standard of living. Numerous government actions have been identified and are being implemented to increase the use of financial services, ranging from allowing the entrance of new participants and issuing regulation for branchless banking services, including mobile banking, to requiring the industry to provide better disclosure of information to consumers and enhance consumer protection services.

10. As measured by some indicators, significant progress has been achieved recently in increasing the number of people and the use that they make of financial services in Mexico. According to a survey commissioned by SHCP,⁵² the number of people in the 19 to 44 age group who have at least one financial service (checking account, debit card, credit card, personal loan, investment account or insurance contract) with a bank or other financial

⁵¹ Data for 2008 from the revised Financial Structure Dataset, January 2010, following Thorsten Beck, Asli Demirgüç-Kunt and Ross Levine (2000), "A New Database on Financial Development and Structure," World Bank Economic Review 14, 597-605.

⁵² SHCP *Uso de Servicios Financieros (Cultura Financiera)* National Household Survey. April 2009.

institution amounts to 59 percent of the total number of people in that age group in 2009, compared to only 45 percent in 2007.⁵³



11. Total domestic credit to the private sector began to expand, in real terms and as a percent of GDP, as of 2003 after a long period of credit contraction following the 1995 banking crisis (Figure 1a). The credit growth even reached double digit rates between 2006 and mid -08, initially due to strong growth in consumer credit followed subsequently by stronger credit growth in the housing finance and business segments (Figure 1b).

12. Consumer credit expanded at high annual rates of growth for an extended period, led by the credit card business, and currently accounts for about 16 percent of total domestic credit to the private sector. Total consumer credit outstanding by the end of 2009 amounted to nearly 5 percent of GDP and the equivalent of approximately US\$40 billion. However, a rapidly increasing nonperforming loan portfolio led financial intermediaries to drastically cut back on consumer credit and the number of credit cards as early as the beginning of 2008, i.e., even before the international financial crisis hit Mexico.

13. The Central Bank estimates an increase in nonperforming loans in consumer credit from about 5 percent in 2005 to 13.4 percent in the first quarter of 2008 and 20.7 percent in the first quarter of 2009⁵⁴ based on an adjusted nonperforming loan index.⁵⁵ For comparison, the level of nonperformance in housing finance is significantly lower at approximately 5.3 percent of the total loan portfolio. The significantly higher nonperforming loan portfolio ratio in the credit card business is an important element for substantially higher interest rates applied to this kind of lending to households compared, for example, to housing finance. Average annual interest rates on credit card-based consumer lending moved between 30 and 35 percent from 2007 to 2009. In contrast, average annual interest rates on mortgage financing are substantially lower at about 12 percent due to the strong underlying guarantee. Consumer lending with strong collateral, such as car financing, also shows substantially lower interest rates at about 15 percent.

⁵³ Excludes people with only a mandatory pension account contract.

⁵⁴ *Banco de Mexico* Report on the Financial System, June 2009.

⁵⁵ In addition to the traditional nonperforming loan portfolio, the Central Bank also estimates an adjusted nonperforming loan index that takes into account the write-offs that banks have incurred on their consumer loans during the previous twelve months.

14. The limited penetration of financial services in Mexico and the lack of access of lower-income households to affordable consumer credit, as well as the relatively high interest rates prevailing in unsecured consumer lending, motivate the inclusion of a public sector-supported financing component in the electric appliance replacement program.

C. Lending and on-lending terms and Guarantee Facility

15. Building on the existing relationship between the power utility (CFE) and its consumers, public support in providing finance makes credit available to all eligible households, including those at lower-income levels, at a substantially lower and more affordable rate. The program reduces the cost of credit to the end-user by lowering the risk of nonpayment and loan default because debt service payments are included in the monthly or bimonthly electricity bills. Because consumers have an interest in maintaining their connection to the grid, their propensity to pay their bills is expected to be higher than the compliance of paying a self-standing, almost unsecured consumer loan. It should be noted that project parameters do not mandate a lending rate; it simply reduces risks and costs.

16. During the initial pilot phase of the program, nonpayment has been limited to approximately 0.75 percent of the outstanding loan amount. However, it should be mentioned that the program began about a year ago, implying a rapidly growing outstanding loan amount while loan delinquency tends to increase with more mature loans; both elements depress the nonperforming loan to outstanding loan amount ratio. There are obviously more data available on nonperformance in general, unsecured consumer lending, although that experience does not include linking debt service payment to the payment of a periodic, essential service such as electricity.

17. The guarantee provided by the public sector to cover first loan losses allows for a further reduction of the interest rate by reducing the risk premium related to the possibility of nonpayment. The reduction of the risk premium and, as a result, of the interest rate charged to the final beneficiary will be at least the amount of the guarantee and is potentially larger in case one allows for a relation between nonpayment and the level of the interest rate and debt service.

18. An adequate estimate of possible nonperforming loan losses and the size of the guarantee that is required for a given end-user interest rate is relevant because an underestimate would lead to unexpected losses incurred by financial intermediaries, whereas an overestimate would lead to an inefficient use of government resources. In the latter case, resources are not lost but have been temporarily allocated to a use with a lower social return than could have been given to them.

19. During the pilot phase of the program, an interest rate of about 12 percent was applied to the end-user. This rate was decided by NAFIN taking into account the market and business conditions, i.e., costs and associated risks. This rate is neither mandated by the Government nor fixed because NAFIN will have the right to adjust it in light of the evolving market and business conditions. In addition to tying debt service to the electricity bill, this was made possible with a government guarantee for an amount of 15 percent of the outstanding loan amount (now slightly reduced as explained in paragraph 23). The funding cost in the market for four-year fixed rate loans is about 6.3 percent, leaving a spread of about six percentage points to cover the administrative cost, remaining credit risk and intermediation margin between NAFIN and FIDE.

20. The use of concessional CTF funds in the funding mix of NAFIN lowers the overall average cost of funding for the program. Total credit exposure by the end of the project implementation period is estimated at US\$ 177 million, of which US\$50 million or about 29 percent will be funded with concessional CTF funds. The remaining 71 percent will be funded by NAFIN with a €25 million (approximately US\$32.5 million at an exchange rate of 1.3US\$/€) loan from KfW and US\$94.5 million in the domestic credit market. On the assumption that the CTF debt service payments can be swapped into a peso liability at an interest rate of approximately 3.3 percent and compared with the currently prevailing peso market interest rate of some 6.3 percent, the average funding cost for the program would be brought down to about 5.4 percent. This benefit of a below-market cost of funding is planned to be plowed back into the program as follows: (i) by allowing a larger administrative cost recovery of FIDE, thereby strengthening its program administration and monitoring capacity (NAFIN currently pays 1 percent to FIDE and this would increase to 2 percent), and (ii) by reducing the size of the Guarantee Facility, thereby freeing up program resources that can be employed for additional vouchers as instant discounts (Component 2a.i.).

21. The proposed program and Bank support have two implications for the Bank's operational policy for Financial Intermediary Lending: (i) the operation makes use of directed credit by providing credit to a defined segment of the consumer market, and (ii) it passes the CTF funds to the financial intermediary, NAFIN, at a below-market rate. Directed credit is proposed to be provided in view of the fact that targeted consumers otherwise would not have access to consumer credit because of their relatively low levels of income (paragraph 13 above) while realization of project benefits critically depends on their participation. Moreover, the objective of this component is to make households aware of the financial benefits of using energy-efficient appliances. It is expected that once the project is completed, the households, having seen the money-saving potentials of energy-efficient appliances, would on their own go for such choices and NAFIN would maintain the financing program on its own. A public information program would also facilitate this.

22. Therefore, this Project would serve as a catalyst. A more rapid introduction of energy-efficient appliances, particularly by lower-income households, as well as the effective scrapping of older appliances, justifies a government intervention including the use of direct credit and a government-sponsored guarantee. It can hardly be argued that this specific purpose-directed consumer credit could lead to significant distortions in the consumer credit market because the peak amount of outstanding credit, US\$177 million, is equivalent to some 0.45 percent of the total amount of consumer credit outstanding at the end of 2009. Moreover, the households targeted under this component by most measures do not even count as part of the consumer credit market, a governing factor for using NAFIN, a development-oriented entity, as the sole financial intermediary for the handling this project component.

23. Although the CTF funds are channeled directly to NAFIN at a below-market cost (i.e., at 3.3 percent versus the market cost of 6.3 percent, giving a nominal net cost advantage of 1 percent which would virtually disappear after FIDE's fee is increased), it is worth noting that the benefit of below-market funding cost to NAFIN is plowed back into the program because the Government and NAFIN have agreed on changes to some of the key parameters to the program. These changes are the reduction (from 15 to 12.5 percent) on the US\$50 million CTF portion of the line of credit in the amount of the first loss guarantee that NAFIN requested during the first year of the program, and the strengthening of the program's operator, FIDE. The reduction in the Guarantee Facility would free government resources to be redirected to the vouchers-instant discounts as a driver for the replacements under levels 1

to 3, resulting in additional replacement of appliances. The strengthening of FIDE would improve the monitoring capacity and also allow the enhancement of awareness campaigns to generate more traction in level 4, which showed the lowest number of replacements in the pilot. This setup is justified because it is institutionally much simpler and facilitates the timely and effective operation of the program. It also provides for additional incentives to NAFIN to operate and provide information on the program to external audiences.

24. It is also worthwhile to mention the economic and environmental benefits of energy efficiency investments in lighting and appliances being supported in this Project:

Delaying or avoiding new power generation infrastructure by reducing the demand for electric power from the residential sector. Energy efficiency savings would result in both a reduction in peak and base load electricity demand, and the delay in or avoidance of constructing new electric generating capacity.

Reduced fuel consumption for power generation resulting from the lowered demand for power from the residential sector. In Mexico, a significant portion of power generation is oil- and gas-based generation plants, with electricity savings avoiding the corresponding need for fuel. This reduces total energy costs and improves the competitiveness of the economy.

Consumers' electricity bills are reduced through the adoption of CFLs and the replacement of inefficient appliances by reducing the amount of electricity consumed by households' principal electricity-consuming equipment.

Mitigation of the burden of the electricity subsidies currently being provided to the residential sector. Although the absolute tariff levels for residential consumers in Mexico are not particularly low by regional standards, the total amount of residential subsidies—notionally, the difference between accounting costs and tariffs—is large, estimated to be equivalent to 1 percent of GDP in 2006. Reducing end-use consumption through energy efficiency directly reduces the fiscal burden associated with the provision of electricity subsidies. The replacement of 45 million CFLs and 1.7 million appliances under the Project would generate about 10,000 GWh of electricity savings during the implementation period (through June 30, 2014). Given the rate of subsidy to residential electricity consumers of 10 US¢ per kilowatt-hour, the avoided tariff subsidy payments over the implementation period is US\$1 billion.

Energy security is enhanced by reducing the overall energy needs of the economy and thus increasing reserve margins and reducing the risk of energy shortfalls.

Environmental benefits associated with improved energy efficiency include:

- a. Reduction of greenhouse gas (GHG) emissions from Mexico's largely thermal-based power system, which reduces Mexico's contribution to global climate change.
- b. Reduction of local and regional air pollutants from electricity generation that contribute to acid rain and adverse health impacts from respiratory disease.
- c. The avoidance of vented chlorofluorocarbons (CFCs), powerful GHGs that will be captured from old appliances and destroyed. The economic benefits of avoided CFC venting are due to both the gas's global warming potential (GWP) and its contribution to ozone depletion.⁵⁶

⁵⁶ The economic effects of ozone depletion include reduced human immune responses (increasing the incidence of infectious disease and reducing the efficacy of vaccination programs), disrupted growth processes in plants (leading to reduced yields

D. NAFIN

25. Mexican development banks are important players in the financial system, providing more than 15 percent of the total credit of the banking system and controlling assets of 6.7 percent of GDP as of end-2008. Although development banks in Mexico have a long history (NAFIN was created in 1934), about a decade ago the government started a process of reform to enhance the performance and potential impact of these institutions. Development banks are now regulated and supervised as private banks; interest rate loan subsidies have been reduced, an increasing share of subsidies is financed through the government's budget, and lending by development banks has significantly shifted from direct lending to lending through private financial institutions. As a result, development banks have reported adequate capital positions and positive results (FSAP Update 2006).

26. Law amendments in 2002 introduced the principle of capital preservation and offered greater autonomy of operation in exchange for improved governance and accountability. Importantly, the independence of development bank Boards was enhanced through the mandatory participation of two independent and qualified members; disclosure and transparency were strengthened with the annual submission of operational and financial plans to the government and Congress; and a risk management committee was created at each institution.

27. Significant changes in 2009 took place to strengthen the accountability framework. Development banks will have to publish indicators measuring their services to their target population according to guidelines issued by SHCP; and SHCP will have to conduct and publish independent evaluations on development banks. In addition, there has been a general tendency to change the pricing of products to better reflect costs. Guarantees of market products with higher risks or social rationale are supported by counter-guarantee funds directly financed from the Federal Government in order to make subsidies more transparent and allay the tensions between the need to maintain a sound financial performance and fulfill specific policy objectives.

28. Governance and institutional reforms have contributed to improvements in the overall financial performance of development banks. All development banks have maintained capital levels above the regulatory minimum, which is the same as that of commercial banks. Return on assets has varied over time and among development banks, yet all showed positive positions in 2008 and 2009. Margins of intermediation tend to be thin reflecting the tension between profitability and their public policy mandate. Delinquency rates had been on a downward trend until 2008 when the international financial crisis materialized and non-performing loan portfolios went up particularly in the housing finance sector.

29. NAFIN is one of the Government of Mexico's larger development banks, with a broad mandate of promoting savings and investments and channeling financial and technical resources to the country's industrial development and to national and regional economic development. After a restructuring process in 2001, NAFIN has started to focus on access to

for certain crops and forest trees), and disrupted development in fish (estimated to reduce ocean fish stocks by several million tons per annum).

Source: International Development Research Center (IDRC), "Human and Economic Costs of Ozone Depletion", <http://www.idrc.ca>, 1997, February 26, 2010, <http://archive.idrc.ca/books/reports/1997/14-02e.html>

financial problems by SMEs, offering widely available, low-cost products by utilizing commercial banks and a network of nonbank financial intermediaries.

30. NAFIN has been a catalyst in increasing the supply of private sector financing to the SME sector. It has developed a number of credit products and instruments, the most significant of which include: (i) Supply chain program. This program provides working capital to SME suppliers of larger companies with a low credit risk through an Internet-based market for SME receivables that can be discounted with commercial banks and nonbank financial intermediaries. The program has become an example of innovative practices in the region. In 2008, NAFIN channeled MX\$162.5 billion to the operation of 451 productive chains benefiting 22,000 enterprises; (ii) Guarantees and indirect credit. NAFIN has also led the development of credit guarantee programs to provide incentives for financial intermediary lending to SMEs, obtaining budget allocations from the government to cover the first losses and operating a periodic auction among financial intermediaries, strengthening competition among them and improving the credit conditions of beneficiary SMEs. The program induced financial intermediaries to grant credit to an amount of MX\$82.9 billion to more than 73,000 enterprises; (iii) Microenterprise. This program provides lines of credit through financial intermediaries to provide credit to microenterprises of up to two years for working capital and the purchase of fixed assets. In 2008, it channeled credit to an amount of MX\$6.3 billion and benefitted close to 550,000 microenterprises.

31. NAFIN is a profitable and solvent institution with exemplary risk management practices and the full backing of the Government of Mexico. By the end of 2009, NAFIN controlled assets to an amount of MX\$285 billion (US\$22 billion), including a loan portfolio of MX\$111 billion. The bank maintains a capitalization index of 12.55 percent, well above the minimum legal requirement of 10 percent, and has posted an annual positive net return ever since 2001. Net profits were MX\$ 570 million in 2009 up from MX\$108 million in 2008, though the profitability of the institution remains modest in terms of its return on assets (ROA) at 0.23 percent and return on equity (ROE) at 4.36 percent. Non-performing loans have been kept at minimum at 0.11 percent of the total loan portfolio.

32. Audited financial statements of NAFIN are published in an annual report available on the institution's website (www.nafin.gob.mx). In addition, the banking and securities commission (CNBV) publishes quarterly summary financial statements of all development banks and operational progress reports on each of the development banks are included in the quarterly reports on public finance to Congress.

Table Summary Statistics Mexican Development Banks and NAFIN

	Development banks (2009)	2009	2008	2007	2006
Capital Adequacy ratio	14.54	12.55	12.47	14.52	16.08
NPL/Total Loans	2.20	0.11	0.25	0.39	0.24
Return on Assets	0.51	0.23	0.05	0.64	0.02
Return on Equity	6.28	4.36	0.83	6.60	0.35

Source: CNBV

45. Savings from avoided tariff subsidy payments: The replacement of 1.7 million appliances under the Project would generate about 3,600 GWh of electricity savings during the implementation period (through June 30, 2014). Given the rate of subsidy to residential electricity consumers of 10 US¢ per kilowatt-hour, the avoided tariff subsidy payments over the implementation period is US\$360 million. The avoided tariff subsidy payments are greater than the total amount that the government must provide for either vouchers or the guarantee facility. The avoided tariff subsidy payments improve to US\$1.4 billion if the energy savings over the entire useful life (10 years) of the appliances are considered.

Annex 18: Maps

MEXICO: Efficient Lighting and Appliances Project

